



Australian Government

Great Barrier Reef
Marine Park Authority

Instructional Manual for Reef Guides

Middle School

Part of the:

'Be a Marine Biologist for a Day' Toolkit

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Aboriginal and Torres Strait Islander readers are advised this publication may contain names and images of deceased persons.

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Preface

The Great Barrier Reef Marine Park Authority has produced this package of resources to assist reef guides working on tourism operations facilitate high quality educational excursions for students and teachers visiting the Great Barrier Reef. These resources will also assist teachers prepare students for their visit before their excursion and make further connections after.

Visiting the Great Barrier Reef is not just an amazing opportunity for all those involved. Reef activities undertaken by tourism operators, schools and other organisations make an important contribution to promoting understanding of the Great Barrier Reef Marine Park. Our 'Eye on the Reef' monitoring and assessment program enables anyone who visits the Reef to contribute to its long-term protection by collecting valuable information about reef health, marine animals and incidents. These are used to understand the bigger picture and inform how we manage the Reef.

This toolkit uses our Eye on the Reef rapid monitoring survey on Reef visits and builds students' abilities to use this tool from prep to senior school. The educational resources have been written by a Queensland marine science teacher with curriculum-linked content specific to each year level. What makes these resources even better is that they are editable, so that teachers and reef guides can include local context, such as introducing the tourism staff that students will meet and reef site-specific information. This enables students to take their learning from the classroom to the coral.

This toolkit adds to the vast collection of educational materials the Great Barrier Reef Marine Park Authority has produced over many years, it looks forward to the knowledge and understanding this will bring to the tourism industry, as edutourism continues to grow, as well as educators and students.



Dear reef guide,

The purpose of these instructions are to give you an insight into the world of middle school in Queensland, Australia. Students in years 7-10 are typically 12-15 years of age.

There will be a mixed bag of students on these excursions, mainly because most Reef excursions in middle school are for science, and science is a compulsory subject. Some students will be engaged and interested in what you have to say. Others will be disengaged or seek unwanted attention. Some students will be shy. Other will be talkative. Some students will live and breath the ocean. Others will have never snorkelled before.

Excursions in middle school generate a mixed bag of emotions as well — mostly excitement. Some will be nervous. Others might be scared. And that's just the reef guides! Jokes aside, most students in middle school are very well behaved on excursions. Whilst many will be excited — getting to leave the classroom and go somewhere with their friends — they know the same rules apply on excursions as at school. The expectations of lining up before moving from one place to the next, or being asked to sit on the floor to listen to a teacher speak, are all common practices for middle school students. The raise of a hand, a hand on the head, a countdown from 3 to 1, or two slow claps followed by three quick claps are all well-known signals for quiet. Don't forget the teachers, who do a wonderful job, are there to help you too.

This aim of these instructions is to help you to prepare for middle school excursion groups by becoming familiar with their experiences at school. In doing so, you will be able to connect the experiences they have at school with the experiences they have on the Reef.

These instructions are divided into five main chapters. The first three chapters are based on the Pedagogical Content Knowledge (PCK) model for teachers. The first is all about the curriculum taught at school. The second is about how to teach with a selection of teaching pedagogies, which will help you as an educator. Notably, the teaching pedagogy for this *Be a Marine Biologist for a Day* program is an inquiry-based pedagogy, with an overarching inquiry question, 'how can I help the Great Barrier Reef?' The third is about how students learn. The fourth chapter is about how to use the pre and post-snorkel brief cards. The fifth chapter includes suggestions on how to customise the teacher resources in this program to your tourism operation.

I hope you enjoy delivering this program as much as I enjoyed writing it.

Yours thankfully,



Gail Riches

Commissioned author for *Be a Marine Biologist for a Day*

Owner of Marine Education (www.marineeducation.com.au) and Queensland secondary teacher.

What is in the toolkit?

Instructional manual for reef guides

Suggestions for tourism operators running Reef education programs for:

- primary school
- middle school
- senior school

Part 1 Preparing to find out

Pre-excursion resources for use at school:

- PowerPoint presentations
- student activity books



Part 2 Finding out

On-day resources for use on the Reef excursion:

- PowerPoint presentations
- flip chart presentations
- student activity books
- rapid monitoring survey tools

Part 3 Making connections

Post-excursion resources for use at school:

- PowerPoint presentations
- student activity books
- assessment tasks

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An underwater photograph of a coral reef. The water is a deep, clear blue. In the foreground, there is a sandy or silty bottom with some small, light-colored patches. The reef structure is visible in the mid-ground, showing various coral species and their intricate patterns. The lighting is natural, coming from above, creating a gradient of blue from the surface to the depths.

Introduction

**Instructional Manual
for Reef Guides**



Edutourism

Tourism and Events Queensland define edutourism as tourism experiences designed or adapted to meet teaching, learning and experience requirements. They are experiences focused on hands-on learning within a tourism context, with potential for outcomes for local research or community programs. Edutourism can be delivered as stand-alone products within a study tour itinerary or packaged to offer authentic, immersive education programs of approximately one to two weeks. Similar to study tours, edutourism programs may or may not produce a formal study outcome/qualification.

If your tourism operation is looking to establish an edutourism product, refer to the Queensland Study Tours and Edutourism Toolkit. The toolkit has been designed to assist education providers and tourism operators in developing study tours and edutourism programs. It is supported by the Study Tours and Edutourism Opportunities Guide including case studies. The toolkit provides an overview of definitions, key success factors, elements of using a consortium-based approach, requirements for ensuring academic integrity, marketing methods, other considerations and sample itineraries.

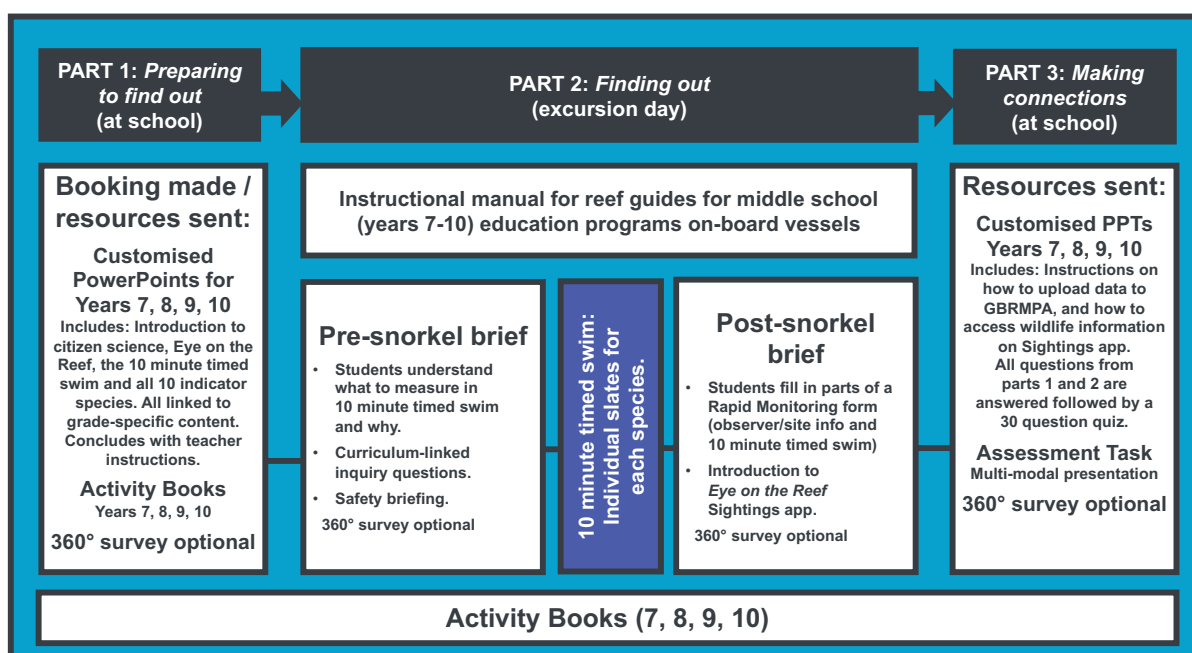
<https://teq.queensland.com/industry-resources/how-to-guides/queensland-study-tours-and-edutourism-toolkit>

Be a Marine Biologist for a Day has been developed to provide resources with academic integrity and alignment with learning outcomes to present a high quality learning experience for students visiting the Reef.

Be a Marine Biologist for a Day program overview

This manual is part of a training toolkit to support the *Be a Marine Biologist for a Day* learning experience for students visiting the Reef with tourism operators. The toolkit is aimed to develop an understanding of, and appreciation for, the Great Barrier Reef. The main focus of the toolkit is to provide curriculum-linked and grade-appropriate teaching materials for reef guides on board tourism operations delivering education activities to students. The reef guides will lead students using simplified versions of the rapid monitoring survey tools on the Reef. The toolkit also includes pre and post-trip activities and resources that tourism operators can provide to teachers to support the learning objectives of the excursion.

A concept map of the toolkit for middle schools is below (there is also a guide for primary school and senior school excursions).



The toolkit consists of a three-part learning package:

Part 1 Preparing to Find Out – pre-excursion resource kit for use at school

Part 2 Finding Out – on-day resource kit for use on the Reef

Part 3 Making Connections – post-excursion resource kit for use at school

The toolkit is scaled to address three key learning target groups (primary, middle and senior school students) using an inquiry pedagogical model. Each group is further divided into year levels.

Resources are colour coded:

- Orange – Primary school (prep-year 6)
- Blue – Middle school (years 7-10)
- Purple – Senior school (years 11 and 12)
- Red – Additional resources and extension activities (advanced students)

This is the guide for middle school students (blue).

The resources for each part

Part 1: Preparing to find out

- Resources that reef guides can share with teachers to be delivered at school, prior to the Reef excursion.
- In-class delivered learning package aimed at preparing students for their Reef excursion. The package develops understanding of the rapid monitoring survey tool as well as general Reef ecosystem and biodiversity knowledge.
- Materials and resources: PowerPoint(s), activity books with corresponding answer books, and teacher instructions (for you to edit/customise)

Part 2: Finding out

- Resources for reef guides to deliver a rapid monitoring survey to schools groups on their Reef excursions.
- Materials and resources: pre-snorkel brief cards/flip book and post-snorkel brief cards/flip book (developed in PowerPoint so you can edit/customise to your operation, before saving as a PDF and printing double-sided, to make waterproof flip books for use on the Reef). Both flip books include reef guide delivery instructions/cheat sheets to couple the rapid monitoring survey with grade-specific curriculum objectives.
- Modified rapid monitoring survey slates for students to tally their counts of individual species whilst in the water.
- This instructional manual for reef guides to teach target learning groups (primary, middle and seniors levels) and things to consider when delivering educational programs on board vessels.

Part 3: Making connections

- Resources that reef guides can share with teachers to be delivered at school, after the Reef excursion. In-class delivered learning package aimed at reflecting on the Reef excursion and making new connections from the experience that teachers deliver at school.
- Materials and resources: PowerPoint(s) including a 30 question quiz, activity books with corresponding answer books (same as those used for part 1 and 2), and a multi-modal assessment task.



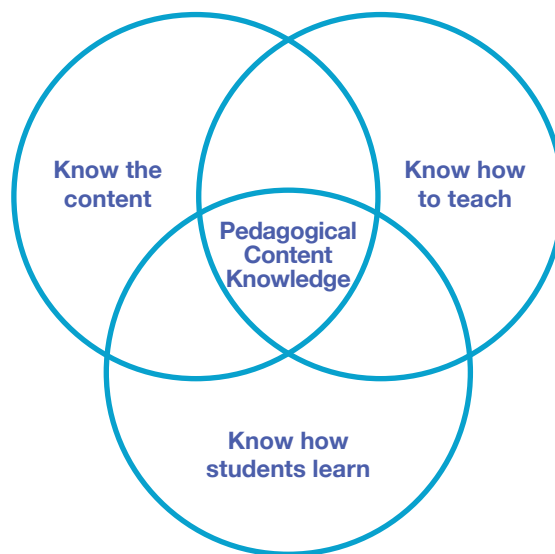
Commonwealth of Australia (GBRMPA). Photographer: M. Knapton.

