Australia's National
Science Agency

Investigating water quality

'Keeping an Eye on Water' class activities

Contents

About CSIRO's teacher resources

CSIRO, the national science agency, has been delivering high-quality STEM education and outreach programs and initiatives for Australian teachers, students and the community for over 40 years.

This collection of activities has been prepared in conjunction with Australian-based educators. While activities include an indication of what learning stage they may be suitable for, teachers are invited to see these as recommendations and modify the activities as appropriate for their circumstances and students' needs.

About AquaWatch Australia and Eye on Water

The health and quality of our inland and coastal waterways are under threat from increasing human activity, including urbanisation, population growth, land use changes, deforestation, competition for the resource with irrigation and farming needs, and contamination.

Water quality is also under pressure from the effects of climate change. As variations become more marked, the environmental impact from drought, bush fire sediment, storm events, toxic algal blooms and contamination is growing.

Together with our partners, CSIRO is co-designing and building the AquaWatch system of technologies to monitor water quality with real-time data and predictive analysis.

The system will use an extensive network of Earth observation satellites and ground-based water sensors to monitor the quality of Australia's inland and coastal waterways.

AquaWatch Australia will provide an early warning system to improve management of harmful algae blooms and contaminants. This timely data will support communities to better manage human and animal health impacts from toxic water quality events.

It will also assist with monitoring and managing our aquatic ecosystems and reducing the economic impact on industries that rely on safe healthy marine environments, such as aquaculture, fishing, tourism and recreation.

Eye on Water is a citizen science app from the AquaWatch program which aims to use measurements of water colour to understand changes in water quality. Water colour is a very informative indicator of the ecological state of marine and fresh-waters.

Activity 1: Using the EyeOnWater app (Excursion)

Background

Earth Observation (EO) is the process of using satellites, airplanes, or other tools to gather information about the Earth's surface. This includes looking at things like weather patterns, land use, water quality, and changes in the environment. Scientists use this information to understand how our planet is changing and to help protect it.

CSIRO's AquaWatch Australia is using EO including citizen science combined with satellite data to understand how our water quality is changing. The Eye on Water citizen science app was introduced to Australia because of water quality issues like floods, droughts, and algal blooms. The Eye on Water app data can help monitoring water colour and water quality changes over time. This information can be compared with satellite data which covers a much wider area than ground measurements.

Find out more about AquaWatch on our website.

This activity suggests taking students to a body of water (river, lake, calm beach without waves) to use the EyeOnWater Australia app. Please take all precautions necessary to ensure the safety of all parties present.

Introducing water quality

See the "What is water quality and how can I measure it?" and "What are your local rivers, lakes and coasts like?" resources in the Appendix and use these as slides or handouts to introduce the topic of measuring water quality.

Using the 'EyeOnWater – Australia' citizen science app

1. Download the 'EyeOnWater – Australia' app to school devices (or students' devices if permitted) from the Google Play store or Apple store.
2. Open the app and have students answer the Quality quiz that appears onscreen. Pay attention to the recommendations and try to get a score of seven or above. Students can retry as many times as they like.
3. Once the quiz has been completed, choose to 'Continue without login'
4. Head to your chosen body of water.
   Tip from the AquaWatch team: Find a larger water body, such as a big lake or river.

5. Find a good location to take a photo. You will need solid ground near the water's edge where nothing is in the way of the water, and you can't see the bottom. To avoid glare, try to ensure the sun is behind you.

6. Press the 'Get Started' button and position the phone or tablet over the water to take a photo. Don't lean over the water, instead, find a safe distance from the water's edge and kneel on one knee in a stable position to take a photo. (See image.)
7. Once you have a clear photo, the app will prompt you to match the colour of the water to the colours displayed on the screen. Swipe through the options until you find a match. These colours are called a Forel-Ule chart.
8. Once you have chosen a matching colour, answer the questions about your location and the clouds above.
9. After submitting your details, your image will be queued for uploading to the database. Tip from the AquaWatch team: After your first reading using the app, you will be given a prompt to allow notifications from the app. If you press yes, you will get a notification when a satellite is coming over your water body. When you take a photo at the same time as a satellite it makes both photos more useful.
10. Under the queued uploads button, you will be given information about the what the water your described means.
11. Now see your measurements online at https://research.csiro.au/eyeonwater → observations (top banner)

Activity 2: Designing water filtration systems using a bottle sieve

Curriculum links

Science Understanding

- Use a particle model to describe differences between pure substances and mixtures and apply understanding of properties of substances to separate mixtures (AC9S7U06)

Science Inquiry Skills

- Develop investigable questions, reasoned predictions and hypotheses to explore scientific models, identify patterns and test relationships (AC9S7I01)
- Plan and conduct reproducible investigations to answer questions and test hypotheses, including identifying variables and assumptions and, as appropriate, recognising and managing risks, considering ethical issues and recognising key considerations regarding heritage sites and artefacts on Country/Place (AC9S7I02)
- Select and use equipment to generate and record data with precision, using digital tools as appropriate (AC9S7I03)
- Analyse data and information to describe patterns, trends and relationships and identify anomalies (AC9S7I05)
- Construct evidence-based arguments to support conclusions or evaluate claims and consider any ethical issues and cultural protocols associated with using or citing secondary data or information (AC9S7I07)

Objectives

By the end of this lesson, students will be able to:

- Physically separate a mixture of 'contaminated' water by creating a water filtration system
- Design, construct, test and evaluate water filtration system to separate a mixture of 'contaminated' water
- Describe how the physical properties of substances in the 'contaminated' water relate to their removal during the filtration process
- Extend their understanding of physical separation techniques to consider how they are used in protecting our environment.

Teacher notes

This lesson is intended for students to engage with experimental design and critical thinking and connect with the ideas of separating mixtures and water quality. It might be best split over two sessions to give students enough time to engage fully with discussing, designing, building, testing and communicating their results. To condense the lesson into one session, you may wish to reduce the number of discussion questions for students in the lead-up to the experiment, and to predetermine the designs, allocating one design to each group.

