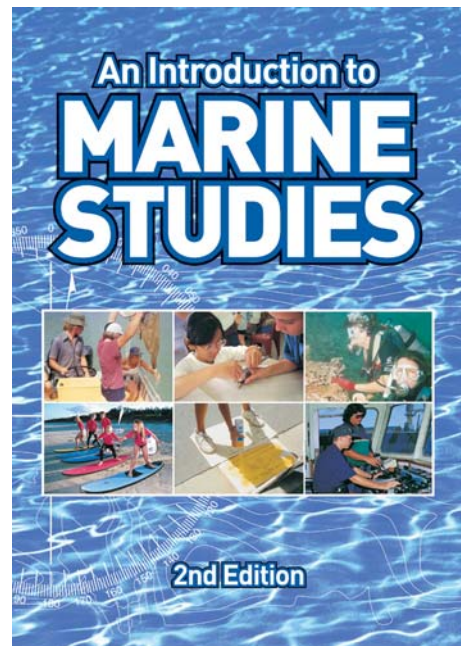


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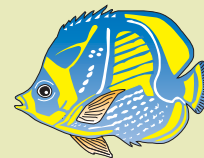
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Western Australia syllabus match

Senior Science marine studies thematic approach

Year 11

Outcome 11.1: Demonstrate an understanding of relevant concepts, laws, procedures and conventions in biological science, physical science, environmental/earth sciences.

Biological science - Ch 3 Dangerous creatures, Ch 5 Living in the sea, Ch 20 Coastlines and marine life, Ch 21 Estuaries and marine life, Ch 25 Small sea creatures, Ch 26 Animals without backbones, Ch 27 Marine vertebrates.

Physical science - Ch 1 Water safety, Ch 6 Sea water, Ch 18 Weather, Ch 19 Oceans, Ch 23 Waves.

Environmental and Earth science - Ch 24 Tides and currents, Ch 28 Trashing the sea, Ch 29 Sea water quality, Ch 30 Saving the sea, Ch 31 Antarctica.

Year 12

Outcome 12.1: Demonstrate an understanding of relevant concepts, laws, procedures and conventions within real life and/or work place context, in biological science, physical science, environmental/earth science.

Biological science - Ch 2 First aid, Ch 8 Snorkelling, Ch 13 Crayfish, Ch 15 Food from the sea.

Physical science - Ch 4 Maintaining equipment, Ch 7 Boating, Ch 11 Aquariums, Ch 22 Coastal engineering, Ch 10 Making a surfboard, Ch 32 Shipwrecks.

Environmental and Earth science - Ch 9 Fishing, Ch 12 Underwater farming, Ch 14 Aquaculture farm design, Ch 16 Marine industries, Ch 17 Marine employment.

Outcomes	Chapters most suited for activities
Outcome 11.2: Plan and carry out simple controlled experiments. Outcome 12.2: Plan and carry out short term and extended investigations independently or within a group.	Ch 6 Sea water, Ch 11 Aquariums, Ch 18 Weather, Ch 23 Waves, Ch 24 Tides and currents.
Outcome 11.3: Present data in tables, appropriate graphs or diagrams. Outcome 12.3: Present data in a variety of forms (including oral, graphical tabular, diagrammatic and written forms) as appropriate to the task.	Ch 3 Dangerous creatures, Ch 4 Maintaining equipment, Ch 5 Living in the sea, Ch 6 Sea water, Ch 18 Weather, Ch 23 Waves, Ch 24 Tides and currents, Ch 28 Trashing the sea, Ch 29 Sea water quality.
Outcome 11.4: Describe patterns and trends in a range of data sets. Outcome 12.4: Describe patterns and trends in data observation and make valid inferences.	Ch 5 Living in the sea, Ch 20 Coastlines and marine life, Ch 21 Estuaries and marine life, Ch 23 Waves, Ch 24 Tides and currents.
Outcome 11.5: Use appropriate sensorimotor skills and equipment to carry out scientific procedures, make accurate observations and measurements. Outcome 12.5: Use appropriate sensorimotor skills and equipment to carry out scientific procedures, make accurate observations and measurements.	Ch 4 Maintaining equipment, Ch 8 Snorkelling, Ch 9 Fishing, Ch 11 Aquariums, Ch 12 Underwater farming, Ch 13 Crayfish, Ch 19 Oceans, Ch 14 Aquaculture farm design, Ch 15 Food from the sea, Ch 18 Weather.
Outcome 11.6: Communicate effectively using appropriate scientific terminology. Outcome 12.6: Communicate effectively using scientific terminology as appropriate to the audience.	Ch 1 Water safety, Ch 2 First aid, Ch 16 Marine industries, Ch 17 Marine employment, Ch 30 Saving the sea.
Outcome 11.7: Perform simple calculations using mathematical ideas and techniques and appropriate scientific units. Outcome 12.7: Perform a range of appropriate calculations using mathematical ideas, techniques and scientific units with reasonable accuracy.	Ch 10 Making a surfboard, Ch 9 Fishing, Ch 11 Aquariums, Ch 22 Coastal engineering, Ch 23 Waves, Ch 24 Tides and currents, Ch 29 Sea water quality.
Outcome 11.8: Demonstrate safe procedures in investigating scientific issues. Outcome 12.8: Demonstrate and apply safe procedures and a high level of responsibility in investigating scientific issues.	Ch 1 Water safety, Ch 2 First aid, Ch 4 Maintaining equipment, Ch 11 Aquariums, Ch 12 Underwater farming, Ch 13 Crayfish, Ch 14 Aquaculture farm design, Ch 16 Marine industries.
Outcome 11.9: Discuss how science has had an impact on the environment and our society. Outcome 12.9: Illustrate, with examples, how science has had an impact on the environment and our society.	Ch 14 Aquaculture farm design, Ch 16 Marine industries, Ch 17 Marine employment, Ch 28 Trashing the sea, Ch 29 Sea water quality, Ch 30 Saving the sea.