Pedagogical content knowledge

Developing your educator skills

Pedagogical content knowledge is divided into three chapters, inspired by the concept that a good educator is someone who not only knows the content, but also knows how to teach and how students learn. These chapters are designed to prepare you to deliver high quality educational programs to students. They teach you what students are learning at school, how to teach them and how they learn. They will provide you with some basic theoretical knowledge of pedagogy (how to teach) that will support the skills you already have. This knowledge will become your pedagogical content knowledge (PCK), which you will use to teach Part 2 of the *Be a Marine Biologist for a Day* program to school students.

This theory goes beyond basic instructional or interpretation methodology and is suited for Reef Guides and tourism operations wanting to deliver high quality education activities and programs to students.



PCK was proposed by Lee Shulman in 1985-86 as a special amalgam of knowledge possessed by a teacher. As a reef guide delivering programs to students, you are essentially 'teaching' students on their excursion. PCK has since been widely researched and is regarded as a fruitful tool for understanding teacher knowledge. Just as every profession has a body of knowledge that sets it apart from others and makes people who master such skills considered professionals, so do teachers. PCK is sometimes called 'craft knowledge', or having knowledge of one's craft – being a teacher or educator. PCK is the blending of content (curriculum), pedagogy (how to teach) and learning into an understanding of how particular aspects of subject matter are organised, adapted and represented for instruction. It encompasses theory learned during teacher training and experiences gained from ongoing schooling activities. At the heart of effective teaching is the teacher's PCK.

Pedagogy can be defined as the art of teaching. It involves being able to convey knowledge and skills in ways that students can understand, remember and apply. Pedagogy also defines the methods for conducting teaching-learning sessions. It includes the strategies and approaches adopted by teachers to ensure meaningful learning sessions for students.

The next three chapters are: know the content, know how to teach and know how students learn. In each chapter, your pedagogical content knowledge will continue to build. The pedagogies and theories presented in each of the three instruction manuals has been tailored to suit the year levels (primary, middle and senior school). Each manual presents different pedagogies and theories. Therefore, read all three manuals to grow your knowledge base of how to be a good educator to students of all ages.

An underwater photograph of a coral reef. The water is a deep, dark blue, and the reef is illuminated from the left, creating a bright, glowing area of white and light blue coral. The rest of the reef recedes into the darker water.

Know the content

**Instructional Manual
for Reef Guides**

Overview of mainstream schooling in Australia

Prep to year 10

The Australian Curriculum Assessment and Reporting Authority (ACARA) developed the Australian curriculum for prep to year 10. Learning areas include English, mathematics, science, humanities and social sciences (includes geography and history), the arts, technologies, health and physical education, languages, and work studies (years 9 and 10).

In addition, there are three cross-curriculum priorities and seven general capabilities that teachers should integrate into all learning areas. The cross-curriculum priorities are Aboriginal and Torres Strait Islander histories and cultures, Asia and Australia's engagement with Asia, and sustainability.

The general capabilities are literacy, numeracy, information and communication technology, critical and creative thinking, personal and social capability, intercultural understanding and ethical understanding.

You can find further details about the Australian curriculum online at www.acara.edu.au.

Three Cross-curriculum Priorities





Commonwealth of Australia (GBRMPA). Photographer: C. Jones.

The Great Barrier Reef in the Australian curriculum

Most middle schools that visit the reef book the excursion as part of studying science. The science subject is the most compatible with the rapid monitoring survey

Geography is another subject popular with Reef trips, but the content descriptors for geography in years 7-9 do not match the themes of a rapid monitoring survey (although they do for year 10).

Science understanding is taught over four terms: biology, chemistry, Earth and space science, and physics.

Science

Science is divided into three sub-strands:

- Science understanding (biology, chemistry, Earth and space science, physics)
- Science as a human endeavour (students learn who the scientists were/are)
- Science inquiry skills (practical skills).

The curriculum that matches the Eye on the Reef program best is biology (formally called *Biological Sciences*).

Content descriptions

Content descriptions describe what is to be taught and what students are expected to learn. They feature as dot points in every Australian curriculum. All content descriptions are mandatory. Thus, schools must teach what appears in each content description. Content descriptions are accompanied by content elaborations, which are optional and provided to give teachers ideas about how they might teach the content.

Year 7 curriculum

First year of high school

Year 7 is the first year of high school for Queensland students. They move from primary school, where students mainly have one teacher for the entire year, to middle school, where students have many teachers — one for each subject. Subjects are the learning areas in the Australian curriculum and are compulsory. Religious schools have religion studies as well. Most middle school groups that visit the Reef book the excursion for science. A summary of year 7 science is below.

Biology	Chemistry	Earth & Space Science	Physics
Classification, food chains and webs	Mixtures (solutions) and pure substances	Seasons, eclipses, renewables, H ₂ O cycle	Forces and motion, gravity

The mandatory content descriptions for biology are below. Key concepts that form the main topics of inquiry in a rapid monitoring survey for year 7 are in italics.

Relevant content descriptions for biology

- *Classification* helps organise the diverse group of organisms.
- Interactions between organisms, including the *effects of human activities*, can be represented by *food chains and food webs*.

Year 7 science achievement standard

By the end of year 7, science students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the *effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences*. Students describe situations where scientific knowledge from different science disciplines and diverse cultures have been used to solve a real-world problem. They explain possible implications of the solution for different groups in society.

Science students identify questions that can be investigated scientifically. They plan experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Year 7 biology in the textbook

Below is a list of biology topics that feature in a popular year 7 science textbook called 'Big Ideas' by Oxford. Rarely is there time to teach all these topics, or in the detail required for long term memory retention. Therefore, do not expect students in year 7 to have a comprehensive understanding of the topics listed below.

- Living versus non-living
- Dichotomous keys
- Linnaean classification system
- Greek name meanings
- How do living things interact?
- Food chains and food webs
- Adaptations – physical and behavioural
- Biodiversity – genetic, species, ecosystem
- Habitat change and biodiversity
- Conserving biodiversity

Student work example (year 7)

The following student work samples were taken from ACARA, to give you a level of understanding about what students' work looks like and what you can expect them to complete.

Source: <https://www.australiancurriculum.edu.au/resources/work-samples/science-work-samples-portfolios/>

The image displays a collection of student work samples related to biology classification. The central focus is a blue sticky note with the text: "All around the World there are all the same type of Species but they all have different Names, but they are all classified as one Scientific Name." Below this, there are two smaller notes: one orange one explaining that having one name makes it easier to find species, and one green one suggesting that having one name would reduce confusion. To the right, an orange sticky note shows a taxonomic hierarchy for humans: Kingdom (Animalia), Phylum (Chordata), Class (Mammalia), Order (Primates), Family (Hominidae), Genus (Homo), and Species (Homo sapiens). Below these are three more sticky notes: a pink one titled "Classification:" discussing the hierarchy from Kingdom to Species; a purple one with "PRO:" and "CON:" sections; and a green one titled "Classification FACTS:" stating that animals are natural groups or clades descended from a shared common ancestor.

Year 8 curriculum

Second year of high school

By the time students reach year 8, they have consolidated their friendship groups and are more familiar with the cultural expectations of the school. Students are still being asked to learn subjects they did not choose, as all subjects are compulsory, with no elective subjects until year 9. Most year 8 school groups that visit the Reef book the excursion for science. A summary of year 8 science is below.

Biology	Chemistry	Earth & Space Science	Physics
Cells, body systems, survival and reproduction	Particles, elements, compounds, mixtures, reactions	The rock cycle	Energy – types and changes to

The mandatory content descriptions for biology are below. Key concepts that form the main topics of inquiry in a rapid monitoring survey for year 8 are in italics.

Relevant content descriptions for biology

- *Cells* are the basic units of living things; they have *specialised structures* and functions.
- Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to *survive and reproduce*.

Year 8 science achievement standard

By the end of year 8, science students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the timescales involved. They *analyse the relationship between structure and function at cell, organ and body system levels*. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems. They reflect on implications of these solutions for different groups in society.

Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.

Year 8 biology in the textbook

Below is a list of biology topics that feature in a popular year 8 science textbook called 'Big Ideas' by Oxford. Rarely is there time to teach all these topics, or in the detail required for long term memory retention. Therefore, do not expect students in year 8 to have a comprehensive understanding of the topics listed below.

- Microscopes
- Animal cells versus plant cells
- Cell structure
- Cell organelles and their functions
- Cells to systems
- Digestive system
- Reproductive system
- Circulatory system
- Respiratory system
- Excretory system

Suggested practical: dissection (e.g. fish).

Student work example (year 8)

The following student work samples were taken from ACARA, to give you a level of understanding about what students' work looks like and what you can expect them to complete.

Source: <https://www.australiancurriculum.edu.au/resources/work-samples/science-work-samples-portfolios/>

Year 8 Science
Earth and Space Unit Test

1. Rainwater can damage rocks by physical and chemical weathering.

(i) Give one example in which rainwater causes **physical** weathering and describe the process of how the damage to the rock occurs.

When water goes into the cracks of bricks and rocks which then freezes and expands, then breaks.

(ii) Give one example in which rainwater causes **chemical** weathering and describe the process of how the damage to the rock occurs.

When the rain water chemically reacts to the minerals in the rocks and the rocks break down

Year 9 curriculum

Third year of high school

Year 9 students are now allowed to choose elective subjects that they enjoy. This changes the dynamics of a typical day at school for many students. However, science is still compulsory. Most year 9 school groups that visit the Reef, book the excursion for science. A summary of year 9 science is below.

Biology	Chemistry	Earth & Space Science	Physics
Systems of life. Responding to the world	Atoms, radioactivity, chemical reactions	Plate tectonics	Wave and particle models

The mandatory content descriptions for biology are below. Key concepts that form the main topics of inquiry in a rapid monitoring survey for year 9 are in italics.

Relevant content descriptions for biology

- Multi-cellular organisms rely on coordinated and interdependent *internal systems to respond to changes* to their environment.
- *Ecosystems* consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.

Year 9 science achievement standard

By the end of year 9, science students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. *They analyse how biological systems function and respond to external changes* with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people's lives.

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others' methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Year 9 Biology in the textbook

Below is a list of Biology topics that feature in a popular year 9 Science textbook called 'Big Ideas' by Oxford. Rarely is there time to teach all these topics, or in the detail required for long term memory retention. Therefore, do not expect students in year 9 to have a comprehensive understanding of the topics listed below.

'Systems of Life'

- What are ecosystems?
- Flow of energy (e.g. food chains and food webs)
- Flow of matter (e.g. water cycle, carbon cycle, nitrogen cycle, O₂ cycle, phosphorus cycle)
- Comparing ecosystems
- Cellular respiration
- Photosynthesis
- Symbiosis
- Estimating human population size
- Impacts on human population size (e.g. competition, limited resources, seasonal changes, disease, pollution, greenhouse effect, climate change, loss of biodiversity, natural disasters)
- Succession
- Abiotic components

Suggested practical: measure abiotic factors, such as water temperature and visibility, on a field trip.

'Responding to the World'

- How do we sense our world?
- Identifying stimuli
- The sense organs (sight, hearing, taste, smell, touch)
- What is a hormonal response?
- The endocrine system
- Flight or fight
- What is a nervous response?
- Nerves
- The central nervous system (testing reflexes practical)
- Peripheral nervous system (skin sensitivity practical)
- Responding to threats
- The immune system

Suggested practical: Brain dissection (e.g. sheep brain).

Student work example (year 9)

The following student work samples were taken from ACARA, to give you a level of understanding about what students' work looks like and what you can expect them to complete.

Source: <https://www.australiancurriculum.edu.au/resources/work-samples/science-work-samples-portfolios/>

Question 1

Container A (metal) and Container B (glass) are of the same size and contain 100 ml of hot water. The containers have been left on the benchtop in a laboratory. The room temperature is 25°C. Table 1.1 and 1.2 below show the temperature change of the water in the two containers.

Time (Minutes)	Temperature of water (°C)
0	75
5	65
10	55
15	45
20	35
25	25
30	25
35	25
40	25
45	25
50	25



Container A (metal) placed on laboratory benchtop

} -10

Table 1.1

Time (Minutes)	Temperature of water (°C)
0	75
5	70
10	65
15	60
20	55
25	50
30	45
35	40
40	35
45	30
50	25



Container B (glass) placed on laboratory benchtop

} -5

Table 1.2

1a) Identify the container which has a greater heat transfer rate from the hot water. Justify your decision by analysing trends in the data. (SIS-C)

The data shown above indicates that container A decreases 10°C every five minutes, where as container B decreases by 5°C every five minutes. Container A took only 25 minutes to reach temperature (25°C). Container B took longer to reach room temperature 50 minutes. These data shows that metal (container A) is a better thermal conductor than glass.

