

Applicable standards

Next Generation Science Standards

Grade 5-8 Science	Lessons						
	1	2	3	4	5	6	7
Element of the curriculum							
Life Sciences							
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.		✓	✓				
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.		✓	✓				
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.				✓			
MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.				✓			
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	✓		✓			✓	
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	✓		✓			✓	
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem.				✓			
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.				✓			
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.				✓			
MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.						✓	✓
						✓	

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Next Generation Science Standards

Grade 5-8 Science	Lessons						
	1	2	3	4	5	6	7
Element of the curriculum							
Life Sciences							
MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.				✓	✓	✓	
MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	✓			✓	✓	✓	
MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.				✓	✓	✓	
Physical Science							
MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.					✓		
Science and Engineering Practices							
• Asking questions					✓	✓	✓
• Developing and using models					✓	✓	✓
• Planning and carrying out investigations					✓	✓	✓
• Analyzing and interpreting data					✓	✓	✓
• Using mathematics					✓	✓	✓
• Constructing explanations					✓	✓	✓
• Engaging in argument from evidence					✓	✓	✓
• Obtaining, evaluating and communicating information					✓	✓	✓

SCHEME OF WORK

Lesson 1: How do scientists explore underwater ecosystems?

Overview

This lesson introduces students to the marine habitat and the wealth and diversity of life found in the ocean. Students will learn about how scientists explore underwater, going on their first classroom 'Dive' and learning some important dive skills.

Learning outcomes

- Recognize the diversity and range of habitats and life in the ocean
- Use some of the dive skills needed to explore underwater
- Classify common species found on coral reefs

Resources



Slideshow 1:
How do scientists explore underwater ecosystems?



Student Sheet 1a:
Video reflection

Student Sheet 1b:
Species card sort

Student Sheet 1c:
Dive log



Video:
Setting sail

Video:
Dive signs



Google Map:
Lady Elliot Island



Subject Update:
About: Catlin Seaview Survey

Subject Update:
How to: Quick start to 360VR in the classroom

Subject Update:
How to: Four ways to use 360VR in the classroom

Lesson 2: How do scientists use classification in coral habitats?

Overview

Coral reefs support 25% of all marine life on the planet. During this lesson, students will discover more about the coral ecosystem and about the different types of coral. They will then 'dive' on the Great Barrier Reef to undertake a coral survey, identifying the main coral types, distribution and abundance on two survey sites.

Learning outcomes

- Identify the different habitat zones and describe differences in environmental conditions
- Use simple key to identify coral types
- Use survey techniques to compare coral distribution

Resources



Slideshow 2:
How do scientists use classification in coral habitats?



Student Sheet 2a:
Coral reef scale

Student Sheet 2b:
Reef habitat zones

Student Sheet 2c:
Coral ID

Student Sheet 2d:
Dive log



Video:
Wonders of coral



Gallery:
Zones on the reef

Gallery:
Coral reef quadrat survey

SCHEME OF WORK

Lesson 3: How is energy transferred on the reef?

Overview

In this lesson students will explore the interdependence of life on the reef and where different animals, plants and other organisms get their energy from through feeding and symbiosis. Students will learn about the different nature of primary production on the reef compared to terrestrial environments.

Learning outcomes

- Describe the different techniques species use to get their energy
- Identify the range of primary producers in the ocean
- Create a food web describing interdependence of reef life

Resources



Slideshow 3:
How is energy transferred on the reef?



Activity Overview 3a:
Coral feeding game

Activity Overview 3b:
Coral food web



Student Sheet 3a:
Coral species

Student Sheet 3b:
Dive log



Video:
Wall of mouths

Video:
Sea cucumbers

Video:
Reef shark

Video:
Coral feeding game



Gallery:
Coral life (advanced)



Subject Update:
About: Coral

Lesson 4: How have reef specialists evolved and adapted?

Overview

Different species have adapted to life on the coral reef in amazing and diverse ways. From sleeping in mucus bubbles, to flexible snakelike skeletons, life on the reef has had to find ingenious methods to find food and stay alive. The reef is also host to numerous examples of symbiosis and finding food and safety in the strangest of places, whether that be in a shark's mouth or 'vacuuming' the sandy seabed. In this lesson, students are challenged to create the ultimate reef organism.

Learning outcomes

- Identify and describe different types of adaptation on the coral reef
- Create the ultimate coral animal, demonstrating an understanding of adaptation

Resources



Slideshow 4:
How have reef specialists evolved?



Student Sheet 4a:
Ultimate coral animal

Student Sheet 4b:
Dive log



Gallery:
Coral life

Gallery:
Adaptation on the reef



Subject Update:
Learn more: Adaptation

SCHEME OF WORK

Lesson 5: How do forces affect deep coral exploration?

Overview

The expedition also explored the deep reef down to 100 metres. Find out about water pressure, the use of special technology and how corals have adapted to life in this twilight zone.

Learning outcomes

- Explain the relationship between water depth and pressure
- Describe the technology needed to explore the deep reef
- Investigate how corals adapt to lower light conditions

Resources



Slideshow 5:
How do forces affect deep coral exploration?



Activity Overview 5a:
Under pressure

Activity Overview 5b:
Exploring deep coral



Student Sheet 5a:
Diving deeper

Student Sheet 5b:
Dive log



Video:
Monitoring the reef

Video:
Submarine science

Video:
Under pressure



Subject Update:
How to: Quick start to 360VR in the classroom

Subject Update:
How to: Four ways to use 360VR in the classroom

Lesson 6: What is the effect of human impact on the reef?

Overview

Students will consider the varied threats that the coral reef faces. These range from long-term environmental changes caused by increased atmospheric carbon dioxide, to changes in land use in coastal areas and the impact of fertilizer on a certain species of starfish. Students will be prompted to consider what changes could be made to ensure that there are healthy coral reefs well into the future.

Learning outcomes

- Investigate the different factors affecting the coral reef
- Judge the impact of human activity on the coral reef
- Explain their own and others' views about environmental change

Resources

**Slideshow 6:**

What is the effect of human impact on the reef?

**Activity Overview 6a:**

Cloudy waters

Activity Overview 6b:

Ocean acidification in a cup

Activity Overview 6c:

Dissolving 'coral' in vinegar

**Student Sheet 6a:**

Cloudy waters

Student Sheet 6b:

Ocean acidification in a cup

Student Sheet 6c:

Dissolving 'coral' in vinegar

Student Sheet 6d:

Threats overview

Student Sheet 6e:

Coral threats information sheets

**Video:**

Coral future

Video:

Sailing home

**Subject Update:**

Learn more: Coral threats overview

Subject Update:

Learn more: Coral and water quality

Subject Update:

Learn more: Human activity on the reef

Subject Update:

Learn more: Coral in a high CO₂ world

SCHEME OF WORK

Lesson 7: How do scientists share their findings?

Overview

At the end of an expedition, teams create an expedition report to communicate their findings to a wider audience. This could take the form of a formal written report, a press release or a video. These outputs can be shared at an assembly, parents evening, with the local press or do send a selection through to Encounter Edu (info@encounteredu.com) so that we can post them on our website.

Learning outcomes

- Communicate findings using primary and secondary sources
- Choose an appropriate format and style for a real purpose and audience
- Explain their own and others' views about environmental change

Resources



Slideshow 7:

How do scientists share their finding?



Subject Update:

Learn more: Coral threats overview

Subject Update:

Learn more: Coral in a high CO₂ world

Subject Update:

Learn more: Coral and water quality

Subject Update:

Learn more: Human activity on the reef