

**USING UNDERWATER 360 VIDEO
TO EXPLORE SOUTH
AUSTRALIA'S MARINE
ENVIRONMENTS**

**A RESOURCE BOOK OF IDEAS
FOR TEACHERS**

Acknowledgements

This online curriculum-linked resource was produced by the Angela Colliver Consulting Services Pty Ltd (ACCS).

This curriculum-linked resource is designed to introduce young people to the importance of science and technology in generating the knowledge and actions needed to support sustainable use of marine and coastal areas.

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All links to websites were accessed in March 2018. As content on the websites used in this resource book is updated or moved, hyperlinks may not always function.

Introduction

More than 90 per cent of South Australians live within 50 kilometres of the sea and coastal areas. Schools across South Australia are engaged in teaching about marine and coastal areas. Many schools also access and experience the Experiencing Marine Sanctuaries (EMS) Schools Education Program.

This resource book aims to support teachers in schools engage students about sea and coastal areas and a range of marine-related topics.

Aim

The aim of this resource book is to educate students about South Australia's unique temperate marine environments.

This resource book provides schools with opportunities to:

- develop understandings about South Australia's unique temperate marine environments;
- discover ideas and solutions to take action to tackle science sustainability challenges as individuals, as a community and as the future decision-makers;
- discover and envision a range of creative solutions to real-world problems;
- design research projects with the ultimate goal of reflecting on appropriate local actions to ensure sustainable use of South Australia's unique temperate marine environments;
- design the steps required to create sustainable solutions for the problems;
- dream and consider the many possible solutions to deal with real-world challenges affecting South Australia's unique temperate marine environments;
- deliver and debrief solutions; and
- practise and reinforce the marine education and sustainability messages delivered in the Australian Curriculum Learning Areas and Cross Curriculum Priorities.

In schools, there is scope for teachers to integrate this resource book into their existing classroom programs.

How to use this resource book

This resource book provides learning experiences to support your school's involvement in learning about South Australia's unique temperate marine environments.

Teachers can use the following learning experiences to plan, publicise, provoke, stimulate, support and inspire their students learning about these important areas.

This resource book includes ideas to support students' involvement in investigating, exploring, experimenting, designing, creating and communicating their understandings about

what's involved in protecting and conserving South Australia's unique temperate marine environments.

Curriculum focus

This learning resource has a variety of student activities that link to the Australian Curriculum in Science, Technologies, English, and the Arts. It also has many opportunities to integrate the Australian Curriculum's Sustainability and Aboriginal and Torres Strait Islander histories and cultures Cross Curriculum Priorities (CCP) and General Capabilities.

Teaching and learning about South Australia's unique temperate marine environments can therefore be integrated into a range of learning areas.

A suggested learning sequence

The Project Based Learning (PBL) learning sequences used in this book are underpinned by the work of Lee Crockett.

PBL uses the *solution fluency* through six phases: Define; Discover; Dream; Design; Deliver and Debrief. The phases of the model are based on the 21st Century Fluencies created by Crockett et al. (2011).

The 2Essential Fluencies are outlined extensively in the book '*Mindful Assessment*' (Crockett, L. & Churches, A. (2016) *Mindful Assessment*. Published by Solution Tree. See also '[Solution Fluency](#)', Global Digital Citizen Foundation website.

The fluencies are:

- **Define:** The 'Define' phase begins with lessons that intellectually engage students with a challenge, problem, question and task. This phase captures their interest, provides an opportunity for them to express what they know about the topic, share understandings being developed, and helps them to make connections between what they know and the new ideas.
- **Discover:** The 'Discover' phase includes activities in which students can explore, investigate, research, read, discuss, gather, organise and compare knowledge and data. They grapple with the challenge, problem, question or phenomenon and describe it in their own words. This phase provides a context and enables students to acquire a common set of experiences that they can use to help each other make sense of the new knowledge or understandings.
- **Dream:** The 'Dream' phase enables students to imagine and develop possible solutions and explanations for the challenge, problem, question and task they have experienced. The significant aspect of this phase is that the students' explanations follow substantive conversations and higher order thinking experiences.
- **Design:** The 'Design' phase provides opportunities for students to apply what they have learned to new situations, to map production processes and so develop a deeper understanding of the challenge, problem, question or phenomenon. It is important for students to extend explanations and understandings, using and integrating different modes such as diagrammatic images, written language and media.
- **Deliver:** The 'Deliver' phase has two stages – production and publication or presentation. In the production phase, the task comes to life – this is the doing phase. At the end of this phase, the student task should be completed. Next, they present or publish their work sample to an audience.
- **Debrief:** The 'Debrief' phase provides an opportunity for students to revisit, review and reflect on their own learning and new understanding and skills. This is also when students provide evidence for changes to their understanding, beliefs and skills.

Source: '[Solution Fluency](#)', Global Digital Citizen Foundation website.