Year 10 curriculum

Preparing for senior school

Year 10 students are starting to choose their pathway for senior school which will ultimately impact career and further study options after school. Year 10 students often select subjects in line with subjects they intend to study in senior years. The year 10 curriculum is still outlined in the Australian Curriculum. However the year 11 and 12 curriculum is outlined by each state or territory. In Queensland, this is the Queensland Curriculum and Assessment Authority (QCAA). Year 10 students will select either a pathway towards vocational education and training (VET) or Australian Tertiary Admission Rank (ATAR).

In 2019, Queensland changed from a tertiary admission system which provided students with a ranking or position relative to other students, called Overall Position (OP), to the ATAR. As a result of a more academically rigorous curriculum, many schools began teaching year 11 content in year 10 to prepare students. Depending on the school's approach, year 10 students may be being taught a mixture of year 10 content as well as the start of year 11 content. Most year 10 school groups that visit the Reef, book the excursion for science (see below) but may book for geography or tourism (elective).

Biology	Chemistry	Earth & Space Science	Physics
Earth systems, genetics	Periodic table, chemical reactions (types and rates)	Earth spheres, global systems, stars, galaxies, solar system	Newtons laws, motion, energy conservation

The mandatory content descriptions for biology as well as Earth and space science are below.

Key concepts that form the main topics of inquiry in a rapid monitoring survey for year 10 are in italics.

Relevant content descriptions for biology

- Transmission of *heritable characteristics* from one generation to the next involves DNA and genes.
- The *theory of evolution* by natural selection explains the diversity of living things and is supported by a range of scientific evidence.

Relevant content descriptions for Earth and space science

- *Global systems*, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere.

Year 10 science achievement standard

By the end of year 10, science students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. *Students describe and analyse interactions and cycles within and between Earth's spheres.* They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. *They explain the processes that underpin heredity and evolution.* Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.

Year 10 biology in the textbook

Below is a list of biology topics that feature in a popular year 10 science textbook called 'Big Ideas' by Oxford. Rarely is there time to teach all these topics, or in the detail required for long term memory retention. Therefore, do not expect students in year 10 to have a comprehensive understanding of the topics listed below.

Biology

'Genetics'

- DNA
- Nucleotides
- Double helix
- Transcription and translation
- Mitosis and meiosis
- Gregor Mendel's peas
- Common terms: genes, alleles, chromosomes, dominant and recessive genes, genotype, phenotype, etc.)
- Monohybrid cross
- Punnet squares
- Sex chromosomes
- Family tree diagrams
- Mutations and mutagens
- DNA fingerprinting and DNA matching
- Gene ethics
- Cloning, gene therapy
- Stem cells
- GMO crops and GMO issues

Suggested practical: DNA extraction (e.g. strawberries).

Earth and Space Science

'Global Systems'

- Rock cycle
- Lithosphere
- Atmosphere
- Hydrosphere
- Cryosphere
- Biosphere
- Water cycle
- Oxygen cycle
- Nitrogen cycle
- Carbon cycle
- Weather
- Ocean currents and climate control
- Greenhouse effect and climate change science
- Carbon sinks
- Effects of climate change (e.g. increasing temperatures, melting sea ice, melting permafrost, extreme weather events, health and disease, low water supplies, loss of biodiversity)

Year 10 Geography

Other year 10 school groups that visit the Reef, book the excursion for geography or other elective subjects (that are simplified from the senior curriculum). The mandatory content descriptions for geography and other elective subjects are below. Key concepts that form the main topics of inquiry in a rapid monitoring survey for year 10 are in italics.

Geography is divided into two sub-strands:

- 1) Geography knowledge and understanding (environmental change and management, and geographies of human wellbeing)
- 2) Geographical inquiry and skills.

Relevant content descriptions for geography

Environmental change and management

- *Human-induced environmental changes* that challenge sustainability.
- Environmental world views of people and their implications for *environmental management*.
- The *Aboriginal and Torres Strait Islander Peoples' approaches* to custodial responsibility and environmental management in different regions of Australia.

Students then select one of the following types of environment as the context for study: land (e.g. forests, deserts, grasslands, farmland), inland water, coast, marine or urban. A comparative study of examples from Australia and at least one other country should be included.

- The application of systems thinking to understanding the *causes and likely consequences of the environmental change* being investigated.
- The application of geographical concepts and methods to the management of the environmental change being investigated.
- The application of environmental economic and social criteria in evaluating *management responses* to the change.

Year 10 geography achievement standard

By the end of year 10, geography students explain how interactions between geographical processes at different scales change the characteristics of places. *Students identify, analyse and explain significant interconnections between people, places and environments and explain changes that result from these interconnections and their consequences*. They predict changes in the characteristics of places and environments over time, across space and at different scales and explain the predicted consequences of change. They evaluate views on a geographical challenge and alternative strategies to address this challenge using environmental, economic, political and social criteria and draw a reasoned conclusion.

Students use initial research to develop and modify geographically significant questions to frame an inquiry. They critically evaluate a range of *primary* and secondary sources to select and *collect relevant, reliable and unbiased geographical information and data*. Students record and represent multi-variable data in the most appropriate digital and non-digital forms, including a range of graphs and maps that use suitable scales and comply with cartographic conventions. They use a range of methods and digital technologies to interpret and analyse maps, data and other information to make generalisations and inferences, propose explanations for significant patterns, trends, relationships and anomalies across time and space and at different scales, and predict outcomes. They analyse and synthesise data and other information to draw reasoned conclusions, taking into account alternative perspectives. Students present findings, arguments and explanations using relevant geographical terminology and graphic representations and digital technologies in a range of selected and appropriate communication forms. They evaluate their findings and propose action in response to a contemporary geographical challenge, taking account of environmental, economic, political and social considerations. They explain the predicted outcomes and consequences of their proposal.

Tourism Elective

Tourism is not part of the Australian curriculum. A tourism syllabus was developed by QCAA for years 11 and 12 that some schools teach or modify for middle school elective subjects.

Core topics include:

- tourism as an industry
- the travel experience
- sustainable tourism

Elective topics include: Technology and tourism, Forms of tourism, Tourist destinations and attractions, Tourism marketing, Types of tourism, Tourism client groups.

Assessment techniques include a project, investigation, an extended response and an exam.

Marine and aquatic elective

Marine science and aquatic practices is not part of the Australian curriculum. A marine science and aquatic practices syllabus was developed QCAA for years 11 and 12 that some schools teach or modify for middle school elective subjects.

Core topics include:

- oceanography
- marine biology
- marine systems — connections and change
- ocean issues and resource management.

Elective or other topics may include: environmental conditions, ecosystems, conservation and sustainability, entering the aquatic environment, employment, cultural understandings, and safety and management practices.

Assessment techniques include a project, investigation, an extended response and an exam.

Student work example (year 10)

The following student work samples were taken from ACARA, to give you a level of understanding about what students' work looks like and what you can expect them to complete.

Source: <https://www.australiancurriculum.edu.au/resources/work-samples/science-work-samples-portfolios/>

1. Explain briefly the four conditions for Evolution by Natural Selection according to Charles Darwin.

Natural selection is a theory that states that evolutionary change is the result of the variation among generations. The variable characteristics an individual has will determine their likelihood of survival, as well as their ability to reproduce. The conditions are:

1. All organisms produce more offspring than can survive: Not every organism produced will survive. If organism reproduction had a 100% survival rate, the environment would not be able to cope, resulting in expansive population growth. However, many organisms will die before reaching sexual maturity. Charles Darwin calculated among elephants that if 100% of female offspring survived and produced at the same rate, the number of descendants from a single mother would be 19,000,000.
2. In any population there are variations; all members of one species are not identical - variation is hereditary among species of organisms. Variation is what allows organisms to reproduce and survive better than other organisms. It is essentially 'survival of the fittest'. Variation can increase or decrease an organism's survival chances.
3. Those organisms that survive and reproduce are well adapted to that environment; they have favourable characteristics - organisms that fit best into an environment have a higher chance of surviving, reproducing, and passing on the favourable characteristics.
4. Favourable characteristics are passed onto offspring; they become more and more common in the population - As organisms reproduce the favourable or 'helpful' trait will be passed onto offspring, resulting in more of the population having that trait. As reproduction continues, the less favourable trait will slowly be eradicated while the more favourable trait will be more common. Organisms with the less favourable trait are likely to be killed before reproduction.

1. Explain briefly the four conditions for Evolution by Natural Selection according to Charles Darwin.

The four conditions for evolution are a process by which Natural Selection occurs.

1. All members of one species are not identical. There will always be variations in each individual in each species.
2. In any generation there are offspring that do not reach maturity and do therefore not reproduce. This causes the characteristics of this offspring to lessen in frequency within the population.
3. Organisms that survive and reproduce are well adapted to that environment, making their characteristics favourable.
4. These favourable characteristics are passed on to offspring and begin to become more common within the population.

Summary of curriculum links to resources/themes

Overarching inquiry question: *how can I help the Great Barrier Reef?*

Year	Be a Marine Biologist for a Day Themes	Mandatory ACARA Content elaborations
Year 7	<ul style="list-style-type: none"> • Classification • Food Chains • Humans 	<p>BIOLOGY</p> <ul style="list-style-type: none"> • <i>Classification</i> helps organise the diverse group of organisms. • Interactions between organisms, including the <i>effects of human activities</i> can be represented by <i>food chains and food webs</i>.
Year 8	<ul style="list-style-type: none"> • Cells • Systems • Survival • Reproduction 	<p>BIOLOGY</p> <ul style="list-style-type: none"> • <i>Cells</i> are the basic units of living things; they have <i>specialised structures and functions</i>. • Multi-cellular organisms contain <i>systems of organs</i> carrying out specialised functions that enable them to <i>survive and reproduce</i>.
Year 9	<ul style="list-style-type: none"> • Systems of Life • Responding to the World 	<p>BIOLOGY</p> <ul style="list-style-type: none"> • Multi-cellular organisms rely on coordinated and interdependent <i>internal systems to respond to changes</i> to their environment. • <i>Ecosystems</i> consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.
Year 10	<ul style="list-style-type: none"> • DNA • Earth Systems • Humans • Tourism 	<p>BIOLOGY</p> <ul style="list-style-type: none"> • Transmission of <i>heritable characteristics</i> from one generation to the next involves DNA and genes. • The <i>theory of evolution</i> by natural selection explains the diversity of living things and is supported by a range of scientific evidence. <p>EARTH AND SPACE SCIENCE <i>Global systems</i>, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere.</p> <p>GEOGRAPHY: Environmental Change and Management: People in Environments.</p> <p>TOURISM: Tourism as an Industry, The Travel Experience, Sustainable Tourism.</p> <p>MARINE: oceanography, marine biology, marine systems — connections and change, ocean issues and resource management.</p>

An underwater photograph of a coral reef. The water is a deep, dark blue, and the reef is illuminated from the left, creating a bright, glowing turquoise area. The reef structure is visible as a textured, porous surface. The overall mood is serene and mysterious.

Know how to teach

**Instructional Manual
for Reef Guides**

Teacher qualifications and experience

The following information gives you an understanding of the qualifications and experience teachers and other school staff may have. This will help you understand why you may have different experiences with different teachers. Teachers are humans too, but they may come from very different levels of experience, knowledge and comfort on excursions.

Teaching qualifications in Australia

To teach in Australia, you must hold a degree with a minimum of four years' tertiary study. That must include university-based assessment on site, and at least 45 days' supervised teaching practice in primary or secondary schools. Qualifications may include:

- a four year Bachelor of Education degree
- a three year Bachelor's degree (in anything) plus a Post Graduate Certificate in Education (PGCE) in primary or secondary, such as a Masters or Graduate Diploma of Education.

Teacher registration

All teachers in Australia must hold teaching registration with the board of education of the state or territory they intend to teach in. For Queensland, the board of education is the Queensland College of Teachers (QCT).