Planning a unit of work - assignment contracts

In his 1983 book *Frames of Mind*, Howard Gardner introduces us to the concept of multiple intelligences. To help all our students to learn, the teacher can plan lessons to reach as many of these intelligences as possible. The table below is an adaptation of one given by Ralph Pirozzo. It combines Blooms taxonomy with the concepts of seven different ways learners think.

To plan a unit, you could set a learning contract which can have a number of different options.

- Option A — Choose a minimum of 2 activities from each column → 14 activities
- Option B — Choose a minimum of 2 activities from each row → 12 activities
- Option C — Complete all activities that have been shaded (see examples) → 15 minimum activities

ASSESSMENT OPTIONS

Select 12 or more tasks from Columns 1, 2, 3 etc, then assign points and set criteria (Knowledge and understanding) etc. Set a number of points to finish with and shade core activities eg, you must finish with 40 points, 21 have been shaded as compulsory.

Example: Chapters 26 and 27

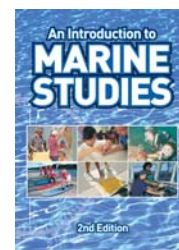
Gardner's intelligences Seven ways to complete this unit	Knowing Describe, find, list, locate, name, relate, state, tell, write 1 point	Understanding Convert, draw, describe, distinguish, express, interpret, match, outline, restate, translate, apply 2 points	Applying Calculate, classify, construct, complete, examine, illustrate, record, report, show, solve, use 3 points	Analysing Analyse, arrange, categorise, compare, contrast, distinguish, examine, explain, identify, investigate, separate, survey 4 points	Creating Compose, research, create, design, devise, estimate, formulate, imagine, improve, invent, plan, predict, propose, conduct 5 points	Evaluating Argue, assess, choose, debate, decide, determine, evaluate, discuss, judge, justify, prioritise, rate, recommend, verify 6 points
1. Verbal/linguistic (I enjoy reading, writing and speaking)	Locate the animal you want to study in Chapter 26 or 27 and state why you have chosen it.	Draw your selected animal and describe its external appearance.	From the animals in the hat provided by your teacher, draw one and classify it to species level.	Write 6 similarities and 6 differences between two animals in the same phylum in one A4 page.	Write a poem/brief skit to describe how this animal feeds or reproduces.	Write 4 of the animals adaptations and rate it's chances of survival from pollution.
2. Maths/logical (I enjoy working with numbers and science)	Count the number of external features on the animal.	Construct a food web showing the trophic relationships of the animal and possible predator-prey relationships.	Explain in clear logical steps how the animal moves .	Decide if the animal is radially or bilaterally symmetrical or another form.	Design another way the animal could defend itself from predators using chemicals. Explain how they may work.	Decide if the animal lives in a population and determine the habitat size.
3. Visual/spatial (I enjoy painting drawing and visualising)	Paint a colour illustration of the animal showing clearly its external features.	Use a map of hypothetical bay to show where the animal would live. Explain your reasoning.	Prepare a map of Australia to show the distribution of the animal.	Compare the external features of the animal with one from a different phylum.	Make a model of the animal and paint it explaining your choices.	Prepare a map of the continental shelf and decide and label the distribution of the animal.
4. Body/kinaesthetic (I enjoy doing hands on activities)	Mime the movements of how the animal could defend itself from a possible predator.	Describe what could be in an invertebrate board game.	Prepare a museum mount of the animal (microscopic, embedded or preserved).	Analyse the pleopod of a mantis shrimp and work out how it can move at the speed of a .22 calibre bullet.	Make a diorama of the animals habitat to show parts of the food chain.	Evaluate the performance of a group members poem/rhyme/song/rap.