Materials (per group of 3-4 students)

A copy of instructions and printouts for using a Secchi disk, found in Appendix 1.

Also see Appendix 1 for 'Experimental method for designing a water filtration system' for the materials and instructions for setting up the experiment. This activity has been adapted from CSIRO's Living STEM program.

Lesson Structure

Introduction (15 mins)

1. Explain to students that contaminated water can take many forms, the most easily recognised being visibly dirty water, with sediment (dirt and mud) and debris (plastic, wood, leaves, etc). Contaminated water is often 'low quality'. Before exploring water filtration, ask students
   a. What does water 'quality' mean to them?
   b. Why is it important to have good quality water?
   c. What might be some of the impacts of poor water quality for humans and other life (animals – in the sea and on land – and plants)?
   d. How can water become contaminated? Encourage students to think beyond human pollution and consider the effect of natural events, such as heavier than usual rainfall, flooding and earthquakes.

2. Show students the following video from CSIRO:
   How can we easily check our water quality? Clue - it involves satellites
   (URL: youtu.be/33wTtqgHsEA?si=q35_Zlgl3hZf_J57)

3. Having watched the video, ask students:
   a. How might we measure the quality of water?
   b. What might we measure? There are many variables we can measure. Depending on your class, students might be familiar with testing pH, biodiversity and dissolved oxygen.

4. Following this, hold up two samples: one clear (tap or filtered) water, and another cloudy ('contaminated') water. Ask students the question: '*how might we remove the contaminants in this sample to make it safe to drink?'.* You might like to have students do a quick 'think-pair-share' on this question before discussing as a class.

5. Explain to students that the 'cloudiness' of the water is known as its **turbidity.** We can measure the turbidity of the water using a **Secchi disk**. A Secchi disk and instructions for use can be found in the Appendix.

Designing a filtration system (25 minutes)

1. Most students will be familiar with the idea of using filters to sort objects of different sizes – colanders and sieves for pasta and rice being some of the most obvious around the home.

Some students might have filtered water on tap from their fridge.

If you have already addressed the idea of filtration with your students, use this point to find out what students can remember or already know about how filtration works.

If you have yet to discuss the idea of filtration, ask students to consider how colanders and sieves work and why a colander is suitable for some food (e.g., vegetables and pasta), whereas a mesh sieve is needed for others (e.g., rice and lentils).

From here, ask students to consider how they might filter contaminants out of the contaminated water – can they use one filter to remove all contaminants? How can they remove smaller and smaller contaminants while being able to maintain a reasonable flow of water through a filter?

2. Explain to students they will be designing, testing and reporting back on the effectiveness of a water filtration system using a plastic bottle and various filtering substances.

3. Allow students to split into groups (or group them as you see fit).

4. Show students the range of filtration substances available for their filtration system and explain the basic setup of the system, i.e. a 2L plastic bottle cut in half with the top inverted and placed in the bottom of the bottle to collect the filtered water. There are images of the setup on the experimental method to direct students to.

5. Allow the groups to brainstorm, sketch and refine designs in their notebooks to come up with a testable filtration system design. Students should consider:
    - The number and order of filtration layers (gravel, sand, cotton/cloth)
    - The thickness of each layer
    - How to prevent materials from mixing

6. As much as possible, encourage groups to use a novel combination of materials, layering and thickness so that there are differences to compare.

7. Students now have a testable design and a method of measuring its effectiveness using the Secchi disk. So that different designs can be compared between groups, ask students to consider the variables they'll need to keep constant for a fair comparison between groups.

    Some suggestions are:
    - The way in which the contaminated water is created (i.e. using the same ratios, volumes and masses of contaminants)
    - The time the contaminated water is left to filter. Students might allow the samples to filter completely, recording the time it takes to filter completely. Alternatively, they may allow the samples to filter for a specific length of time and record the volume of water filtered in that time in addition to the turbidity.

- Note: recording the time to filter will be useful as an extra comparison point for groups with similar turbidity results.

Construction and testing the filtration system (15 minutes)

Using the experimental method in the Appendix, students can now build their design using their sketch as a guide. Groups should take note of any changes they had to make to their design once they had the actual equipment to use.

Analysing and reflecting on the investigation

A results table and questions are included in the method for students to consider and take notes in their notebooks. Here they are for reference:

Comparing your results

Compare your group's results with at least two other groups – how did the other groups' filtration systems compare to yours? Are there any patterns you notice? Anything in common? Anything that is different? What do you think might be the reason for the differences you see?

Analyse the results

To help you write a conclusion, here are some guiding questions to help you. It might be useful to look at other groups' results and setup so it's easier to compare results and effectiveness.

- Which designs were most effective?
- How did the order and thickness of layers affect filtration?
- What role did each material play in the filtration process?

Write a conclusion about the effectiveness of different layers of filtering materials for removing contaminants from water, making reference to the results of your class.

Reflect

Reflecting on the investigation, how well did the filtration process work? What could be improved? Provide suggestions for improvements.

Real-world connections

Thinking about your investigation and the work of scientists to monitor water quality through EyeOnWater, how might we use separation techniques to clean up contaminated bodies of water?

How is the water from our taps cleaned before it reaches our homes and gardens? Investigate water purification methods.

If you were out in the bush and needed clean water, what materials could you use to filter dirt out of water?

Extending your knowledge

Use what you know about separating mixtures,

- are there other ways of separating the contaminants from the water that could be used?

- What might be the benefits or disadvantages of using those methods?
- Could those other methods be combined with your filtration system to make the process even more effective at removing contaminants?