Queensland College of Teachers

To be eligible for registration, teachers must have appropriate qualifications, meet the English language proficiency requirements (if applicable) and meet the 'suitability to teach' criteria. After registration has been granted, teachers are eligible to seek employment in any Queensland school. Note: all teachers must start on a preliminary registration before moving to full registration (even experienced teachers arriving to Queensland). A component of maintaining current registration is police checks to be able to work with children. In Queensland, this is a 'working with children' Blue Card.

Teacher experience

A teacher can be asked by their school to teach any subject, regardless of qualifications and experience. Therefore, a science or geography teacher may have never taught the subject before, nor had any experience teaching in marine environments or taking students on excursions. Maths and health and physical education teachers are often given middle school science classes to teach.

Do not expect the teachers to know how to safely supervise their students outside the classroom or in or around water. Most of their time is spent in a classroom, not in the water or on a boat. If a teacher is quiet, they could either be very competent in the water, or very nervous and trying to hide it from the students. Either way, prepare for the worst and hope for the best, and check the experience and comfort of supervising teachers before the excursion.

Planning excursions

Planning and risk assessments

Teachers need to undertake some very detailed planning in order to take students on excursions. Excursions are often flagged in annual planning at the end of term 4 (about November or December) for the following year. In the lead-up to excursions, teachers need to seek parental permission. If your tourism operation requires medical declaration or waiver forms, it is helpful if teachers can get all parental consent at one time. So providing these documents early is important.

Teachers also need to manage risks for activities with procedures that support schools to identify potential hazards, assess risks and implement control measures. To assist Queensland state schools to conduct and prepare risk assessments, Curriculum Activity Risk Assessment (CARA) guidelines are available for a wide range of activities, including snorkeling. The guidelines align with policies and regulations of state and federal governments, and the standards and processes of peak bodies in Australia. In addition, they are regularly reviewed and undergo a comprehensive consultation process with schools and regions. It is helpful if you provide teachers with a copy of your tourism operation risk assessment or Safe Work Method Statement (SWMS) for these activities, as teachers often rely on the expertise of tourism operators to reduce risk and hazards.

Adult-to-student ratios

The CARA guidelines and schools may use different adult-to-student ratios for excursions and particular activities. Teachers may also use tourism operation staff to contribute towards adult-to-student ratios. For example, a school may use a ratio of 1 adult to 10 students for general excursions but then use a ratio of 1 adult to 7 students for snorkeling. It is important to consider what ratios schools are using for the excursion, in-water activities and on-water activities.

These ratios mean that schools often call upon other teachers, other school staff and even parents or guardians to help. Do not assume that every adult on a school excursion is a teacher or knows the students they are supervising.

Teacher aides

Teacher aides are not qualified nor employed to teach, but interact with students under the direct or indirect supervision of a qualified teacher. To work as a teacher aide in Australia, a qualification in education is desirable. Examples include a Certificate III or IV in Education Support. Again, a teacher aide may not be experienced teaching in marine environments.

Supervising parents and guardians

Sometimes schools will invite parents and guardians to attend excursions to contribute towards adult-to-student supervision ratios. Any supervising adults that attend excursions should have Queensland 'working with children' Blue Cards and be approved by the school to attend. However, do not assume that these adults work at the school, are teachers, have much experience with behavior management or even know many students. They themselves may not be comfortable in marine environments.

Middle school behaviour management

Middle school students are right in the middle of the transition from child to adult. Some year 7 students look like they should still be in primary school, whilst others may be taller than most adults. Year 7s are still trying to work out where they 'fit in'. Some do this by acting silly. By the time students reach year 8, they have made friendship groups and are more confident. They know they're not the youngest in the school anymore. That sense of confidence can sometimes spell trouble. Year 9s are a mixed bag. Some students are still testing the boundaries of what they can and can't get away with, whilst others have matured and moved on. Most year 10s are treated as 'senior students'. Middle school can finish in either year 9 or 10, depending on the school. A lot more is expected of year 10s because, by that time, they should know the rules and the expectations of the school.

Upon arrival, the cultural and behavioural expectations of the school will become obvious. For example, some schools have very strict guidelines that students must adhere to whilst on excursions, such as wearing full school uniform. In contrast, other schools are more relaxed, such as letting students move about when lining up. After meeting and greeting the teachers and students, you will get a feel for who they are and how they are likely to behave. You will probably see who the students are that need more supervision. Once you have met the students and spoken to the teacher, you can use your professional judgement to help you prepare for the day.

Most behavioural problems occur during transitions, when moving from one place to the next. When students are seated quietly, and cannot move, you have control. Most problems occur when they are moving and you have less control. Coordinate a plan with the teacher before moving the students. Importantly, the teacher may have never been on a boat before. They may not know where to go, where things are, or how long it takes to get somewhere. Make sure they have all the information they need before anyone moves anywhere, so they can be two steps ahead of the students.

- Before moving from point A to point B, ask the students to assemble in one or two lines. Some students will insist they be at the front. You may have to ask them to go to the back of the line (unless you want to keep an eye on them).
- Beware of pushing and shoving — this is common. Making students stand in lines may feel like quite an ordeal at first, but it's better than the alternative.
- After a head count, return to the front of the line, give any last instructions, and then start walking.
- As you walk, the line will naturally spread apart. Regularly stop and wait, so you keep the group together and have more control. Students are used to constant stopping. If possible, put another adult at the back of the line.
- When reaching your destination, sit them all down. They will need guidance and repeated instruction about exactly where you want them to sit. There will always be students who try to sit as far away from you as possible. Bring them in closer (preferably before they sit down) so they can hear your instructions.
- Asking teachers to keep head counts (or do your own) to ensure everyone is where they need to be. Student 'buddies' are always a good idea ("do you have your buddy?") to help keep track of everyone.

The teacher will be trying to multi-task and keep eyes in the back of their head. It's a big day for them. They will be tired. Think about what you will do if the teachers are sea-sick or out of their 'comfort zone'.

Any problems that can occur, will occur. Play them out in your mind ahead of time, so you've already thought about how to deal with problems, should they occur. Plus, you can put in place procedures to prevent problems from occurring in the first place. If you need to stop an activity to gain control, do it, even if it takes longer and means you don't finish everything you want to. At the end of the day, safety is the most important thing and behaviour problems compromise safety.

Behaviour problems and strategies

Waiting to board

Behaviour: Wandering off. Not listening or failing to follow instructions.

Behaviour management strategy: Form two lines in buddies. Sit down to wait.

On board the vessel

Behaviour: Goofing around. Not following instructions. Being too loud. Swearing. Spreading out. Putting feet on furniture. Touching things that don't need touching. Not holding on when moving about. Exploring the vessel and going where they shouldn't. Leaning over railings. Polluting. Hogging the food. Pushing ahead of others. Disrespecting paying customers. Being wet in a dry area. Taking photos of people without their consent.

Behaviour management strategy: Introductory briefing and using teachers to nip these behaviours early. It's ok to ask a teacher to manage behavior if you need to.

Pre and post-snorkel briefings

Behaviour: Students not listening. Students talking over the top of you. Students distracted.

Behaviour management strategy: See below for a range of strategies.

If one or two students are talking over the top of you, there are a number of steps you can take. They involve a series of graduated behaviours matched to the extent of the problem. Those graduated behaviours include: looking at the problem students, using non-verbal communication, moving in the direction of students, and stopping the class to confront the behaviour.

Looking at the problem students

The first and least intrusive action is to look at the disruptive students. Keep looking at them to let them know that you have noticed their behaviour and that the behaviour is not acceptable.

Using non-verbal communication

If necessary, gesture for them to be quiet and listen. An example of non-verbal communication is the 'shhhh' signal with your pointer finger against your mouth, or staring at them whilst raising the eyebrows and looking down, like you are peering over a pair of glasses. If you can, do this whilst continuing to deliver your presentation. As soon as you stop talking, all attention will go from what you were saying to the students getting into trouble. You don't want this.

Moving in the direction of the students

If the talking continues, the next step is to move in the direction of the disruptive students. At this point, continue to address the entire group; however, move towards and eventually stand right next to the student or students in question. With you close by, they will be more reluctant to continue talking.

At this point, it is advisable to look at the teacher for back-up.

If the teacher is not there, a slightly more intrusive action is to quietly and privately talk to the offending students. This might be as simple as leaning towards the students and saying, *'I need you to pay attention here. Whatever you are doing, please put it off until I am finished'*. If the students say they're talking because they have a question to ask, gesture for them to raise their hand. At this point, the interaction with students should be as private and positive as possible. It is important that the students in question are not embarrassed in front of the rest of the group and that your comments are offered as a request, not a demand. The underlying message to the students should not be 'pay attention or else'. It should be *'would you please stop what you are doing and join in what we are doing, your participation is welcomed and desired'*.

Stopping the class and confronting the behaviour (last resort)

If students still have not re-engaged, then stop your presentation and address the students directly and publicly. This is done in a calm and polite manner. You might say, *'I'm sure whatever it is you are doing is important to you, but I need you to pay attention right now'*. The confrontation is public and direct. At this stage, there can also be an explicit statement of the consequences if the current behaviour continues, such as moving them apart. As much as possible, communicate to the students that they have a decision to make, and what occurs next is in their direct control. Any consequences stated must be followed through if the behaviour continues. For example, you could say, *'I assume you are aware of the rules about talking during a presentation. I'm going to have to (consequence) if the talking continues. It's really up to you what happens. I hope you choose to join us. Your ideas could be very helpful'*.

When you have finished your presentation, check in with the offending students by asking them to repeat your instructions, so you can be sure they did not miss any important information, they know what to do, and are not going to be causing any trouble in future.

If lots of students are talking over the top of you, stop and wait for them ALL to stop talking, before you continue speaking again. Do not be afraid to wait a long time. If they don't realise you're waiting for them to be quiet, raise one arm. Again, look to the teacher for back-up. Other strategies include making a loud noise (whistle, clap), counting down from 3 to 1 or praising students who are doing the right thing, hoping others will want to be quiet and praised as well. Insisting on quiet before continuing is an effective and well-known behaviour management strategy that is commonly used in the classroom.

If students are not listening because they're distracted by something else, try to remove the distraction. If you can't remove the distraction, try to use it as part of your brief, so they are no longer distracted by it.

If they not listening because your tone of voice too monotonous, try changing your style or tell a funny story.

If they are so excited that they don't want to listen to you, slow down to bring their energy levels down to a manageable level before continuing. You can do this by simply waiting for quiet. The waiting time will help them to settle.

It is very important students hear what you have to say, particularly when it relates to safety.

In-water activities

Behaviour: Separation from their buddy. Separation from the group. Not looking up frequently enough to know their position. Swimming where they are not supposed to. Duck-diving for too long. Getting swept away by current. Touching the animals. Picking up the animals. Getting stuck on a shallow section of Reef on a dropping tide. Not wearing protective clothing. Showing off.

Behaviour management strategy: Pre-snorkel briefing. Increase in-water adult supervision ratios.

Ask if you need more help!

No-one on board knows the students better than the teachers do. Ask for help if you need it, particularly if you feel someone's behaviour is compromising your ability to teach or maintain a safe learning environment. Teachers manage behaviour problems at school every single day. They are the behaviour experts. Not only did they study it at university, but they live and breathe it every day at work. Do not feel embarrassed to ask them for help. They will not, and should not, expect you to take the reins when students are misbehaving. Also, students are accustomed to getting instructions and warnings from teachers, not you. However, the teacher won't know your operation. You need to tell them exactly what instructions you want the students to follow, especially regarding logistics and safety on the day.

Middle school teaching pedagogies

What is a pedagogy?

Pedagogy can be defined as the art of teaching. Pedagogy involves being able to convey knowledge and skills in ways that students can understand, remember and apply. Pedagogy also defines the methods adopted for conducting teaching-learning sessions. It includes the various strategies and approaches adopted by teachers to ensure meaningful learning sessions for students. The demand for quality education is at an all-time high today, so effective pedagogical approaches are critically important.

Traditionally, classrooms were teacher-centred with communication happening only one way, from teachers to students. However, with new technologies now in place, more forms of hybrid or blended learning now exist, where schools use a combination of teaching mediums through technology and digital resources as well as interpersonal means like discussions, case studies and lab work.

Five pedagogies that embrace these new forms of learning include constructivist, collaborative, integrative, reflective and inquiry-based learning (refer to senior guide). The pedagogy adopted for the '*Be a Marine Biologist for a Day*' program is inquiry-based.