Project-Based-Learning (PBL)

In this resource, the emphasis is on providing teachers with ideas and activities that enable students to investigate and respond to a challenge, task or project (commonly called PBL tasks) and these enable students to pursue deep real-world investigations where they:

- Design real and complex projects for learning;
- Think and create in digital and non-digital environments to develop unique and useful solutions by both adapting and improving on current designs as well as the innovation of new possibilities;
- Think analytically and communicate using multi-media formats and engage in authentic assessment; and
- Present their learning via exhibitions.

Tech Talk

Virtual Reality (VR) technology is opening the door to a new world of immersive storytelling. As some of the world's biggest media and technology companies invest in the technology. It seems likely that VR will become a new content platform for schools.

EMS and [360Underwater](#) are integrating [360 degree video experiences](#) to this range of curriculum content.

Students are encouraged to use the 'click and drag' icon found within the 360 degree panorama photographs and videos to interact with the image and explore what each interactive experience has to offer.

Google's Cardboard headset is a recommended resource to enable students to access and use our 360 degree panorama videos content. Along with Cardboard, Google has launched Daydream, a high-quality VR platform with sophisticated headset hardware.

Learning Experiences for Foundation – Year 2

Activity 1: “I Spy” lots about marine creatures

Teacher Notes: Students use their senses to observe the external features of marine plants and animals. They begin to understand that observing is an important part of science and that scientists discuss and record their observations. Students learn that the survival of all living things is reliant on basic needs being met. They share findings of observations of living things in marine environments.

The focus of this task is for students to design and produce a product based on the game “I Spy” which allows children to discover their findings of living things in the marine environment.

Overview: Explain to the class that they will be exploring the basic needs of living things and their features. They will design and produce a text modelled on the game “I Spy” to share their observations of living things in South Australia’s marine environment.

Background Notes for Students: Needs of living things

Every living organism on earth needs basic living things to survive, be safe and healthy. There are five basic things that all organisms have. They include water, sunlight, air, food and a habitat or shelter.

The essential question: What might marine animals and plants need to survive and be healthy?

Scenario: Observing is an important part of science. The school science room is looking for classes to observe things about marine animals and plants and then create “I Spy” posters to share observations about their features.

What science investigations might help you?

Your challenge is to use science and observe, discuss and record your observations about living things in South Australia’s marine waters and what they need to survive, and be healthy.

A suggested learning process:

Define:

Share the essential question with the class and talk about their external features and what they need to survive, be safe and healthy.

Record students’ ideas on a classroom’s ‘Word Wall’.

Present the scenario, assign teams if appropriate, and ask students to define the task they have been set.

Discover:

Go outside, visit a pond or beach and observe any animals, insects and plants. Brainstorm what these animals, insects and plants look like, discuss their external features and what they might need to survive and be healthy.

Invite students to explore a Tinker Space where they can explore the features of marine animals and plants and what they might need to survive and be healthy.

For example:

A Tinker Space can be set up with pictures of different marine animals and plants. Include fish, sharks, rays, invertebrates, seagrass, samphire, and seaweed.

Locate pictures from a downloadable [snorkeler's guide to plants and animals in South Australia's Marine Parks](#).

Ask students to observe external features of a range of marine animals and plants and talk about what living things need to survive, and be healthy.

Ask the students, working in pairs or small groups, to group or classify the pictures and talk about their external features and the basic needs of marine animals and plants.

For example: Plants (pictures of seagrass, seaweed) Seaweed has branches. Seagrass has roots, stems and leaves. These marine plants need salt water, sand and sunlight to be healthy.

Ask students to share and compare their groupings, their features and ideas about what marine animals and plants need to survive and be healthy.

Play a 360 degree video for example, about South Australia's iconic Leafy Sea dragon (click [here](#) to play) on the 360 degree underwater website and explore what its external features are, and what it needs to survive, and be healthy.

Play the 360 degree video about jelly fish or sea jellies (click [here](#) to play). Ask students to focus on their long tentacles and to think about what they might be used for. (Note: the tentacles are used to catch their prey) Encourage students to look deeper and see if they can identify any barbed stinging cells on the tentacles. Talk about the food types the jelly fish might need to survive and be healthy.

Play the 360 degree video about sharks (click [here](#) to play) and interact with the images and explore the entire marine environment that is captured. Navigate to where you can find a Port Jackson Shark. Navigate further and locate where you think it might live. Try finding a cave. View the habitat of this marine creature and describe it.

Discuss what each of these marine creatures needs to survive and be healthy.

As an extension activity, share stories about marine creatures, their habitats and needs. For example:

- 'Commotion in the Ocean' by Giles Andrea

- 'Secret Seahorse' by Stella Blackstone
- 'Platypus' by Sue Whiting and Mark Jackson
- 'A House for Hermit Crab' by Eric Carle
- 'Hooray for Fish' by Lucy Cousins

Read [A House for Hermit Crab](#) by Eric Carle. Discuss the relationship between the crab and its shell. Ask students if they know of any other relationships between a living marine animal and something that is not alive. Students may wish to suggest other homes that animals rely upon including rocky crevices, caves, seagrass or inside shipwrecks. Explain to the students that animals may have relationships with other animals that are important for their survival.