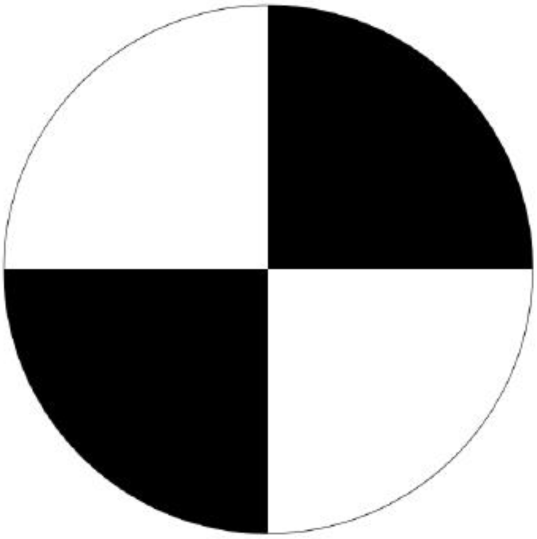
How could we ensure the filtered water is free from any harmful bacteria or viruses?

Connecting to EyeOnWater

Now that you have learned about the importance of maintaining safe and healthy bodies of water, remember you can help CSIRO and scientists around the world by contributing to their research and action through using the EyeOnWater app. Citizen scientists (like you!) are a huge contributor to the success of initiatives like EyeOnWater. Taking part in those initiatives is one of many ways you can help keep our environment healthy and sustainable for generations to come!

Appendix 1

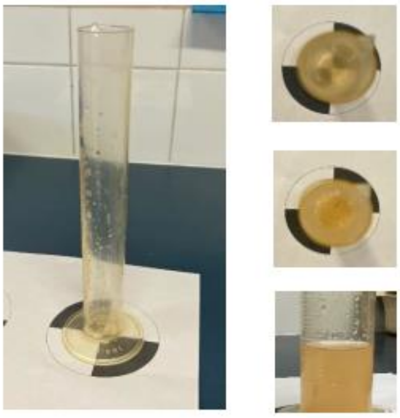
- Measuring turbidity using a Secchi disc
- Experimental method for designing a water filtration system
- Results table
- Student questions



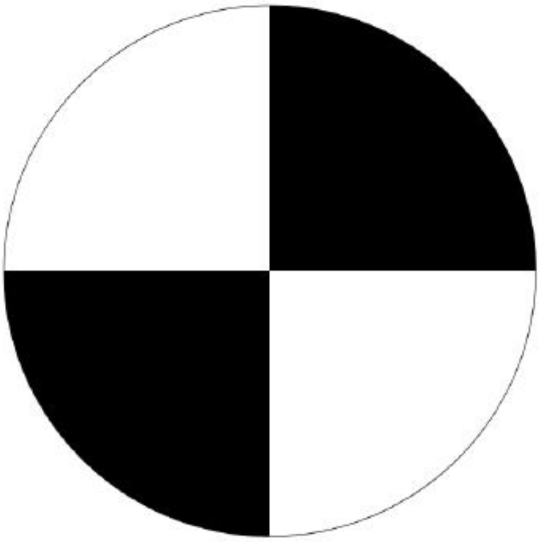
This black and white circle is called a **"Secchi disc"**. Scientists use these to check how clear the water is in bodies of water like lakes or oceans. The point where the black and white pattern is no longer visible is called the Secchi depth. We will use the Secchi disc by placing a clear measuring cylinder on top of it, and reading the depth in mL where the pattern disappears.

Method

1. Place the measuring cylinder over the Secchi disc.
2. Pour the water sample in, carefully watching the pattern. Stop pouring when the pattern is no longer visible.
3. Record the measurement.
4. Repeat steps 2 – 3 with any additional water samples.



Measuring turbidity using a Secchi disc. Photo David Broun.



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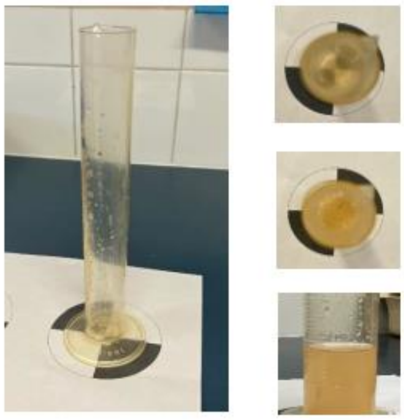

Measuring turbidity using a Secchi disc. Photo David Broun.

Experimental method for designing a water filtration system

Equipment
For each group:

- Dirty water sample (include leaf litter, dirt)
- 2L plastic bottle with lid removed
- Scissors
- Ruler
- Stopwatch
- Small square of fine dish cloth to cover bottle spout
- Elastic band to fix dish cloth
- Washed sand
- Gravel (aquarium gravel rinsed clean)
- Cotton balls or cloth gauze (10cm x 10 cm piece)
- Small stones in two sizes
- 100mL measuring cylinder
- Secchi disc printed (see Appendix A)
- Marking pen

Figure 1: Student water filters using stones and sand. Teacher: Rebecca Mackin, Onslow Primary School. Photo: David Broun CSIRO.

Method

1. Cut the plastic bottle in half.
2. Fit the dish cloth and band over the end of the bottle to prevent your filtering substances from falling out the nozzle.
3. Add layers of filtering materials based on your designs, using a ruler to measure the depth required.
4. Using the 100mL measuring cylinder, measure and record the turbidity of a sample of dirty water using a Secchi disc.
5. Using the measuring cylinder, pour the dirty water through the filter and start the timer on the stopwatch.
6. Record how long it takes for the water sample to filter through completely.
   OR
   Allow the dirty water to filter through for as long as you have allowed.
7. Use a Secchi disc and the 100mL measuring tube to measure the turbidity of the filtered water.
8. Record your results in a table similar to the one below.

Safety: DO NOT drink the filtered water! It might *look* clean, but it is not safe to drink!

Results table

Sample	Turbidity (mL)	Time to filter (minutes or seconds)	Observations
Before filtering			
After filtering			

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Activity 3: The carbon cycle and water quality

Curriculum links

Science Understanding

- Represent the carbon cycle and examine how key processes including combustion, photosynthesis and respiration rely on interactions between Earth's spheres (the geosphere, biosphere, hydrosphere and atmosphere) (AC9S9U03)

Objectives

By the end of this lesson, students will be able to:

- Describe the role of the ocean in the carbon cycle
- Pose correlations between global carbon dioxide concentrations, ocean acidification and phytoplankton populations
- Explain how oceanic carbon dioxide is used by phytoplankton and the impacts this can have on marine life and water quality
- Describe how citizen science efforts can contribute to monitoring changes in oceanic carbon dioxide through monitoring phytoplankton blooms

Teacher notes

It is recommended to allow for two lessons to complete these activities. Depending on your students, you may wish to provide more time to spend on the writing and recording of the formative assessment activity at the end of the lesson.