Inquiry-based pedagogy

This program uses the inquiry-based pedagogy. Most of the resources and materials are designed for teaching using this pedagogy. A major part to this pedagogy is to ask students questions, without telling them the answers. The students need to acquire their own answers, which lead to more questions, and so on. Their answers shape the conversations and questions that follow. For this teaching style to be effective, it is important that the reef guides do not answer the questions for students. If a student does not know the answer, the 'finding-out' process is the learning process. The emotion of frustration helps cement the learning experience into the memory bank.

It is very important to pause after a question has been asked. Wait. It may feel like you are waiting a long time. But it takes a long time for students to first comprehend the question (you may need to reword the question whilst you are waiting) and then think of an answer. Be patient. Even try timing it with your watch (for example wait 10 seconds).

There are usually one or two students that will want to be the first to answer all your questions. You will notice them. Their hand will shoot up, perhaps before you even finish asking the question. If you let them answer too soon, it defeats the purpose of the long pause time that other students need to first comprehend the question and then think of an answer of their own. Acknowledge those one or two students who are super keen to be involved and commend them for their enthusiasm. But, at the same time, suggest that you want to hear from the other students as well.

Many students will be too afraid to speak up. If you have a small group, and enough time, you could ask that *everyone* provides an answer. Remember then to ask everyone for their answer. Don't get side-tracked mid-discussion and forget. Sometimes, getting everyone to speak that first time is enough to 'break the ice'. Remind them that there are no wrong answers. If you hear an answer that is so wrong it's funny, do NOT laugh. There is nothing worse than someone laughing at another person's attempt to answer a question. It is your responsibility to create a learning environment where everyone feels safe to participate.

If the students are more confident and super excited with little self-control, they may start calling out answers instead of patiently waiting with their hand up. There are basically two options to manage this situation. You could decide to ride the wave of excitement, but manage it carefully so that it doesn't end up being a shouting fest and your learning intention gets lost in the noise. You run the risk of losing control of the group and precious time waiting for them to settle after each question. However, if there's not too much yelling, and students are feeding on the energy in a constructive and productive way, it can be time-saving.

Alternatively, you could decide to make the discussion more controlled and insist they put their hand up if they want to speak, and then everybody listens to what each student has to say, one at a time. This works when the answers are not silly. It also works when a manageable number of hands are raised and it is not the same student answering your questions every time. It is always good practice to look at the teacher and gauge how they're feeling about it. The teacher might have worked hard training their students to behave a certain way in class discussions. The teacher may also reprimand the students for yelling out their answers in excitement before you even get the chance to decide how you're going to manage the situation. It's important that you support the teacher's wishes every time.

Every question takes time to answer, but you don't have a great deal of time to spare. Therefore, think carefully about what question/s to ask. When asking a question, you should already know the answer. If the answer they provide is not correct, continue asking questions until they reach the learning intention. The pre-snorkel brief has some examples you can use, which you can change as you see fit.

Inquiry-based learning

Inquiry-based learning involves asking questions, investigating ideas, creating new knowledge, discussing and reflecting. These activities work best when conducted one after another, in that order, as a closed cycle: Ask → Investigate → Create → Discuss → Reflect (and back to Ask).

Ask

Inquiry-based learning asks students to notice and observe the world around them and ask questions. They are encouraged to wonder and be curious. Similarly, teachers may pose a question for students.

The overarching inquiry question in this program is, *'how can I help the Great Barrier Reef?'*

Investigate

Students put their curiosity into action by investigating. They gather information and ideas and start to develop genuine lines of inquiry and questions to explore.

Create

Inquiry-based learning implies that students are actively involved in their learning, and that they are creating rather than just consuming information, ideas and solutions. They are constructing meaning, understanding and knowledge for themselves.

Discuss

Inquiry-based learning can be a powerful collaborative endeavour and the 'discuss stage' emphasises the important role that dialogue plays in developing conceptual understanding and knowledge. By experiencing learning as a social activity, students learn from each other, share skills and experiences, and develop empathy and understanding from a range of different perspectives.

Reflect

Inquiry-based learning is an ongoing cyclical process that encourages students to reflect on their learning, collect and respond to feedback, and evaluate their processes and products. There is an emphasis on taking action as a result of inquiry-based learning.





Know how students learn

**Instructional Manual
for Reef Guides**

Gardner's Theory of Multiple Intelligences

No two students are alike. The way every person learns will vary. Our brains are all unique and our experiences all contribute to the different ways we learn. Psychologists have spent countless hours performing tests to better understand how students learn.

An important part of teacher education is understanding different ways of learning. There are many solidified learning theories that teachers learn at university to help students in the classroom. Teachers who understand learning theories can use different techniques in their classroom to cater to different kinds of learning. This can help all kinds of students find success in learning. Gardner's Theory of Multiple Intelligences is an example of how we all have a preferred method of learning and a different type of intelligence. Note: there are more theories to how students learn in the primary and senior school guides.

The theory of multiple intelligences was developed in 1983 by Dr. Howard Gardner, Professor of Education at Harvard University. It suggests that the traditional notion of intelligence, based on I.Q. testing, is far too limited. Instead, Dr. Gardner proposed eight different intelligences to account for a broader range of human potential in children and adults. These intelligences are:

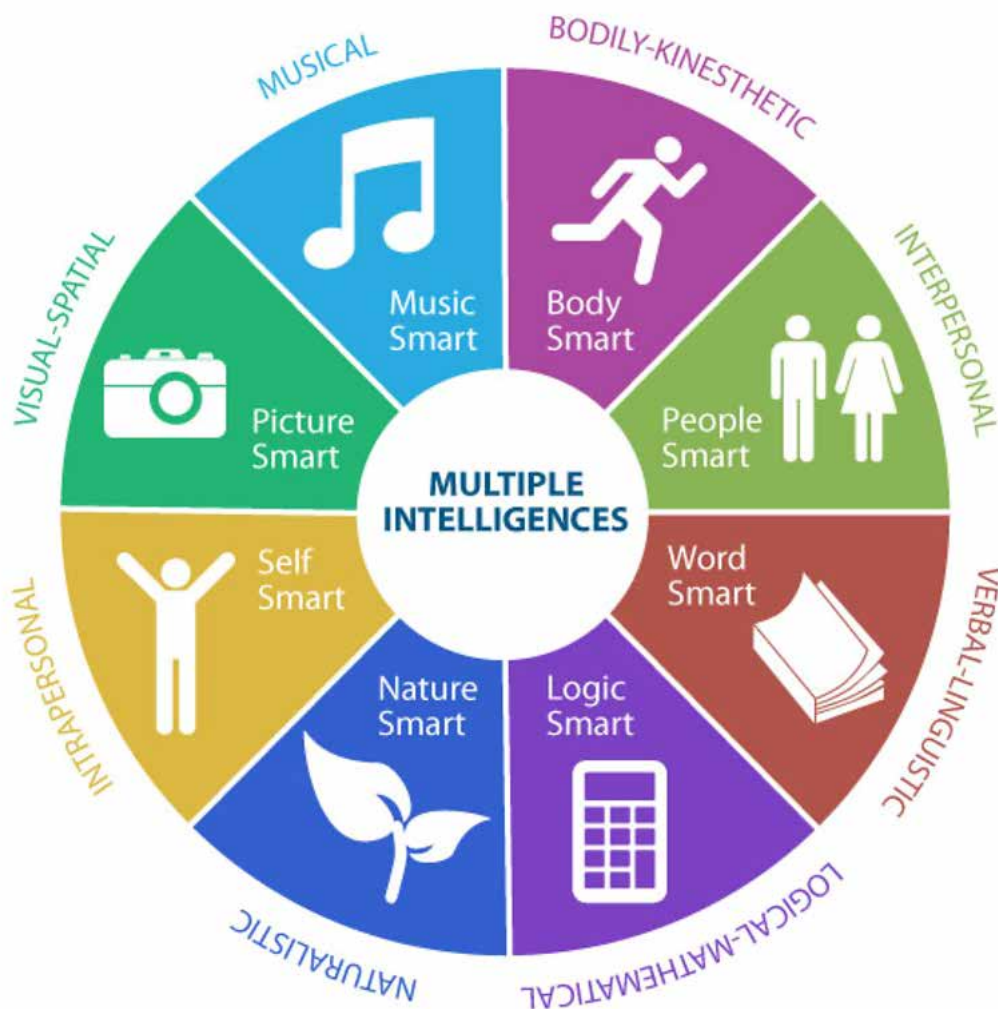
1. Linguistic intelligence ('word smart') – learn best by reading, writing, listening, hearing.
2. Logical-mathematical intelligence ('number smart') - enjoy maths, think sequentially.
3. Spatial intelligence ('picture smart') – learn best with visual aids; graphics, maps, whiteboard.
4. Bodily-kinesthetic intelligence ('body smart') – learn best through hands-on activities.
5. Musical intelligence ('music smart') – learn best through music, lyrics.
6. Interpersonal intelligence ('people smart') – learn best by teaching others.
7. Intrapersonal intelligence ('self smart') – learn best by themselves, prefer to learn alone.
8. Naturalist intelligence ('nature smart') – learn best when surrounded by nature.

“begin with entry points, then offer analogies, then converge upon multiple representations of the core idea” (Gardner, 2000).



One of the most remarkable features of Gardner's theory of multiple intelligences is how it provides eight different potential pathways to learning. If a teacher is having difficulty reaching a student in the more traditional linguistic or logical ways of instruction, the theory of multiple intelligences suggests several other ways in which the material could be presented to facilitate effective learning. For example, the use of pictures and maps will help those with high spatial intelligence. A catchy song can help students with musical intelligence to remember words and concepts they would otherwise forget. When teaching to a group, the audience will be intelligent in different ways. Each person will have their own preferred learning style.

One learning intention or core idea delivered multiple ways reaches a wider audience. Resources in this program use several modes of communication to convey the same learning intention or core idea, for this very reason. Feel free to add more.



An underwater photograph of a coral reef. The water is a deep, dark blue, and the reef is illuminated from the left, creating a bright, glowing area of light blue and white. The reef structure is visible, with various coral and rock formations. The overall scene is serene and beautiful.

Eye on the Reef Training

**Instructional Manual
for Reef Guides**

Eye on the Reef training

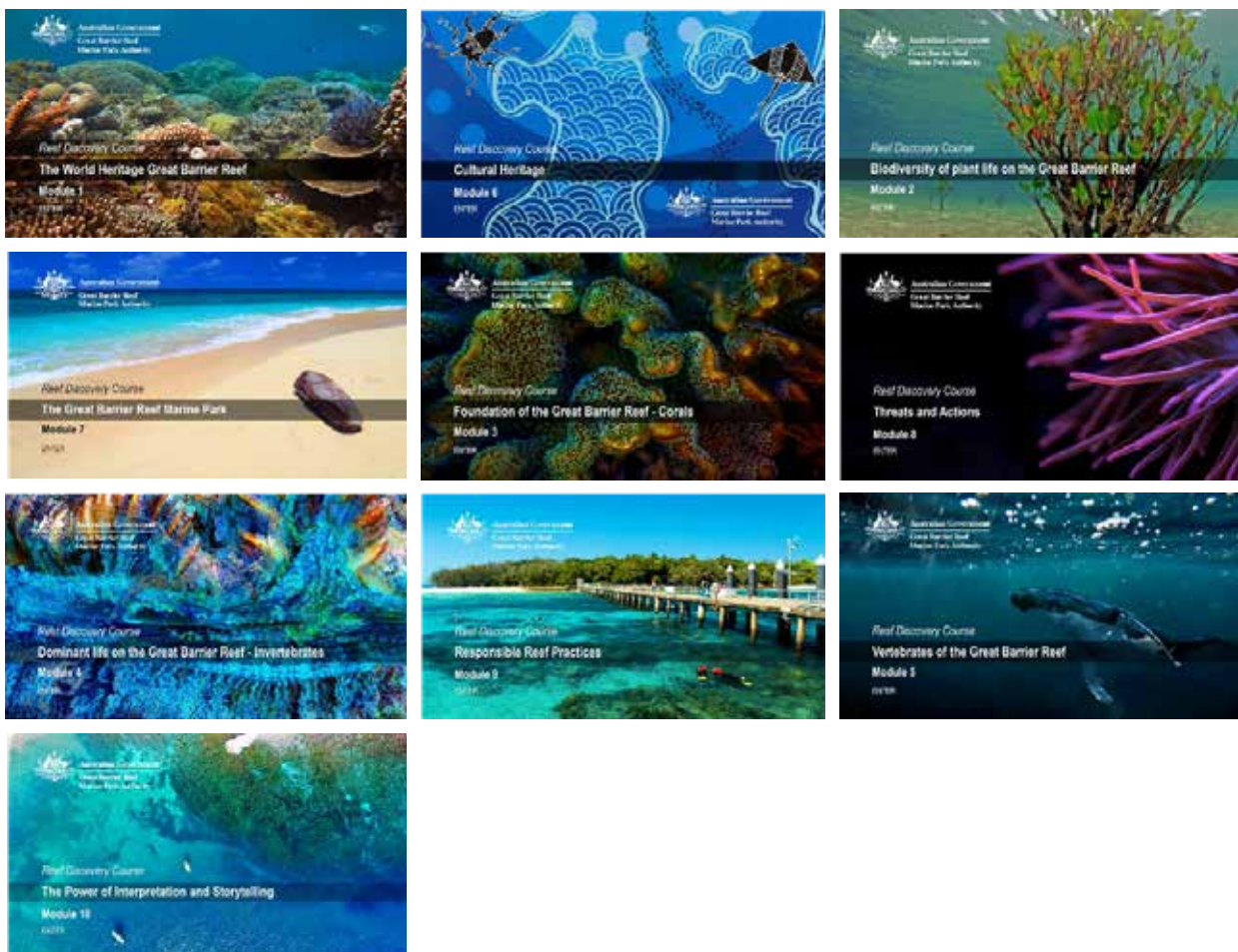
Being a good reef guide is not just about knowing what students need to learn. It is also about you having good knowledge and skills as well. There are a number of online training programs as well as workshops and in-water training opportunities for tourism staff and teachers to complete. Copies of the online training modules are available in PDF as well and can be used to support teacher professional development opportunities as well as training for tourism staff.