Examples could include:

- A goby and alpheid shrimp. Gobies have good eyesight and are very alert. The shrimp however has poor vision but remains in contact with a goby by using its long antennae. Should danger threaten, the retreating fish alert the shrimp, and they all retreat into the burrow. In return, it is the role of the shrimp to do most of the making and maintenance of the burrow.
- The Remora or sucker fish hitch rides on sharks, rays, whales, turtles and even divers by sucking its dorsal fin against the host. They may remove parasites from their host, therefore 'paying' for their ride.

Replay the 360 degree videos and play the game "I Spy" with the students. For example, 'I spy with my little eye, something with a fin that is swimming beneath the diver 'What can it be? It starts with an 's' (shark).

Model the words needed to write an I Spy" text. For example, I spy with my little eye something...What can it be? It starts with...

Give the students practice reading the words.

In small groups, ask students to choose an animal or plant that lives in South Australian waters and list their knowledge about its features and what it needs to survive, and be healthy, and formulate draft questions they would like to answer. For example: Leafy sea dragon. 'A Leafy sea dragon is like a dragon mixed with a floating piece of seaweed. It needs a clean environment to live in and small shrimps to eat. I spy with my little eye something that needs a clean environment to survive. What can it be? It starts with L'.

Ask groups to read aloud and share the features and basic needs of the marine animals and/or plants that have been chosen.

Ask students to identify words they may not be familiar with. Display these where all students can see them.

Use a dictionary and look up the words and model this process to the students.

Make a glossary of words about the marine animals and plants, their features, and what they need to survive, and be healthy.

Compare the basic needs of some marine animals and plants. Create a class chart to display the comparisons.

Dream:

Ask students to visualise their chosen marine plant or animal, their features and what it might need to survive, and be healthy.

Ask students to imagine the steps involved in creating their “I Spy” posters to represent, share and reflect on observations about the features and needs of living things.

Challenge students to think about the materials, tools, and equipment they will need to make or draw their “I Spy” posters.

Design:

Ask students to decide on their marine animal or plant that lives in South Australian waters.

Provide students with a folded sheet of cardboard with two eye holes on the first page. Invite students to design their “I Spy” posters to represent, share and reflect on observations about the features and needs of a marine animal or plant that lives in South Australian waters.

Talk about the importance of an “I Spy” title above the two eye holes on the title page and ask students to decide on the text to be placed beneath the eye holes. Invite students to illustrate the plant, animal or insect on the following page.

Ask students to gather the materials, tools, and equipment needed and then make their “I Spy” poster, and photograph students at work.

Deliver:

Play “I Spy” and share student work samples showing what a marine animal or plant that lives in South Australian waters looks like and what they need to survive, and be safe and healthy.

Create a display of student’s work and enjoy a day of learning about the characteristics and basic needs of marine animals or plants that lives in South Australian waters.

Set up tables or booths in the class and invite students, teachers and parents to “Discover marine animals and plants that lives in South Australian waters”.

Debrief:

Ask students to:

Reflect on their observations of marine animals and plants that lives in South Australian waters.

Draw something new they discovered regarding what they need to survive and be safe and healthy.

Describe their favourite memory of creating their work samples.

Discuss what they learned about what marine animal or plant living in South Australian waters might need, now and in the future, to grow and survive in nature.

Links to the Australian Curriculum

Foundation, Year 1 and Year 2

Biological Sciences

Living things have basic needs, including food and water [ACSSU002](#)

Living things have a variety of external features [ACSSU017](#)

Living things live in different places where their needs are met [ACSSU211](#)

Science as a Human Endeavour – Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events [ACSHE013](#) [ACSHE021](#) [ACSHE034](#)

Science as a Human Endeavour – Use and influence of science

People use science in their daily lives, including when caring for their environment and living things [ACSHE022](#)

Design and Technologies

Explore needs or opportunities for designing, and the technologies needed to realise designed solutions [ACTDEP005](#)

Generate, develop and record design ideas through describing, drawing and modelling [ACTDEP006](#)

Use materials, components, tools, equipment and techniques to safely make designed solutions [ACTDEP007](#)

Use personal preferences to evaluate the success of design ideas, processes and solutions including their care for environment [ACTDEP008](#)

Sequence steps for making designed solutions and working collaboratively [ACTDEP009](#)

Cross-Curriculum Priority: Sustainability

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

General Capabilities: Literacy, ICT capabilities, Critical and creative thinking and Personal and social capabilities. *Source: ([ACARA](#), 2015)*

Learning Experiences for Year 3 and Year 4

Activity 2: Life beneath the ocean waves

Teacher Notes: Students explore requirements for a sustainable life beneath South Australia's ocean and steps involved in attaining it. They use and view videos as 'food-for-thought'. Students design and produce a short illustrated book for a pre-school or kindergarten that explains how science involves solving problems and how it could help create a sustainable life beneath the ocean waves. They evaluate their design, and suggest improvements where necessary, giving reasons. Students use their book and share how sustainability science could help create a sustainable life beneath the ocean waves.