This lesson can be used as a means of connecting the carbon cycle to the ocean and the effect of climate change on oceanic carbon dioxide. This gives a good level of background information about climate change and its effects on the ocean, but can be omitted for time or where the additional information is not required.

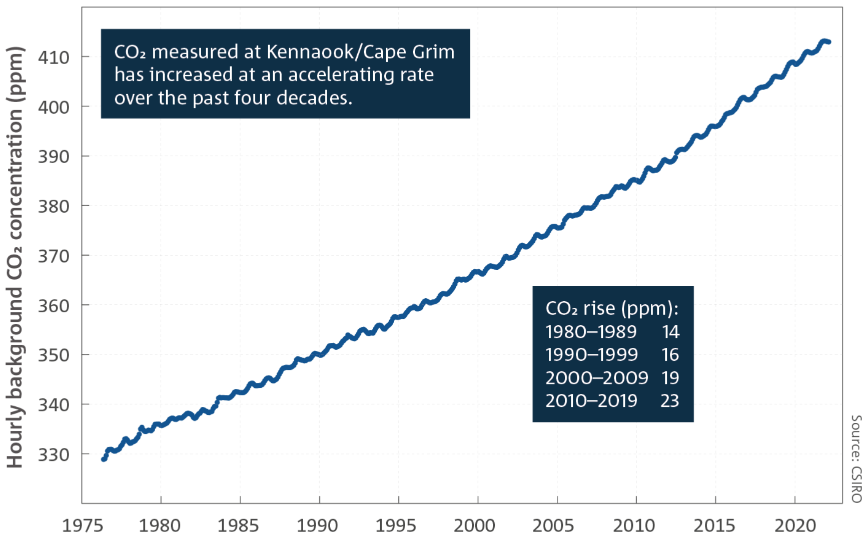
To focus solely on the link between oceanic carbon dioxide, photosynthesis and respiration, you can move straight to the section titled 'The role of phytoplankton in the carbon cycle'. This activity sees students research the effects of increased oceanic carbon dioxide on the abundance of phytoplankton and the ways in which scientists monitor phytoplankton blooms globally using satellites, like those used in CSIRO's AquaWatch initiative. Students then use this information to write a script to present what they've found and promote the EyeOnWater app to help scientists monitor water quality.

Lesson Structure (60+ mins)

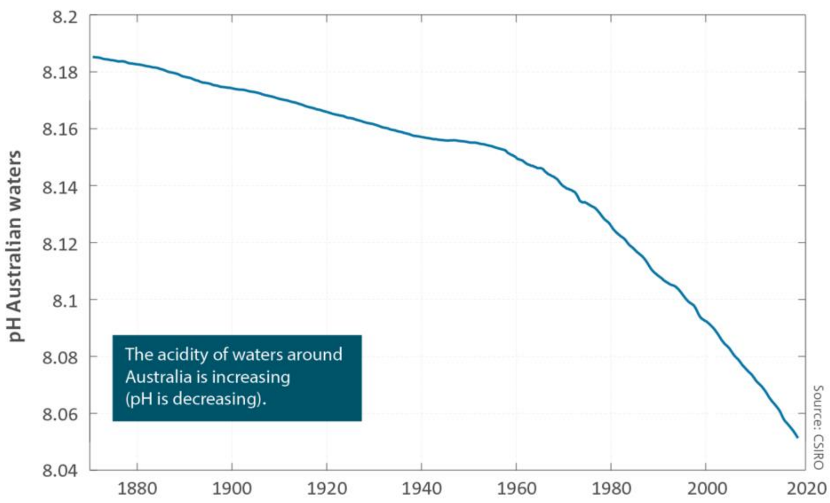
Increasing global carbon dioxide and its effects on the oceans (20 mins)

Display the two charts shown below (also found in the Appendix 2 for easier display).

Background hourly CO_2 measured at Kennaook/Cape Grim has increased at an accelerating rate over the past four decades. CO_2 rise (ppm) 1980-1989: 14 1990-1999: 16 2000-2009: 19 2010-2019: 23 Line chart which shows background hourly clean-air CO_2 as measured at the Kennaook/Cape Grim Baseline Air Pollution Station from 1976 through to June 2022.



The pH of surface waters around Australia. Change between 1880–1889 and 2010–2019. Calculations are based on present-day data on the carbonate chemistry of surface seawater around Australia from IMOS and other programs, and extrapolation of atmospheric carbon dioxide concentration changes since the 1880s. ©CSIRO



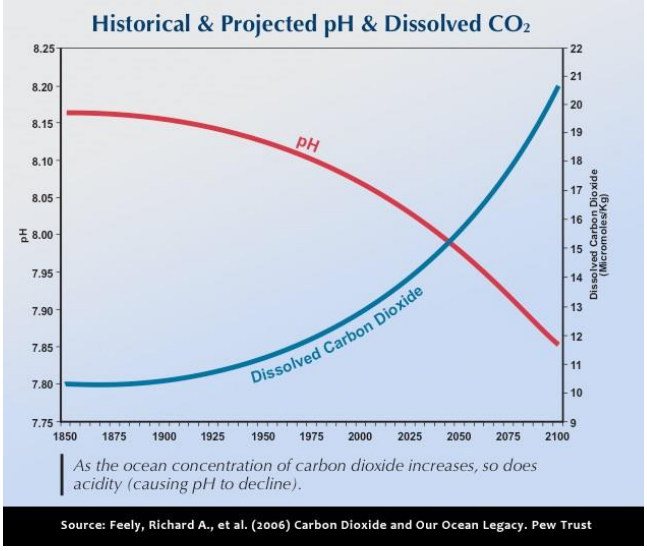
2. Ask students to consider individually what the two charts show and if there might be a relationship between the two charts. Then, ask students to discuss their ideas with a partner close by before discussing as a class.