Reef Discovery Course

The Reef Discovery Course is a convenient online education package that aims to improve knowledge and understanding of the Great Barrier Reef World Heritage Area, its cultural connections, biological diversity, management and protection, and how best to interpret this information to visitors.

The comprehensive training is a free online course covering the A-Z of all things Great Barrier Reef and how best to share that knowledge with visitors. Designed as a primer by the Great Barrier Reef Marine Park Authority, the course aims to inspire people to learn more about the Reef, how valuable it is and how to deliver accurate information about it in an interesting and memorable way.

To gain access to the Reef Discovery Course, please complete the Eye on the Reef online registration at www.gbrmpa.gov.au or email eyeonthereef@gbrmpa.gov.au.

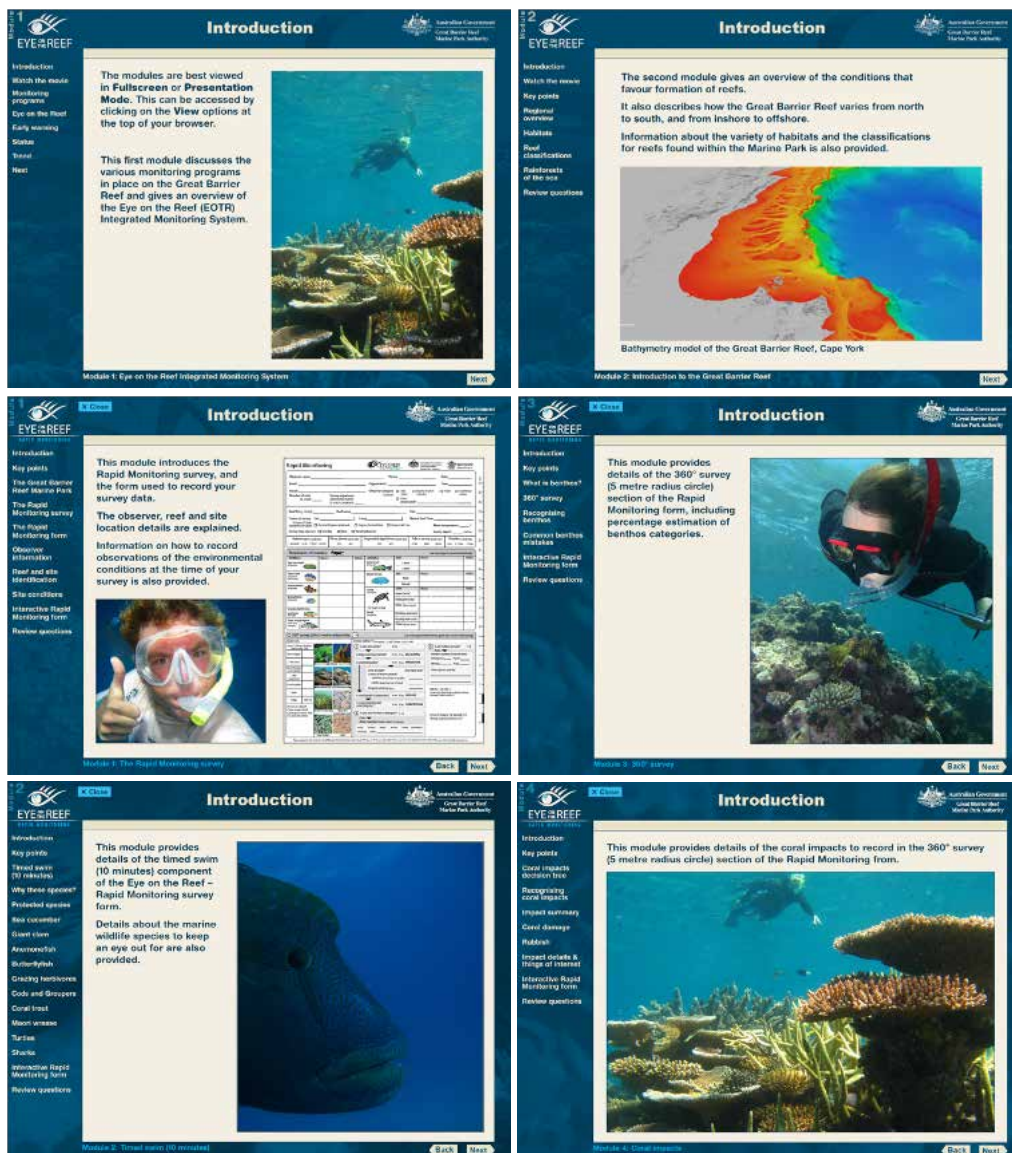


Rapid monitoring training

The rapid monitoring survey online training program has six training modules, which include knowledge reviews and short assessment quizzes.

Each module takes up to 30 minutes to complete. Once participants review all modules and quizzes, they are ready to start undertaking surveys and will be added to the rapid monitoring survey team. In order to submit rapid monitoring data, you need to complete the online training and register.



To be part of the rapid monitoring survey team, please complete the Eye on the Reef online registration at www.gbrmpa.gov.au or email eyeonthereef@gbrmpa.gov.au.



Modified rapid monitoring survey for middle schools

The middle school resources in this toolkit mainly focus on developing students' skills in counting all the species seen in the timed swim section of the rapid monitoring survey and for advanced students starting to build skills to conduct the 360° survey. Resources help students learn about all the species and why we observe and count them and provide learning that is curriculum-linked for their year level.

Skills such as animal identification, counting and tallying are critical for primary students participating in these activities. The Rapid Monitoring underwater survey slate has been modified to suit middle schools by focusing on the timed swim methodology and each individual species. Further details on this are outlined in the chapter customising resources for your tourism operation.

RAPID MONITORING

Observer name: _____ Phone: _____ Date: _____

Email: _____ Organisation: _____ Time: _____

Vessel: _____

Number of visits to a reef: _____ Survey experience (approximate number of surveys completed): _____

Observer category (tick one): Reef visitor Marine tourism industry Fisher Traditional owner

Other (please specify) _____

Reef ID (e.g. 15-023): _____ Reef name: _____ Site: _____

Centre of survey: Lat: _____ S Long: _____ E Marine Park Zone: _____

Tick one GPS type: (see examples over page) Decimal Degrees (preferred) Degrees Decimal Mins Degrees Min Sec

Survey type (tick one): Snorkel Dive Viewing bucket

Water temperature: _____ °C

Survey depth: _____ metres

Habitat type (circle one)	Flood plume (circle one)	Suspended algal bloom (circle one)	Tide at survey (circle one)	Visibility (circle one)
LAGOON FLAT CREST SLOPE	YES NO	YES NO	LOW MID HIGH	<5m 5-10m >10m

Timed swim (10 minutes)

See over page for survey methodology

ANIMALS	TALLY	TOTAL	ANIMALS	SIZE	TALLY	TOTAL
Sea cucumber (all species)			Coral trout (all species)	<38cm >38cm		
Giant clam (larger than size of hand)			Maori wrasse	SEX Male Female	TALLY	TOTAL
Anemonefish (all species)			Turtle (all species)	TYPE Green Turtle* Hawksbill Turtle* Other (please name)	TALLY	TOTAL
Butterflyfish (all species)			*See images over page			
Grazing herbivores (see definition over page)			Shark (all species)	Whitetip reef shark Blacktip reef shark Other (please name)		
Cods and groupers (over 50cm in length)			Crown-of-thorns starfish	Juvenile Adult		

360° survey (One 5 metre radius circle)

See over page for information guide and survey methodology


<p>BENTHOS</p> <p>Answers % for each benthos type to total 100%</p> <table style="width: 100%;"> <tr> <td>Macroalgae </td> <td rowspan="2" style="text-align: center; vertical-align: middle;">←----- NACROALGAE -----→</td> </tr> <tr> <td>Live coral </td> </tr> <tr> <td>Recently dead coral (white) </td> <td rowspan="2" style="text-align: center; vertical-align: middle;">←----- LIVE CORAL -----→</td> </tr> <tr> <td>Live coral rock </td> </tr> <tr> <td>Coral rubble </td> <td></td> </tr> <tr> <td>Sand </td> <td></td> </tr> <tr> <td>Total 100 %</td> <td></td> </tr> </table> <p>PHOTOS TAKEN <small>(Please provide details e.g. image no., name, what it is, and a description)</small></p> <table style="width: 100%;"> <tr> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">RECENTLY DEAD CORAL</td> <td style="text-align: center;">CORAL ROCK (includes dead coral)</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">CORAL RUBBLE</td> <td style="text-align: center;">SAND</td> </tr> </table>	Macroalgae	←----- NACROALGAE -----→	Live coral	Recently dead coral (white)	←----- LIVE CORAL -----→	Live coral rock	Coral rubble		Sand		Total 100 %				RECENTLY DEAD CORAL	CORAL ROCK (includes dead coral)			CORAL RUBBLE	SAND	<p>ORAL IMPACTS (Complete 1, 2 and 3 below. Circle Y or N)</p> <p>1 Is any coral white? Y / N</p> <p>Is living coral tissue present? Y / N If yes: BLEACHING</p> <p>Is coral being eaten? Y / N If yes: PREDATION</p> <p style="margin-left: 20px;">If yes, by what? How many seen?</p> <p style="margin-left: 40px;">Crown-of-thorns starfish</p> <p style="margin-left: 60px;">Juveniles (size of hand or smaller) _____</p> <p style="margin-left: 60px;">Adults (larger than size of hand) _____</p> <p style="margin-left: 60px;">Drupella snails (all sizes) _____</p> <p>Is coral banded in appearance? Y / N If yes: DISEASE</p> <p>Is coral competing with something else? Y / N If yes: COMPETITION</p> <p>2 Is any coral broken or damaged? Y / N</p> <p>If yes: What is the likely main cause? (Circle one)</p> <p>Storm Animal Vessel Anchor Divers Snorkellers</p> <p>Unknown Other: _____</p> <p>3 Is any rubbish present? Y / N</p> <p>If yes: Number of pieces in survey area:</p> <p>Fishing line _____ Plastic _____</p> <p>Netting _____ Rope _____</p> <p>Other (please specify) _____</p> <p>IMPACT DETAILS <small>(How much bleaching, predation, disease, damage? Other impacts?)</small></p> <p>OTHER THINGS OF INTEREST? <small>(Mating, spawning behaviour, etc.)</small></p>
Macroalgae	←----- NACROALGAE -----→																				
Live coral																					
Recently dead coral (white)	←----- LIVE CORAL -----→																				
Live coral rock																					
Coral rubble																					
Sand																					
Total 100 %																					
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CORAL RUBBLE	SAND																				