The focus of this task is for students to design and produce a product in the technologies curriculum using a marine focus.

Overview: Explain to the class that their task will be to explore South Australia's unique ocean waters and uses science understandings to help solve problems.

Background Notes for Students: Scientists

Being a scientist begins with *thinking* like a scientist. Scientists are curious about how the world works. They have many questions and go about answering those questions using the scientific methods.

If you are fascinated by how things work and why they work a certain way, you too could become a scientist!

To work as a scientist, a person usually needs a degree in science. A degree is obtained by attending university and getting a Bachelor of Science or Marine Science degree.

The essential question:

What happens when we understand that science involves observing, asking questions about, and describing changes in objects and environments?

The scenario:

The organisation called 'Experiencing Marine Sanctuaries' (EMS) is searching for schools to discover what a sustainable 'life beneath the oceans' might look like, sound like and feel like through the development of short illustrated books.

We are calling on your school because we have heard about the wonderful sustainability and science program at your school. Your school is well known for its native garden, composting program, recycling program and drain stencilling program.

Your challenge is to produce a short illustrated book for a pre-school or kindergarten that explains how science involves solving problems and how it could help create a sustainable life beneath the ocean waves for marine plants and animals!

I wonder how your school could promote a sustainable life beneath the ocean waves through a short illustrated book. Does anyone have any thoughts?

Are you up for the challenge? If so, then we would like you to create a short illustrated book that explains:

- Something about South Australia's oceans.
- Something about the marine plants and animals that live beneath the ocean waves.
- A description of a sustainable life beneath the ocean waves.

I wonder will you create a paperback or an e-Book?

A suggested learning process:

Define:

Capture students' interest and share a book about oceans. For example, view and read [Commotion in the Ocean](#) on YouTube (6.49 min).

As a class, talk about all stories having an illustrated cover, an inside front cover, a title page, and the other pages available for the story, including the back cover.

Talk about stories needing an action starting point where something exciting happens and the characters are introduced to the reader. Talk about the place or 'setting' in which the story happens, and how the story then unfolds around a problem moves to a really strong ending.

Ask students what they might need to know more about, in order to undertake the challenge set by EMS. Might they need to know something about South Australian oceans, what lives in them, and sustainability?

Discover:

Watch 360 degree videos about South Australia's ocean waters and life beneath the waves (click [here](#) to play). Navigate a full 360 degree field-of-view and discover as many marine animals and plants as you can.

View the video about Sharks (click [here](#) to play), Sea Lions (click [here](#) to play), Leafy Sea dragons (click [here](#) to play), and Jellyfish. (click [here](#) to play)

Talk about and identify the diverse animals and plants that can be seen in the marine environment. Download a [snorkeler's guide to plants and animals in South Australia's Marine Parks](#) to assist with the identification process.

Consider whether refusing plastic items, recycling glass, cans, paper and food waste might be the way to sustain the life within these waters.

Talk about whether sustainable fishing practices might be the way to sustain the life within these waters.

In groups, role play the following scenarios. Ask students to think about what actions might sustain the marine life living beneath the waves.

You want to relax on a beach for a picnic. A family is just leaving a beautiful spot and leaves the area littered with rubbish. What might you do? How might this action impact on the marine life?

You notice people damaging trees and plants on the edge of the coastline. It is an offence to damage any trees or plants. What might you do? How might this action impact on the marine life?

Reef walking is allowed on the Noarlunga Reef but it is expected that reef walkers do not damage or remove any marine life. You come across someone stepping on living matter, lifting up rocks and picking up species that are attached to the reef flat. What might you do? How might this action impact on the marine life?

You see someone throwing out his or her bait bag whilst fishing. This is against the Fishing Code. What might you do? How might this action impact on the marine life?

Brainstorm six ideas for the story. Select the idea that really 'grabs' the class and draft a story sequence. Ask questions like; 'And then what happens?' Encourage students to think deeply about how the story might reveal the way we can use science to create a sustainable life beneath the ocean waves in a funny, exciting and creative way. Talk about the ending as well, asking 'what will happen at the end of the story?'

Ask students to create a short illustrated book that explains:

- Something about South Australia's oceans.
- Something about the marine plants and animals that live beneath the ocean waves.
- A description of a sustainable life beneath the ocean waves.

Dream:

Ask students to visualise an illustrated cover for their 'Life beneath the ocean waves' book as well as an inside front cover and a title page.

Ask students to imagine what their short illustrated story book might look like. Will it be a paperback or an e-Book? Will it include photographs, pop-ups, pull-tabs, textures or other features to increase a reader's interaction with the book?

Design:

Ask students to design their draft story for their book.

Ask students to gather the materials, tools, and equipment needed and then design their book.

Invite a peer class group to the class and to find out more about how a short illustrated book can explain:

- Something about South Australia's oceans.
- Something about the marine plants and animals that live beneath the ocean waves.
- A description of a sustainable life beneath the ocean waves.