3. Point out to students that the time on the horizontal axis of the pH chart starts at 1880. Does anyone in the class know the significance of that period of time? This is around the start of the Second Industrial Revolution – what might the significance of that time be (the development of the combustion engine)?

4. Next, show students the following chart (also found in the Appendix):

This chart shows the increase in carbon dioxide stored in the world's oceans from 1850 to now (and predicted levels for the future). Explain to students that as a result of human activities putting more carbon dioxide into the atmosphere, oceans have absorbed an increasing amount of carbon dioxide.

The decreased pH is a challenge for much ocean life, as it alters the environment they have evolved in, especially the coral reefs of the Great Barrier Reef.



5. Explain to students that measuring the pH of the ocean involves the presence of physical equipment in the oceans, which often involves sending ships out to sea to collect data. Another way we can get a measure of dissolved carbon dioxide in the ocean is to look at the abundance of **Phytoplankton. Phytoplankton** is a type of marine life that uses the carbon dioxide in photosynthesis and we can measure its abundance through the use of satellite imaging, similar to the satellites used in the EyeOnWater program.

The role of phytoplankton in the carbon cycle

1. Show students the following video from the European Space Agency:
   Carbon dioxide ocean–atmosphere exchange
   (youtu.be/0oQ_l-1IdOs?si=yamPt0cvq7lvOZYK)

2. As with all natural processes, a change in one aspect has a knock-on effect on other parts of the process. Explain to students they are going to use information from CSIRO and other reputable science agencies to find out more about the role phytoplankton plays in the carbon cycle and how satellites, like those used in EyeOnWater can be used to monitor the situation.

3. In Appendix 2 – The role of phytoplankton in the carbon cycle: Student guide, students will find questions and prompts to aid them in creating a brief informative message to be delivered to the class or recorded as a video about the link between phytoplankton, climate change and how we can help scientists to monitor waterways for increased phytoplankton populations. You can choose to run this activity with small student groups or individually.

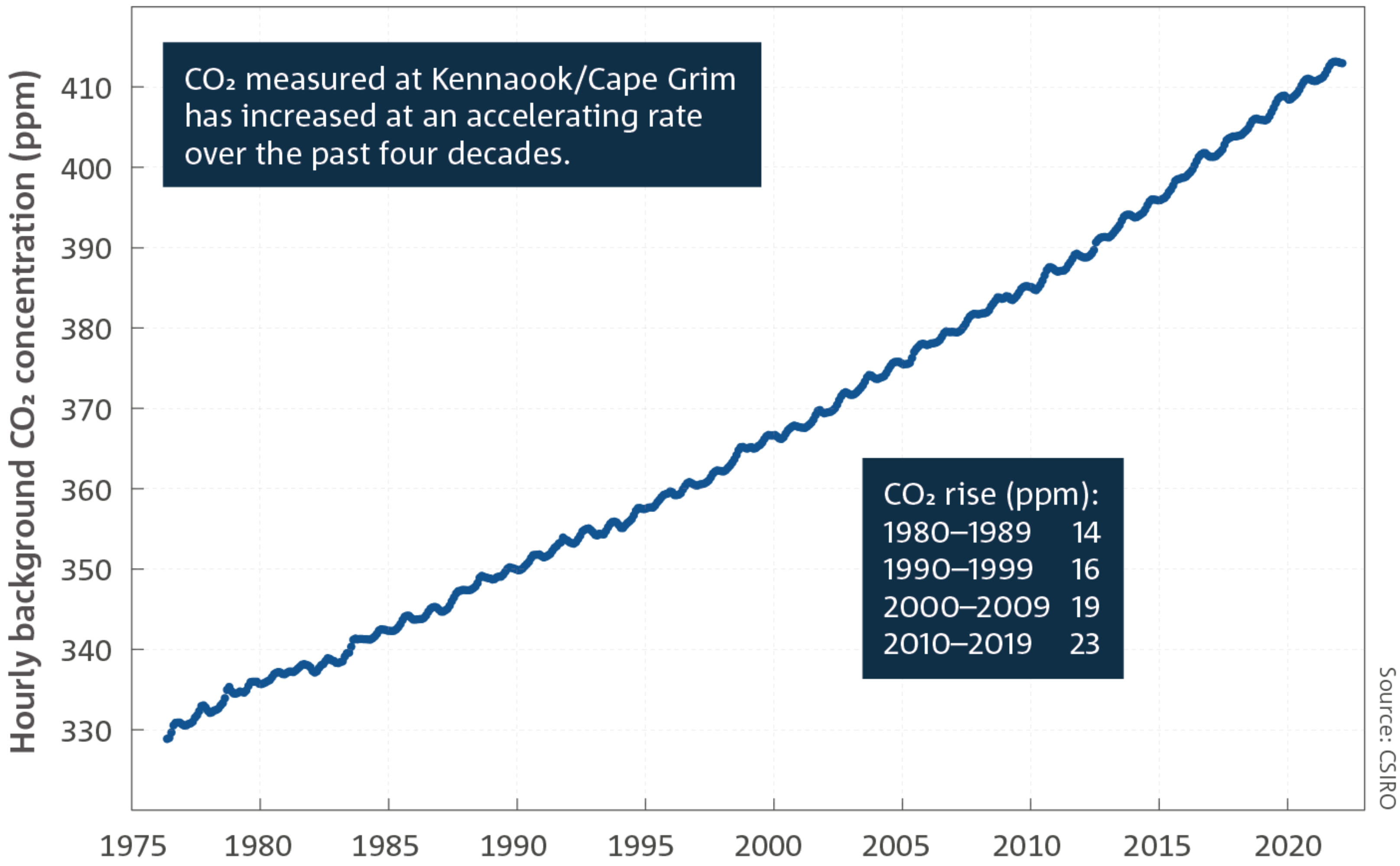
Assessing student scripts

In Appendix 2, you'll find a marking rubric for the scripts students create. These rubrics can be used for self-assessment, peer-assessment or for you to use.