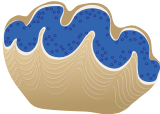

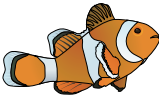

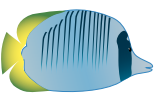




TO SUPPORT YOUR SURVEY, GO TO www.gbrmpa.gov.au/eye-on-the-reef | Reefy Paid PO Box 1379 Townsville QLD 4810 | Fax: (07) 4772 6093 | eyeonthereef@gbrmpa.gov.au

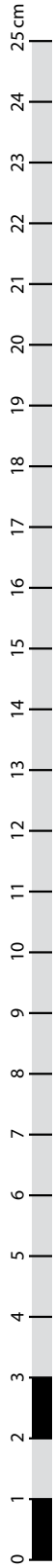
Modified rapid monitoring survey for middle schools

RAPID MONITORING BE A MARINE BIOLOGIST FOR THE DAY




Timed swim (10 minutes)  *See below for survey methodology*

ANIMALS	TALLY	TOTAL	ANIMALS	SIZE	TALLY	TOTAL
Sea cucumber (all species) 			Coral trout (all species) 	<38cm		
				>38cm		
Giant clam (larger than size of hand) 			Maori wrasse 	SIZE	TALLY	TOTAL
				Male		
Anemonefish (all species) 			Turtle (all species) * See images below 	SIZE	TALLY	TOTAL
				Green Turtle*		
				Hawksbill Turtle*		
Butterflyfish (all species) 			Shark (all species) 	SIZE	TALLY	TOTAL
				Whitetip reef shark		
Grazing herbivores <i>See definition below</i> 				Blacktip reef shark		
				Other (please name)		
Cods and groupers (over 50cm in length) 			Crown-of-thorns starfish 	SIZE	TALLY	TOTAL
				Juvenile		
				Adult		




Survey guide

Timed swim 


▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.


GRAZING HERBIVORES



▶ Look for a school of similar looking and sized fish moving slowly along the reef, foraging or grazing close to the coral reef substrate. The most important types to record are species of parrotfish, surgeonfish, rabbitfish and unicornfish.


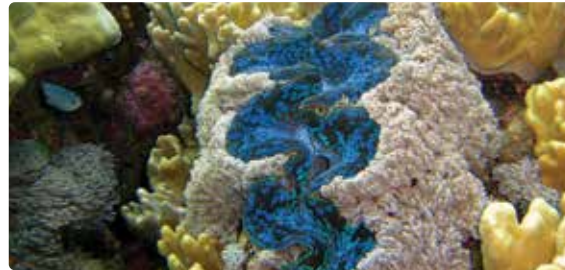


SEA TURTLES

▶ GREEN 





▶ HAWKSBILL 

To submit your survey, go to www.gbrmpa.gov.au/eye-on-the-reef | Reply Paid PO Box 1379 Townsville QLD 4810 | Fax: (07) 4772 6093 | eyeonthereef@gbrmpa.gov.au

Modified rapid monitoring survey for middle schools

<p>RAPID MONITORING BE A MARINE BIOLOGIST FOR THE DAY</p> <p>Australian Government Great Barrier Reef Marine Park Authority</p> <p>EYE ON THE REEF</p> <p>Queensland Government</p> <p>Timed swim (10 minutes)</p> <p>Sea Cucumber (all species)</p>  <p>Names</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/> <p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p> <p>To submit your survey, go to www.gbmpa.gov.au/eye-on-the-reef Reply Paid PO Box 1379 Townsville QLD 4810 Fax: (07) 4772 6093 eyeonthereef@gbmpa.gov.au</p>	<p>RAPID MONITORING BE A MARINE BIOLOGIST FOR THE DAY</p> <p>Australian Government Great Barrier Reef Marine Park Authority</p> <p>EYE ON THE REEF</p> <p>Queensland Government</p> <p>Timed swim (10 minutes)</p> <p>Giant clam (larger than size of hand)</p>  <p>Names</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/> <p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p> <p>To submit your survey, go to www.gbmpa.gov.au/eye-on-the-reef Reply Paid PO Box 1379 Townsville QLD 4810 Fax: (07) 4772 6093 eyeonthereef@gbmpa.gov.au</p>
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Modified rapid monitoring survey for middle schools

<p>RAPID MONITORING BE A MARINE BIOLOGIST FOR THE DAY</p> <p>Australian Government Great Barrier Reef Marine Park Authority</p> <p>EYE ON THE REEF</p> <p>Queensland Government</p>	<p>RAPID MONITORING BE A MARINE BIOLOGIST FOR THE DAY</p> <p>Australian Government Great Barrier Reef Marine Park Authority</p> <p>EYE ON THE REEF</p> <p>Queensland Government</p>
<p>Timed swim (10 minutes)</p> <p>Grazing herbivores</p>  <p>Names</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/>	<p>Timed swim (10 minutes)</p> <p>Cods and groupers (over 50 cm in length)</p>  <p>Names</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/>
<p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p>	<p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p>
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<p>Timed swim (10 minutes)</p> <p>Coral trout (all species)</p>  <p>Names</p> <input type="text"/> <p>Size</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/>	<p>Timed swim (10 minutes)</p> <p>Maori wrasse</p>  <p>Names</p> <input type="text"/> <p>Size</p> <input type="text"/> <p>Tally</p> <input type="text"/> <p>Total</p> <input type="text"/>
<p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p>	<p>Survey guide</p> <p>Timed swim</p> <p>▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.</p>
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Modified rapid monitoring survey for middle schools


RAPID MONITORING
BE A MARINE BIOLOGIST FOR THE DAY

Australian Government
Great Barrier Reef
Marine Park Authority | **EYE ON THE REEF** | Queensland
Government

RAPID MONITORING
BE A MARINE BIOLOGIST FOR THE DAY

Australian Government
Great Barrier Reef
Marine Park Authority | **EYE ON THE REEF** | Queensland
Government

Turtle (all species)



© Commonwealth of Australia GBMPA


Names

Size

Tally

Total

Shark (all species)



© Commonwealth of Australia GBMPA

Names

Size

Tally

Total

Survey guide

Timed swim

▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.

To submit your survey, go to www.gbmpa.gov.au/eye-on-the-reef | Reply Paid PO Box 1379 Townsville QLD 4810 | Fax: (07) 4772 6093 | eyeonthereef@gbmpa.gov.au

Survey guide

Timed swim


▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.

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RAPID MONITORING
BE A MARINE BIOLOGIST FOR THE DAY

Australian Government
Great Barrier Reef
Marine Park Authority | **EYE ON THE REEF** | Queensland
Government

Crown-of-thorns starfish



© Chris Jones

Names

Size

Tally

Total

Survey guide

Timed swim

▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.

To submit your survey, go to www.gbmpa.gov.au/eye-on-the-reef | Reply Paid PO Box 1379 Townsville QLD 4810 | Fax: (07) 4772 6093 | eyeonthereef@gbmpa.gov.au

An underwater photograph of a coral reef. The water is a deep, clear blue. In the foreground, there is a large, textured coral formation with a lighter, turquoise hue. The background shows more of the reef structure, including some smaller coral heads and a sandy bottom. The overall scene is serene and vibrant.

Pre and post-snorkel brief cards

**Instructional Manual
for Reef Guides**

At first, the pre-snorkel brief cards may look a little confusing and you may think they are in the wrong order, but they are not. They are like this on purpose. The pre-snorkel and post-snorkel cue cards are designed to be used as flip books. The students will be seated in front of you. You will hold the cards up high for everyone to see. The content is repeated on the back of the *previous* card so that you do not need to keep turning them towards you to see what they are. That way, not only can you keep the cards facing the students, but there are questions that you can ask the students. You can feel assured that they are directly related to what the students are learning at school for that particular year level. Remember, this program uses an inquiry-based approach to learning, so your delivery of the content should involve a lot of questioning (as opposed to telling them the information). The inquiry questions will help you with this. The students should already know the answers to the questions if they completed Part 1 at school. If not, they may need you to introduce each species first.

Save the PowerPoint to PDF. Print double-sided on waterproof paper (Officeworks or other printing company can do this for you) to the size of your liking (A3 or A4 is recommended). Alternatively, print double-sided and laminate the pages instead. Punch holes along the top edge of each page. Use a large ring to bind the pages together. The pages must be able to flip easily without damage.

The age groups are colour-coded. Primary school (P-6) is in orange. Middle school (7-10) is in blue. Senior school (11-12) is in purple. The pre-snorkel and post-snorkel brief cards for the advanced 360° survey are in red.

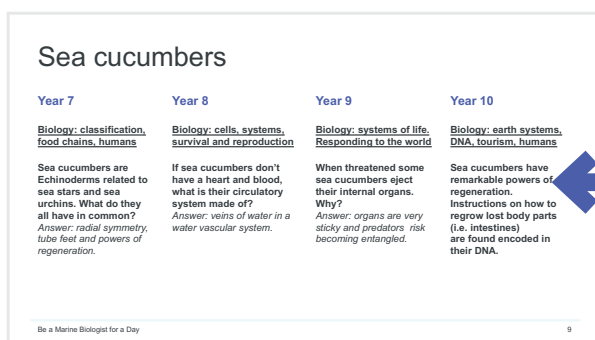
What the REEF GUIDE is reading from



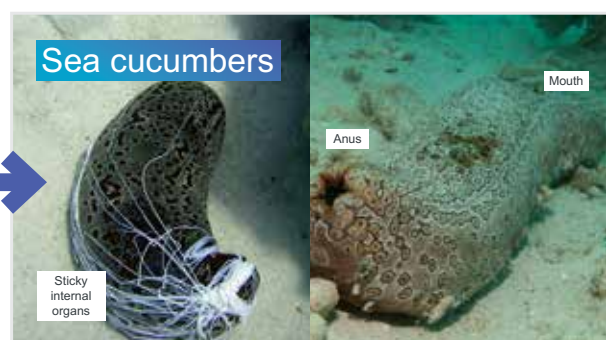
What the Students are looking at



What the REEF GUIDE is reading from



What the Students are looking at



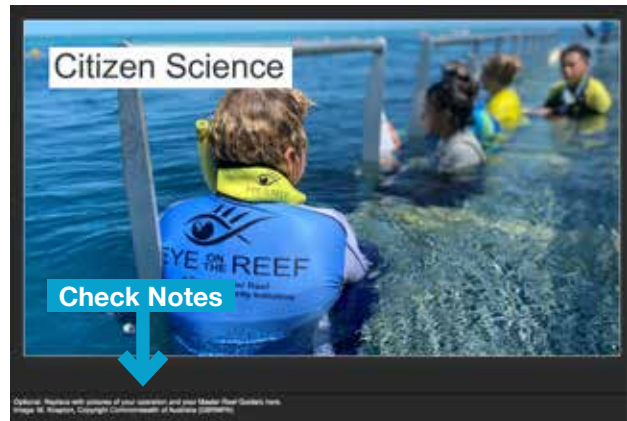
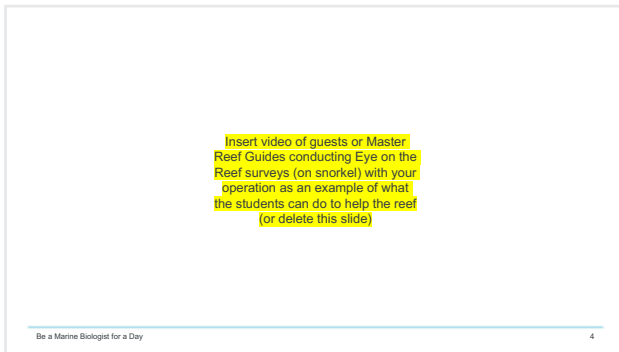
An underwater photograph of a coral reef. The water is a deep, dark blue, and the reef is illuminated from above, creating a bright, glowing effect. The coral structures are visible, though somewhat blurred due to the water's depth and movement.