Deliver:

Create the stories about 'Life beneath the ocean waves'.

Prepare a display of students' stories about how sustainability science could help create a sustainable 'Life beneath the ocean waves'.

Visit the local pre-school, kindergarten, Foundation class or day-care centre and share and discuss the stories with younger children.

Share photos and students' stories via EMS's online community. EMS loves to see pictures of children in the classroom learning, and to share photos via email at info@emsau.org or share what has been created via Facebook, Instagram or Twitter. Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned.

Talk about what they might still like to find out.

Ask students to describe their favourite part of creating a story and sharing it with others as part of World Oceans Day.

Links to the Australian Curriculum

Year 3 and Year 4

Technologies

Design and Technologies Processes and Production Skills

Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques [ACTDEP015](#)

Select and use materials, components, tools and equipment using safe work practices to make designed solutions [ACTDEP016](#)

Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment [ACTDEP017](#)

Plan a sequence of production steps when making designed solutions individually and collaboratively [ACTDEP018](#)

English

Literature: Creating Literature

Create imaginative texts based on characters, settings and events from students' own and other cultures using visual features, for example perspective, distance and angle [ACELT1601](#)

Create texts that adapt language features and patterns encountered in literary texts, for example characterisation, rhyme, rhythm, mood, music, sound effects and dialogue [ACELT1791](#)

Create literary texts that explore students' own experiences and imagining [ACELT1607](#)

Create literary texts by developing storylines, characters and settings [ACELT1794](#)

Cross-Curriculum Priority: Sustainability

O1.2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

O1.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

O1.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

General Capabilities: Literacy, ICT's capabilities, Critical and creative thinking. *Source:* [\(ACARA, 2015\)](#)

Learning Experiences for Year 5 - Year 6

Activity 3: Adaptations for survival

Overview: Explain to the class that their task will be to design a talking avatar to promote South Australia's waters that are home to a variety of habitats and animal species, and explain adaptations that helps marine animals to survive.

Background science for students: Biodiversity and adaptations

Biodiversity or biological diversity is the variety of all forms of life—the different plants, animals and microorganisms, the genes they contain and the ecosystems of which they form a part.

South Australia's waters contain marine flora and fauna found nowhere else in the world and are recognised worldwide for their unique habitats and biological diversity. They provide homes and food for thousands of different species and they are a learning ground for initiating the development of understanding and values about marine species and the need to use all the waters wisely, to protect the animals and habitats that live there and to protect our future enjoyment of them.

An adaptation is a characteristic of an organism that helps it to be well suited to the places where it lives and the kind of life it leads.

There is a mind-boggling array of life in the sea. Many things we cannot see, like microscopic bacteria. Other things we might love to see more often, like sharks, sea lions and giant whales.

To survive, the animals may deceive, confuse, mimic, intimidate, defend, scare, change colour or even stowaway. Their body structure, function and behaviour are adapted to the niche they occupy...that is their 'profession' or 'job'. The goal of every living thing is to survive at least long enough to reproduce.

The essential question:

What is the best way to get people thinking about mind-boggling array of life in the sea in and around South Australia's coastal areas and marine sanctuaries?

Scenario:

Be immersed in the waters of South Australia and discover the amazing marine animals that live there.

Investigate the waters and design a talking avatar that explains how three or more different animals adapt to all the different conditions that can be found there.

Are you up for the challenge?

What kind of researcher and avatar designer will you be?

A suggested learning process:

Define:

Share the essential question with the class and talk about the tasks that need to be addressed.

Present the scenario, assign teams if appropriate and ask students to define the task they have been set.

Discover:

Capture student's interest and locate pictures and information about species of plants and animals that can be found in South Australia's marine environment from a downloadable [snorkeler's guide to plants and animals in South Australia's Marine Parks](#).

Introduce students to the three broad categories of adaptations.

Structural - Structure is the internal and external arrangement and types of body parts e.g. the suckers on the eight arms of an octopus or the barbels on the chin of a goatfish.

Behavioural - Behaviour is what an animal exhibits in response to stimuli. All living animals do things, whether they are sleeping, flying, swimming or sitting perfectly still.

Functional - Functional adaptations in marine animals involve changes in their body over time. e.g. colouration, poisons and buoyancy.

Ask the students to imagine they are swimming underwater to help them understand the marine environment and the special characteristics required to live there. Establish the features that make water unique. Ask questions such as:

- How does water feel against your body?
- What things can you do in the water?
- Can you breathe under water?
- Can you suspend yourself motionless, midway between the surface and the bottom? Can fish do this?
- Can you change colour? Can marine animals do this? If so, why?
- Can you taste underwater? Do fish taste underwater? If so, how?
- Can you smell underwater? Do fish smell underwater? If so, why?
- Can you make noises underwater? Can fish make noises underwater? If so, why would they do so?
- If you were living in a very deep sea, where very little light penetrated, would you have large eyes, small eyes or no eyes? Do fish that live in the deep sea have large, small or no eyes?
- Can you see forwards, sideways and even backwards?