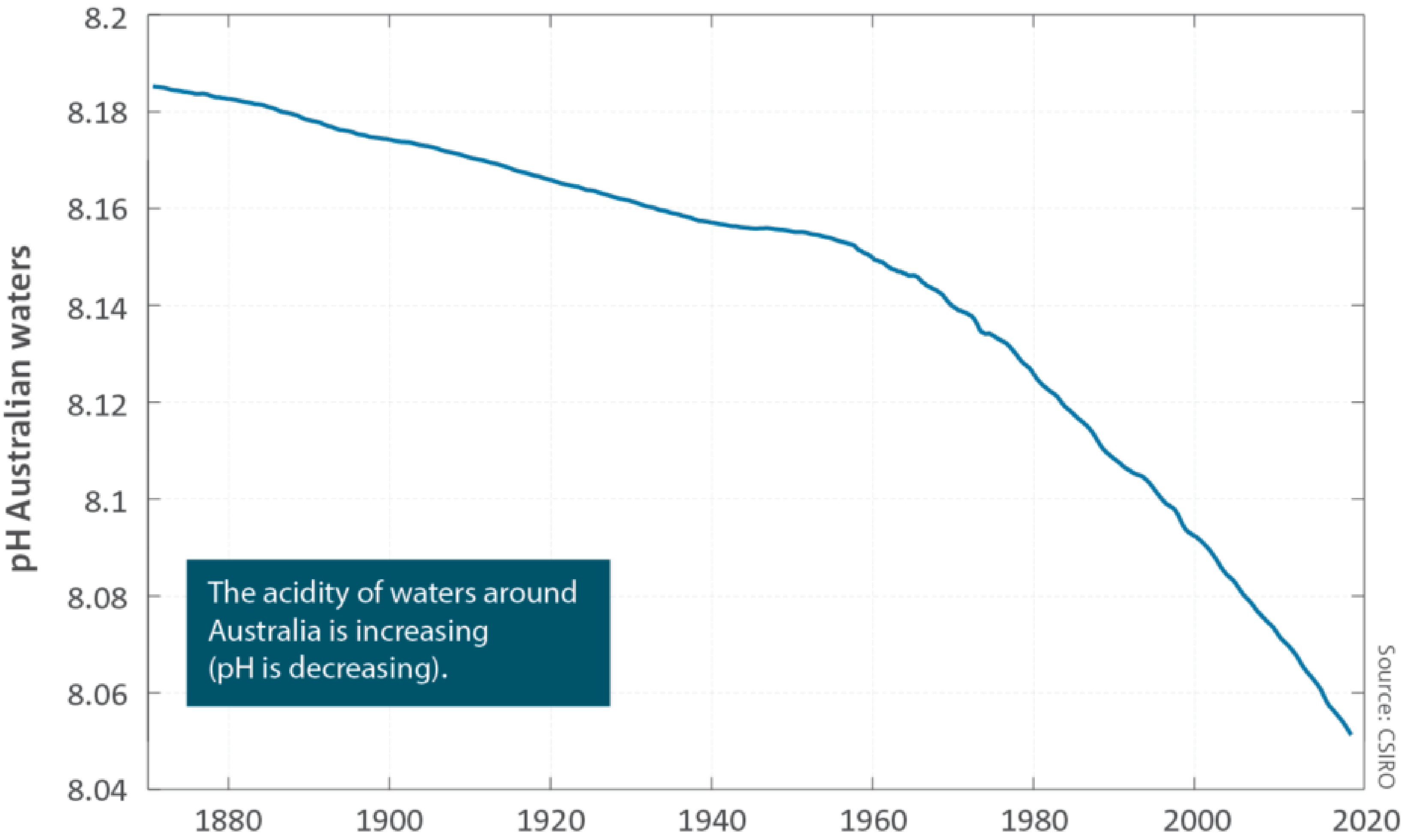
Appendix 2

- CO_2 and pH charts
- Historical & projected pH & dissolved CO_2 chart
- The role of phytoplankton in the carbon cycle – student guide
- Assessment rubric