Customising resources to your operation

**Instructional Manual
for Reef Guides**

Part 1: Preparing to find out

Many of the slides in part 1 of the toolkit can be customised to your operation, particularly at the start and end of the PowerPoints. There will either be prompts highlighted in yellow, or prompts in the notes section of each PowerPoint slide. Check both (and delete when finished). Notably, there are a lot of repeated slides between year levels. You may be able to copy/paste an edited slide from one year level to another year level, to save time. If you'd prefer to leave the examples as they are, that is okay too. However, make sure you go through each slide to delete any unwanted prompts/highlights/notes before preparing to send out to schools.

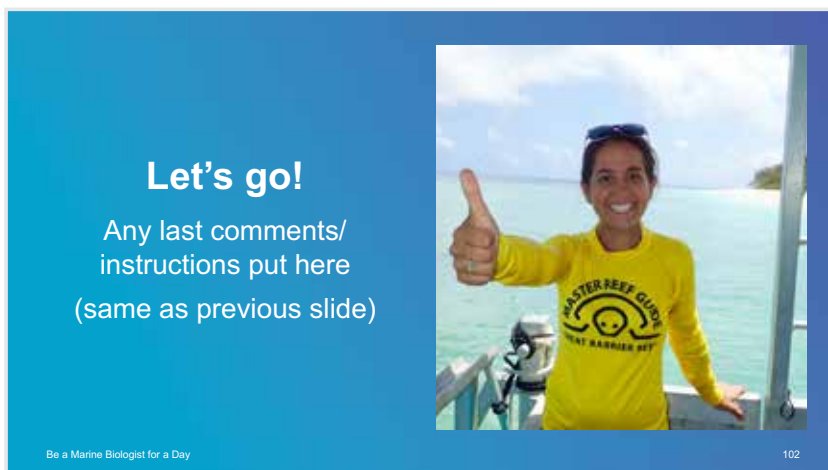


Part 2: Finding out

Pre-snorkel brief cards

Change any pictures to customise the cards to your operation and the animals that reside there.

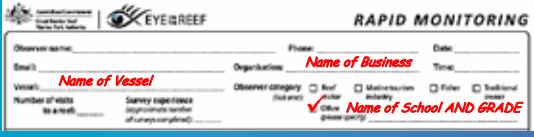
Add any last comments/instructions on the last slide of the pre-snorkel brief.



Post-snorkel brief cards

You will need to customise quite a lot in the post-snorkel brief cards before printing, such as what the students will be writing on their rapid monitoring forms (for example, the name of the vessel, reef, site). If you visit several sites, write them all in. You can simply tell the students which one to copy down. That is much easier than trying to spell a word to a group of students. If you'd prefer to leave the examples as they are, that is okay too.

Organisation: name of the business
Vessel: name of the vessel/s
Observer category: tick Other (name of school)

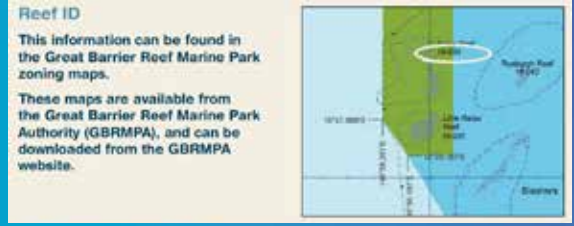


The image shows a 'RAPID MONITORING' form with the following fields and handwritten examples:

- Observer name: _____
- Phone: _____
- Date: _____
- Email: _____
- Organization: **Name of Business**
- Time: _____
- Vessel: **Name of Vessel**
- Observer category: Reef Marine tourism Fishes Traditional Other
- Number of visits: _____
- Survey experience: _____
- Observer name: **Name of School AND GRADE**

Be a Marine Biologist for a Day 8

Reef ID: 18-030 (example only).



The image shows a card with the following text and a map:

Reef ID
This information can be found in the Great Barrier Reef Marine Park zoning maps.
These maps are available from the Great Barrier Reef Marine Park Authority (GBRMPA), and can be downloaded from the GBRMPA website.

The map shows a section of the Great Barrier Reef with a green oval highlighting a specific reef area.

Be a Marine Biologist for a Day 9

Notably, students only learn how to calculate averages in year 8. Therefore, year 7s and 8s may need help. You may want to have a calculator ready.

Modified rapid monitoring survey slates

Years 7-10 conduct the 10-minute timed swim in the water. Because of their age and level of experience, they have only been told to count one indicator species per buddy pair. This method improves safety, accuracy, reduces risk and anxiety, and gives them time to 'look around' as well. The *Be a Marine Biologist for a Day* program has slates that are specially designed for tallying just one individual species per buddy pair. They feature throughout the program, so students will be familiar with how they look. They're also very user friendly, and available in digital format for you to print on waterproof paper (A5 size).

During the pre-snorkel brief, the reef guide can give out the slates, or attach a printed waterproof tally sheet and waterproof pencil to a clipboard (secured with a rubber band around the base of the clipboard) for students to record their data. There are cues on the pre-snorkel brief cards to remind reef guides when to hand out materials. There are also cues on the post-snorkel brief cards to remind reef guides when to collect any borrowed materials.

The survey experience for middle school students is different from that of primary and senior school students. Primary schools do not get in the water and already have all their materials with them in their activity books. Senior students count all 10 indicator species and use the existing A4 rapid monitoring survey slates.

Part 3: Making connections

No changes are required to the PowerPoints for Part 3.

Activity books

During the post-snorkel brief, reef guides help students transfer their data from the in-water 10 minute timed swim, to a rapid monitoring survey form in their activity books. Therefore, it is recommended you keep a class set of activity books as spares for school groups that forget to bring them. This is highly unlikely, but better to be safe than sorry. Alternatively, have some spare rapid monitoring survey forms they can take home with them. Organise to have plenty of pencils and erasers as well. You don't need to make any changes to the activity books, unless you have changed some of the questions in the PowerPoints. The questions in Parts 1 and 3 are the same as the questions in the activity books, so if you change any questions in the PowerPoints, you must change the questions in the activity books as well.

Keep in mind most schools only print in black and white, so colour pictures are likely to be printed in black and white.

Assessment tasks

There is a multi-modal assessment task in Part 3 resources that you do not need to change unless you want to.

Sharing the experience

Asking teachers to share students' work after the excursion will give you a chance to see how students apply what they have learnt. It is always good to follow up to see the impact you have had on these students. They will remember Reef excursions for the rest of their lives, especially if it is the only time they ever go. You will be amazed at how much of an impact you can have on particular students.

You can even ask schools to share photos of their trip on social media or send you some photos (with permission). This makes for good marketing for your tourism operations as well as the school. If you are given any photos or you take some of your own, ensure you have permission to publish. Most schools get parents to complete a permission form at the start of the school year that allows their children to be photographed. But do not assume this is always the case. You can ask the schools to share their photos on their social media and tag your company page, so you can re-share the post.

You could even ask for some student testimonials to share on your company's website about the experience. It is also nice to follow up and check what teachers think of the experience. Many teachers will return year after year with the next cohort of students.

Other educational resources

There are many more educational resources available on the Great Barrier Reef Marine Park Authority's website and YouTube channels that are available for use on your vessels or to share with teachers.

Final tips and things to consider

Eye on the Reef tourism weekly survey

Conducting Eye on the Reef tourism weekly monitoring surveys will give you the knowledge and credibility to deliver rapid monitoring surveys with students and other paying guests under the *Be a Marine Biologist for a Day* program. The tourism weekly survey form records reef health indicators, environmental measurements and the presence of protected and iconic species. All of these factors directly relate to specific known concerns about the resilience of the Reef. By taking part in this monitoring program, tourism operators gain detailed knowledge that can help them improve the local management of their site, update reef interpretation tours and tailor products for their visitors.

Eye on the Reef app and sighting network

There are many ways to get involved and everyone's contribution is welcomed — whether you're a regular day-tripper, tourist on their first visit, fisher, Marine Park ranger, marine tourism staff or marine scientist. One of the easiest ways anyone can get involved is by downloading our free Eye on the Reef app to record reef health, animal sightings and incidents. There are also other monitoring programs for people who visit the Reef more regularly, have more time or marine biology knowledge, or are willing to undergo training.

Master reef guide

All reef guides and staff working on tourism operations along the Great Barrier Reef are critically important to educating Reef visitors. Delivering education experiences to students and improving your knowledge through tourism weekly surveys and the Reef Discovery Course will help you to becoming a great reef guide and educator.

Master reef guides take this to the next level and strive to be world-leading coral reef guides and interpreters, sharing the wonders of the Great Barrier Reef World Heritage Area through engaging stories and memorable experiences. These reef ambassadors can provide up-to-date information on the Reef, share stories of the magical World Heritage Area, and explain what people can do to make a difference.

The Master Reef Guide program is delivered by the Great Barrier Reef Marine Park Authority, Association of Marine Park Tourism Operators and Tourism and Events Queensland. Master reef guide intakes happen in response to industry demand but you can start working towards becoming a master reef guide so you are ready when the opportunity arises.

Reference list

Page 10

Image of learning areas

<https://www.australiancurriculum.edu.au/f-10-curriculum/learning-areas/>

Icons for cross-curriculum priorities

<https://www.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/>

Icons for general capabilities

<https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/>

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Image of ACARA Australian curriculum

<https://www.australiancurriculum.edu.au/f-10-curriculum/structure/>

Page 24

Teacher qualification and experience

https://www.qcaa.qld.edu.au/downloads/senior-qce/syllabuses/snr_aquatic_19_app_syll.pdf (page 28)

Criteria sheet for aquatic practices

https://www.qcaa.qld.edu.au/downloads/senior-qce/sciences/snr_aquatic_19_app_highlighted_standards.pdf

Pages 33 and 34

Image of Gardner's Theory of Multiple Intelligences

<https://www.verywellmind.com/gardners-theory-of-multiple-intelligences-2795161>


Quote: Gardner (2000). *The Disciplined Mind: beyond Facts and Standardized Tests, the K-12 Education that every child deserves*. Penguin Books Ltd. England. P 186.



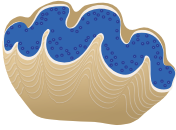
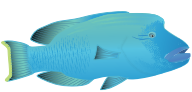
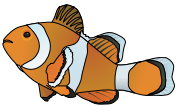
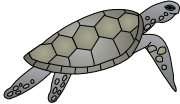
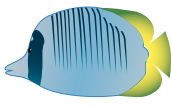





Image of Gardner's Theory of Multiple Intelligences

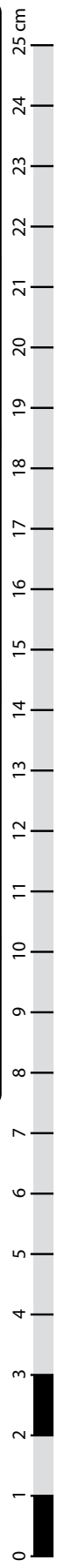
<https://www.institute4learning.com/resources/articles/multiple-intelligences/>

RAPID MONITORING


BE A MARINE BIOLOGIST FOR THE DAY

Timed swim (10 minutes)  See below for survey methodology

ANIMALS	TALLY	TOTAL	ANIMALS	SIZE	TALLY	TOTAL
Sea cucumber (all species) 			Coral trout (all species) 	<38cm		
				>38cm		
Giant clam (larger than size of hand) 			Maori wrasse 	SIZE	TALLY	TOTAL
				Male		
Anemonefish (all species) 			Turtle (all species) <i>* See images below</i> 	SIZE	TALLY	TOTAL
				Green Turtle*		
Butterflyfish (all species) 			Shark (all species) 	SIZE	TALLY	TOTAL
				Whitetip reef shark		
Grazing herbivores <i>See definition below</i> 			Blacktip reef shark 	SIZE	TALLY	TOTAL
				Other (please name)		
Cods and groupers (over 50cm in length) 			Crown-of-thorns starfish 	SIZE	TALLY	TOTAL
				Juvenile		
				Adult		




Survey guide



Timed swim 



▶ Spend ten minutes swimming around your survey site, keeping an eye out for key species and other things of interest.

GRAZING HERBIVORES

 ▶ Look for a school of similar looking and sized fish moving slowly along the reef, foraging or grazing close to the coral reef substrate. The most important types to record are species of parrotfish, surgeonfish, rabbitfish and unicornfish.

SEA TURTLES

▶ **GREEN**  

▶ **HAWKSBILL**  



Australian Government

**Great Barrier Reef
Marine Park Authority**