- Can you move extremely quickly when underwater?
- Can you eat or see well underwater?
- Can you swim very deeply? If so, what do you need to do when going down? How far can humans dive under the water?
- What 'people-made' things could you use that would enable you to perform better underwater? If using things such as flippers, what shapes or features are they modelled on?
- If you were able to 'grow extra features or characteristics', what would they be?
- What marine animals already have these features?
- What are the common characteristics of animals that live in a marine environment?

Stimulate discussion about the special characteristics of animals by posing the questions such as:

- What do marine animals do (behavioural adaptations)?
- What features enable them to do it (structural adaptations)?
- How do they escape detection by predators (camouflage adaptations)? and
- How do they float at different depths in the ocean? (functional adaptation)

Turn suggestions into headings such as 'Animals Eat,' or 'Feeding.' A suggestion of 'Animals Hide,' could be titled 'Camouflage.' Other categories could include reproduction, hunting or movement.

Re-introduce the term 'adaptation'. Discuss the three categories of adaptations you will be covering in your unit:

- Structure (internal and external structure);
- Behaviour (what the animal does); and
- Functional (what strategies it uses to function).

Clarify the categories by explaining and giving examples of each.

With the students' help, construct a simple concept map that groups their suggested characteristics into the three categories of adaptation and explains how they help the animals survive.

Explore and observe adaptations first-hand to see some of South Australia's marine animals up close. Play a 360 degree video for example, about South Australia's iconic Leafy Sea dragon (click [here](#) to play) on the 360 degree underwater website and explore its structural adaptations for escaping predators. Look at its colours and body shape. Ask students to think about and record their ideas about whether its colours might help

the Leafy Sea dragon blend in with the background and escape the detection of predators.

Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Play the 360 degree video about jelly fish or sea jellies (click [here](#) to play). Ask students to focus on their bodies and movement. Talk about how jellyfish use an adaptation called 'pressure adaptation' to adjust the pressure in their tissues to match the pressure of the water outside their body. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Play the 360 degree video about the Port Jackson Shark (click [here](#) to play) and interact with the images and explore the muscular body, fins and cylindrical shape of the shark. Navigate to where you can find a Port Jackson Shark and ask students to think about how these features enable the shark to thrust through the water. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Play the 360 degree video about the marine life found under the Rapid Bay jetty. (click [here](#) to play) Have a good look around and locate schools of fish. Talk to the students about schooling behaviour in fish and what it means. Talk about how fish swim together to look like one large fish, and thereby try and escape from predators. Ask them to explain any advantages and disadvantages of schooling behaviour. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Ask students to focus on the external features of the fish found under the Rapid Bay jetty. Using the downloadable [snorkeler's guide to plants and animals in South Australia's Marine Parks](#), ask students to identify the Six-banded Coralfish, a round fish with a small, pointed head, and broad dark bands along the sides of the body. Discuss how this fish has an elongated mouth so it can eat from hard to get places like crevices and cracks. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Invite students to locate the fins on a range of fish in the 360 degree video. Discuss how fins are used for balance, steering or moving forward or backwards. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Ask students to locate the barnacles on the jetty. Talk about how barnacles are filter feeders and use their legs to catch microscopic plankton as water washes over. Ask students to classify whether they think this adaptation is structural, functional or behavioural.

Talk about how the barnacles are adapted to a life in marine waters that are free of silt and sediment. Discuss how barnacles suffocate when stormwater full of sediments and nutrients ends up in marine waters.

As a class, brainstorm ideas about what we do at home and school and how it can affect the adaptation of marine animals. For example,

- Discuss how our coasts and marine waters receive large amounts of waste from deliberate dumping or by run-off from the land.
- Using an example within or close to the classroom, explore where water goes when it enters a drain. Describe the types of liquid that people might put down a drain - water used for washing hands, paintbrushes, and glue pots.
- Brainstorm ways the class might show more care when disposing of liquid down the drain – for example, by scraping left over paint into paint pots, cleaning paint palettes using newspaper, or by reducing the volume of detergent or soap used in washing dishes or clothes.
- Discuss ways human impacts might affect the animals and plants in marine waters and whether their adaptations will help or hinder their survival. Draw 'cause and effect' flow charts illustrating various environmental impacts, and whether the adaptations of the Reef's plants and animals enable them to survive it.
- Discuss the effects of urban and agricultural run-off. Follow its path from the land to the sea.
- Brainstorm ways in which the adaptations of different marine animals might affect their response to run-off.

Ask students to use their information about marine animals and their adaptations and consider which ones they might focus on when designing their talking avatar.

Design:

Introduce students to information about [creating avatars](#).

Ask students to draft their text.

Review rules on personal safety, group safety, and classroom and furniture safety with the students.

Ask students to establish a workstation and to gather the materials and tools they require.

Talk about safely storing their drafts and keeping a record of the processes they use to create it.

Ask students to draft the steps involved in making their chosen talking avatar that explains how three or more different animals adapt to all the different conditions that can be found in South Australian waters.