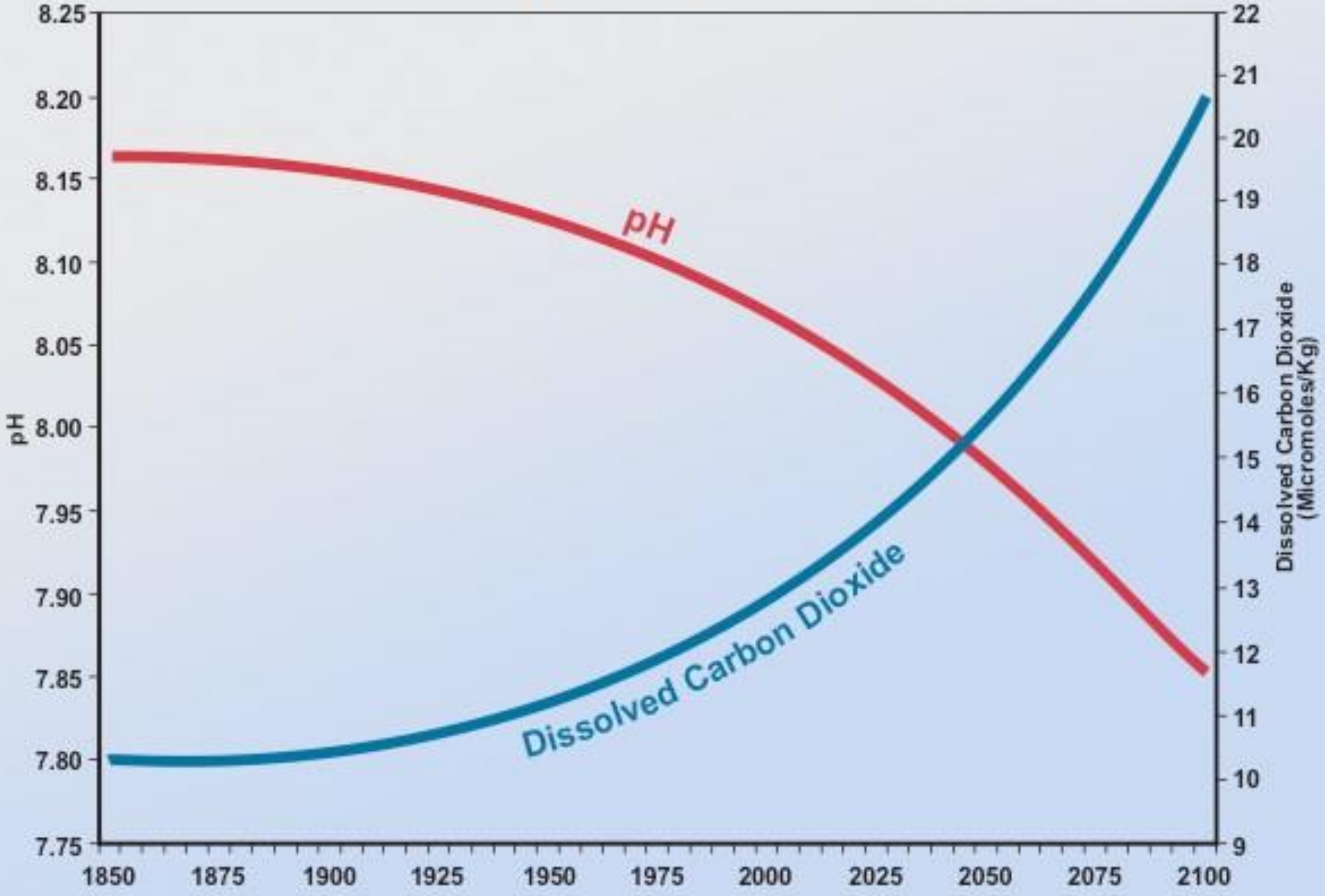
CO_2 concentration measured at the Kennaook/Cape Grim Baseline Air Pollution Station from 1976 through to June 2022.



pH of Australian surface waters (1880 – 2019)



Historical & Projected pH & Dissolved CO_2



As the ocean concentration of carbon dioxide increases, so does acidity (causing pH to decline).

Source: Feely, Richard A., et al. (2006) Carbon Dioxide and Our Ocean Legacy. Pew Trust

The role of phytoplankton in the carbon cycle: Student guide

Task brief: To write (and even record!) a short, informative piece on climate change, phytoplankton and how we can help scientists to monitor waterways for increased phytoplankton numbers. Your script, when spoken out loud, should be between 2 and 5 minutes long.

Getting started

The key to producing a good piece of science communication is presenting accurate information in a way that is interesting to watch. It's also useful to include a 'call to action' to increase engagement (think about how online personalities will often ask people to share or comment on a video). In this script, the call to action should be to encourage people to use the EyeOnWater app to take pictures of local bodies of water so they can be monitored for phytoplankton blooms and other possible issues.

Here are some questions you should research in putting together your script:

- What are phytoplankton?
- What are some of the factors affecting phytoplankton populations?
- How do phytoplankton populations change as a result of climate change and why?
- What are some of the effects of changing phytoplankton populations?
- How does the colour of water relate to phytoplankton and the presence of carbon dioxide?
- What are some of the ways scientists monitor phytoplankton populations?
- How can your fellow students become citizen scientists and help monitor phytoplankton blooms close to home?

Useful website and resources

The websites below can be used to find useful information to help write your script. You should aim to use other reputable sources, too (books from the school library and websites from scientific organisations are a great place to start – be aware of biased blog posts or dubious sources!)

Tip: rather than type the URL, use a search engine to search for the page title and source.

Youtube videos:

- Carbon dioxide ocean–atmosphere exchange | European Space Agency (youtu.be/0oQ_l-1IdOs?si=yamPt0cvq7lvOZYK)

NASA's Earth Observatory

- What are Phytoplankton? URL: earthobservatory.nasa.gov/features/Phytoplankton
- Chlorophyll URL: earthobservatory.nasa.gov/global-maps/MY1DMM_CHLORA

EyeOnWater URL: eyeonwater.org/education

Writing your script

After you have the information for your script, you're ready to start writing! Here's a guide to help structure your talking points. When you're writing your script, use the information you've gathered and the **assessment rubric** to guide what you write.

Script Template

Introduction

- **Hook:** A captivating opening to grab the audience's attention (e.g., a surprising fact, a vivid image, or a personal story related to water).
- **Brief overview**: Clearly state the topic: climate change, phytoplankton, and the importance of monitoring waterways.
- **Introduce yourself**: Briefly explain your role or interest in the topic.

What are Phytoplankton?

- **Definition:** Clearly explain what phytoplankton are and their crucial role in the ecosystem.

Phytoplankton and Climate Change

- **Impact of climate change:** Explain how climate change is affecting phytoplankton populations (e.g., water temperature, ocean acidification, what else?)
- **Consequences:** Discuss the potential consequences of changing phytoplankton populations (e.g., how might it impact marine life, or disrupt the carbon cycle? What else?)

Monitoring Phytoplankton

- **Importance of monitoring:** Explain why monitoring phytoplankton populations is important for understanding climate change and protecting our environment.
- **Traditional methods:** Briefly mention traditional methods used by scientists to monitor phytoplankton.
- **Citizen science:** Introduce the concept of citizen science and how it can help scientists gather more data.

Call to Action

- **Introduce the EyeOnWater app**: Explain what the EyeOnWater app is and how it works.
- **Encourage participation:** Persuasively encourage viewers to download the app and contribute to citizen science.
- **Highlight benefits:** Explain the benefits of participating in citizen science (e.g., helping scientists, learning about the environment).
- **Final appeal**: End with a strong call to action, reminding viewers of the importance of their contribution.

Closing

- **Summarise key points**: Briefly recap the main ideas.
- **Final thoughts:** Offer a final thought or reflection on the topic.