Ask students to gather the materials, tools, and equipment needed and then plan each step involved in creating their designs.

Invite students to start creating the design a talking avatar that explains how three or more different animals adapt to all the different conditions that can be found in South Australian waters. They will need their text and digital device that can record them speaking.

Talk with students about how they might share and present their designs to an audience.

Ask students to explain how they plan to finalise and create their designs with another peer in the class and seek feedback on their ideas.

Invite students to create their work samples.

Photograph students at work.

Deliver:

Share work samples that include a design of a talking avatar that explains how three or more different animals adapt to all the different conditions that can be found in South Australian waters.

Film student presentations and enjoy a day of learning about adaptations.

Debrief:

Ask students to do the following.

Evaluate their designs and write a paragraph about whether each creation matched the definition of the task.

Write about the quality of their planning, their finished designs and whether they enjoyed the task.

Links with the Australian Curriculum

Science

Year 5 and Year 6

Science Understanding—Biological sciences

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

Science as a Human Endeavour—Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions [ACSHE081](#) [ACSHE098](#)

Science as a Human Endeavour—Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions [ACSHE083](#) [ACSHE100](#)

Technologies

Year 5 and Year 6

Design and Technologies – Processes and Production Skills

Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions [ACTDEP024](#)

Generate, develop and communicate design ideas and processes for audiences using appropriate technical terms and graphical representation techniques [ACTDEP025](#)

Select appropriate materials, components, tools, equipment and techniques and apply safe procedures to make designed solutions [ACTDEP026](#)

Develop project plans that include consideration of resources when making designed solutions individually and collaboratively [ACTDEP028](#)

General Capabilities: Literacy, ICT capability, Critical and creative thinking and Personal and social capability. *Source:* ([ACARA](#), 2015)

Learning Experiences for Year 7 - Year 8

Activity 4: Clean oceans

Overview: Explain to the class that their task will be to educate the broader community to understand how local South Australians can advocate for clean oceans.

Background science for students: Marine science

Marine biology is the scientific study of organisms in the sea.

Given that in biology many phyla, families and genera have some species that live in the sea and others that live on land, marine biology classifies species based on the environment rather than on taxonomy.

The study of marine biology dates back to Aristotle (384–322 BCE), who made many observations of life in the sea around Lesbos, Greece, laying the foundation for many future discoveries.

Today, marine scientists study and undertake research about marine life, their habitats and risks they face. (Source: [Wikipedia](#), 2017)

The essential question:

What happens when we understand that our oceans and marine life has been studied by indigenous peoples, scientists, photographers, artists and sailors for millennia, and is an infinite source for human creativity?

Scenario:

The Chair of the EMS Schools Program is looking for schools to be involved in designing an art installation for World Oceans Day.

“We are looking for young people to discover and examine endeavours that have involved indigenous people, scientists, photographers, artists and/or sailors communicate their concerns about our oceans and their marine biodiversity” Carl said.

Your challenge is to research South Australia’s temperate waters and study ways in which others have communicated how we can protect, manage and conserve our ocean waters and marine biodiversity.

Then use science, technology and art to create a piece for a pop-up World Oceans Day Exhibition titled ‘Clean Oceans’ which visitors of all ages will be invited to enter and explore.

Are you up for the challenge?

A suggested learning process:

Define:

Capture students' interest and brainstorm words, phrases and ideas that come to mind when they think about the phrase 'clean oceans'.

Talk about the South Australian waters that are known to the class. List these and ask students to recall times spent on, in or under these waters.

Introduce students to [South Australia's marine parks](#).

Be inspired by an art installation in the [Singapore ARTSCIENCE Museum](#) and explore how art can meet science.

View an art installation that showcases an exhibition titled '[The Deep](#)' that featured in Singapore in 2016 on YouTube. (1:59 min)

Present the scenario, assign pairs or small groups if appropriate, and ask students to define the task they have been set.

Discover:

Invite students to learn more about ocean waters and the threats they face. Consider issues like climate change, plastic pollution, marine debris, water quality and overfishing.

Using the video [Australia's Great Southern Reef](#) by Ocean Imaging (1:05 min), discover the amazing biodiversity within its waters and some of the risks it faces.

Check out some amazing underwater photography by Carl Charter who [photographs](#) marine life in the Great Southern Reef that relies on clean oceans for their survival.

Play a 360 degree video for example, (click [here](#) to play) on the 360 degree underwater website and explore the ocean waters surrounding two South Australian jetties.

Navigate the 360 degree photography and investigate the entire environment of both locations. Classify what can be found in the waters of the jetty in the urban setting and the jetty in the marine park.

Draw [flow-charts](#) to sequence what is found in the waters of the jetty in the urban setting and the jetty in the marine park.

Create a [consequence chart](#) to describe the probable flow-on consequences of each idea documented in the earlier activity.

Brainstorm or make predictions about the materials that could be found along a waterway and or in our oceans.

Ask students to research at least three threats, risks and issues that may inform their artwork.

Talk about areas of South Australia where oceans are facing problems or complications due to human waste, be it by deliberate dumping or by natural runoff from the land.

Research the people who are taking action and helping to clean up our oceans. Learn about [Boyan Slat](#) who used a high school science project to drive his ideas about how to rid the oceans of plastic pollution.

Learn about the game changing idea of a new plastics economy where plastic never becomes waste and [how we can keep plastics out of the ocean](#) on YouTube (3:10 min)

Find out about a [floating bin](#) that can suck up plastic bags from the ocean on the BBC News. (0:25 min)

Introduce students to Aboriginal and Torres Strait Islander peoples' ways of living with Sea Country. Research and find local links to indigenous people who have a culture that relates to the land and sea in a holistic way that includes connections to significant places. Such connections can include Dreaming Tracks, Creation Stories, camping places and ceremonial places.

Use the [Australian Screen](#) website to learn more about land, river, and ocean and the seasons that feed the Indigenous peoples of Australia, and how the different seasons mark different interactions with the Sea Country and different food sources for the Indigenous people.

View the ABC documentary [First Footprints](#) and learn more about the Indigenous people and the ways they managed the land, rivers, seas and their resources sustainably to provide their food and fibre needs.

After viewing, discuss the close relationship between Indigenous peoples and their land/seas and how the relationship to the natural world carries responsibilities for its survival and continuity. Focus on the obligations Indigenous peoples have to protect and preserve life forms that are part of it. For example sources of water have to be looked after and cared for as a matter of health and survival; rock holes are covered with rocks or branches to protect them; only the food that is needed is taken from the environment so that on future visits stocks of plants and animals are still plentiful.

Using the videos and other linked resources, explore these places and their people. Ask questions like:

What is this place like?

What do people do here?

What is happening in this place?

Investigate and be inspired by the [Aboriginal and Torres Strait Islander collection of artworks in the Art Gallery of South Australia](#). Locate artworks about oceans and marine life.

Explore an exhibition titled “[Nets of the Ocean](#)” that shares the Indigenous artists’ concerns for the loss of marine life and environmental damage caused by rogue nets, bringing to light the irreparable harm that discarded nets cause to marine life.

Log into [Pinterest](#) and discover indigenous artworks that feature oceans and their biodiversity.

Read for information about the [art, music and dance](#) connections of Aboriginal and Torres Strait Islander people to the Great Barrier Reef.

View images of [reef art](#) by Aboriginal and Torres Strait Islander people.

Check out images by a range of artists who have been inspired by the ocean.

Dream:

In pairs or small groups, envision or dream about the many possible aspects of marine science that could feature in an art piece, art installation and art exhibition.

Explore ideas and practices used by artists, including practices of artists, including Aboriginal and Torres Strait Islander artists, to represent different scientific ideas.

Further develop ideas for possible solutions using sketches and labels.

Ask students to visualise their most creative solution.

Invite students to think about what materials, tools, equipment and ingredients they will need to make their solution a reality.

Remind students that their solution needs to also explain and help others understand the threats to reefs and study ways we can protect, manage and conserve oceans and their biodiversity.

Design:

Invite students in their pairs or small groups begin drafting their designs for their solutions.

Ask students to draft the steps involved in making their artwork for the pop-up World Oceans Day exhibition titled ‘Clean Oceans’.

Ask students to gather the materials, tools and equipment needed and then design and create their solution.

Ask students to plan the display of artworks to enhance their meaning for their audience.

Invite a peer class group to the class to hear from the students and find out more about the threats to reefs and ways in which we can protect, manage and conserve oceans and their biodiversity.

Deliver:

In pairs or small groups, showcase their artwork for the pop-up World Oceans Day exhibition titled 'Clean Oceans'.

Classes host a the pop-up exhibition titled 'Clean Oceans' as part of World Oceans Day and invite students, teachers and parents to discover what they can learn about South Australia's oceans too!

Debrief:

Ask students to reflect on their learning and draw something new they learnt about.

Ask students to describe what worked well and not so well in their efforts to discover, and examine the threats to South Australia's oceans and ways in which many people have communicated how we can protect, manage and conserve reefs.

Links to the Australian Curriculum

Year 7 and 8

Science

Science as a Human Endeavour - Use and influence of science

Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations [ACSHEI20](#) [ACSHEI35](#)

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity [ACSHEI21](#) [ACSHEI36](#)

Science as a Human Endeavour - Nature and use of science

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

The Arts

Visual Arts

Present artwork demonstrating consideration of how the artwork is displayed to enhance the artist's intention to an audience [ACAVAMI22](#)

Cross Curriculum Perspectives: Aboriginal and Torres Strait Islander Histories and Cultures and Sustainability

OI.3: Aboriginal and Torres Strait Islander peoples have holistic belief systems and are spiritually and intellectually connected to the land, sea, sky and waterways.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

General Capabilities: Literacy; ICT capability, Critical and creative thinking, Ethical understanding and Personal and social capability. *Source:* ([ACARA, 2015](#))