Remember

- Use clear and concise language.
- Keep the script engaging and informative.
- Consider your target audience when choosing your tone and vocabulary.
- Practice your delivery to ensure a smooth and confident presentation.

Other tips:

- Incorporate visuals or sound effects to enhance your presentation.
- Use storytelling to make your message more relatable.
- Practice time management to ensure your script fits within the allotted time.

Assessment rubric

Criteria	Excellent (4)	Good (3)	Developing (2)	Beginning (1)	Notes
Content Knowledge	Demonstrates a deep understanding of phytoplankton, climate change, and their relationship. Accurately explains the role of phytoplankton in the environment and the impact of climate change on phytoplankton populations.	Demonstrates a good understanding of phytoplankton, climate change, and their relationship. Provides accurate information but may lack depth in some areas.	Demonstrates a basic understanding of phytoplankton, climate change, and their relationship. Some information may be inaccurate or incomplete.	Limited understanding of phytoplankton, climate change, and their relationship. Information is inaccurate or missing.	
Scientific Accuracy	Presents accurate and up-to-date scientific information throughout the piece. Uses scientific terminology correctly.	Presents mostly accurate scientific information with minor errors. Uses scientific terminology appropriately.	Presents some accurate scientific information but also includes inaccuracies or misconceptions. Scientific terminology may be misused.	Contains significant inaccuracies or misconceptions about the science. Scientific terminology is not used correctly.	

Clarity and Organisation	Clearly and logically presents information. Uses a clear structure and transitions between sections effectively.	Presents information clearly and logically, but structure could be improved. Transitions between sections are used effectively.	Presents information in a somewhat disorganised manner. Some difficulty in maintaining clarity.	Presents information in a confused and disorganised manner. Lack of clarity and coherence.	
Engagement and Creativity	Captures and maintains audience interest throughout the piece. Uses creative approaches to present information (e.g., visuals, storytelling).	Effectively engages the audience with interesting and relevant information. Uses some creative elements.	Attempts to engage the audience but lacks creativity. Information is presented in a straightforward manner.	Fails to engage the audience. Information is presented in a dull and uninteresting way.	
Call to Action	Clearly and persuasively encourages watchers to take action (use the EyeOnWater app). Provides specific instructions and benefits of participation.	Effectively encourages watchers to take action. Provides clear instructions and some explanation of benefits.	Includes a call to action but lacks persuasiveness. Instructions may be unclear or incomplete.	Does not include a clear call to action or fails to encourage viewer participation.	

CSIRO Education: Opportunities for teachers and students

At CSIRO, we're passionate about the power of science, technology, engineering and mathematics to unlock a better future for all Australians.

We offer a range of programs nationally, all designed to bring real science to life in our classrooms and communities. All of our resources are curriculum-aligned and use best practice STEM teaching methods.

STEM Professionals in Schools

STEM Professionals in Schools is a national skilled volunteer program that facilitates flexible, ongoing partnerships between STEM professionals and teachers. Through these relationships, STEM Professionals in Schools brings real science, technology, engineering and mathematics into Australian classrooms. csiro.au/STEM-Professionals-in-Schools

STEM Together

STEM Together builds capability, confidence and connection with real-world STEM, by facilitating group learning experiences; tailored 'Future Shaper' recognition opportunities for students and supporters; and professional learning and tools for educators.

STEM Together prioritises opportunities for Year 5–10 students that identify as either Aboriginal and/or Torres Strait Islander, female, from schools in regional and/or lower socio-educational advantage areas. csiro.au/stem-together

Generation STEM

Generation STEM is a 10-year program designed to attract, support, train and retain NSW students in STEM educational and career pathways. As part of Generation STEM, the STEM Community Partnerships Program targets Year 7 to 10 students, helping to develop their STEM skills and provide exposure to local STEM careers and pathways. Deadly in Generation STEM aims to increase the participation of NSW Aboriginal and/or Torres Strait Islander students in STEM, through Culture and On Country. Generation STEM Links provides high-quality internships to help tertiary students gain relevant workplace skills and transition into STEM jobs after graduation. csiro.au/generationSTEM

Young Indigenous Women's STEM Academy

Funded by the National Indigenous Australians Agency, the Young Indigenous Women's STEM Academy provides a holistic, streamlined approach to support to Aboriginal and/or Torres Strait Islander young women in secondary school through tertiary studies and onto exciting careers in STEM. The Academy promotes access to STEM careers through a range of opportunities, tailored to each student.

If you know a young Indigenous woman who is interested in STEM, please encourage them to find out more and apply to join the Academy. csiro.au/yiwsa

Creativity in Research Engineering Science and Technology (CREST)

CREST is a non-competitive awards program that supports both primary and secondary students in the design and implementation of their own open-ended science investigation or technology project. csiro.au/crest

PULSE@Parkes

With this innovative program, secondary school students observe with the iconic Parkes radio telescope live but remotely to view pulsars, analyse their data and meet with our professional astronomers. research.csiro.au/pulseatparkes

Atlas of Living Australia

The Atlas of Living Australia is an online database of more than 55 million species of flora and fauna. There are also classroom activities using the ALA that align with the Australian Curriculum. ala.org.au

Living STEM: Connecting Indigenous knowledges to the classroom

Through participation and completion of Living STEM, educators are equipped with the knowledge, practices and resources required to implement the Living STEM inquiries in their classroom.

The program provides a mixed delivery model of online and face-to-face activities to meet the educational needs of clusters and individual schools in the Perth and Pilbara regions of Western Australia.

Educational Datasets

Real-world CSIRO research data is available for students to analyse. These datasets are differentiated and supported by teaching resources to build data literacy skills from novice to programmer. Suitable for Years 3–6 and 7–12. csiro.au/Datasets

Double Helix

Double Helix is Australia's leading science magazine for school-aged children, designed to foster an interest in STEM. *Double Helix* Extra is our free email newsletter delivering news, quizzes and hands-on activities straight to your inbox. doublehelixshop.csiro.au

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.

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For further information and to share feedback

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