5. Music/rhythmic (I enjoy making and listening to music)	Recall a song about a marine animal, record it and play it in class.	Make a chant using invertebrates with the same name eg 1,2,3 we love the sea, sea star, sea urchin, sea cucumber.	Convert the words from a song into a story board interpreting the lyrics.	Select some music for a play on the octopuses garden.	Write a song/rap to describe how an invertebrate moves or reproduces.	Review the music of any students work prior to presentation and make a written report.
6. Interpersonal (I enjoy working with others)	In a pair, present a power point or story board/flip card presentation on the life history of a marine invertebrate.	As a group, select any marine invertebrate discussed and make a summary chart.	As a group, select any marine invertebrate discussed and explain using visuals, its role in its habitat.	Make a summary chart comparing an arthropod and a mollusc.	Make a set of back labels for a Who am I game	In a pair evaluate the author's interpretation of any marine animal from Chapters 26 and 27.
7. Intrapersonal (I enjoy working by myself)	Copy and colour in the tree of marine life in Chapter 26.	Make a drawing of a prawn labelling all parts.	Examine any of the case studies and report on their intended purpose.	Analyse all of the appendages of a crab and explain their functions.	Create a model of an echinoderms tubed foot so you can show how the animal uses it.	Find a brochure, museum model or aquarium display and evaluate how the information has been communicated.

Sample workprogram and activity ideas

The workprogram below is a guide only for teachers attempting design a course in the middle school for 3 years. The book is suitable in senior courses for students who are not bound for university.

There are many ideas and activities from old Wet Paper books on our web site

www.wetpaper.com.au/teacher



<p>Year 1</p>	
Introduction	Decorate the room with marine related gear from table on page 5
Ch 1 Water safety	Bronze star, pool safety, excursion to life saving club, voluntary marine rescue
Ch 2 First aid	First aid certificate, ambulance visit to school, dangerous creature wall chart
Ch 23 Waves	Wave tank experiments, surfing culture project, beach erosion project
Ch 24 Tides and currents	Reading a tide book, graphing tides, current meter design and experiments
Ch 19 Oceans	Make simple oceanographic equipment and test it in local creek or waterway
Ch 32 Shipwrecks	Internet research, make a model ship, immigration, marine museum visit
Ch 3 Dangerous creatures	Design a dangerous creature, wall chart, power point presentation
Ch 31 Antarctica	Assignment, internet research, ABC videos, humpback whale project
Ch 18 Weather	Visit to weather station, emergency plan for severe storms and coastal bushfires
Ch 7 Boating	Canoeing certificate, trip on a boat, navigation assignment, windsurfing, sailing
Ch 6 Sea water	Classroom experiments salinity, temperature, pressure, Cartesian diver
<p>Year 2</p>	
Introduction	Decorate the room with marine related gear from chapters to be studied this year
Ch 8 Snorkelling	Snorkelling certificate, pool skills, rescue, underwater hockey games
Ch 4 Maintaining equipment	Repairs to surfboards, fishing rods, snorkelling gear
Ch 10 Making a surfboard	Visit to a surf shop., industrial arts department, make a model surfboard
Ch 11 Aquariums	Making and stocking an aquarium, class visit from aquarium shop, glass cutting
Ch 12 Underwater farming	Visit to aquaculture farm, rich task on export of aquaculture products
Ch 13 Crayfish	Aquarium breeding, grow out pond construction, crayfish colour wall chart
Ch 25 Small sea creatures	Plankton collection and net making, digital microscope collection
Ch 28 Trashing the sea	Pollution experiments, community surveys, plastic bag studies, media study
Ch 29 Sea water quality	Laboratory experiments, waterwatch involvement, action based research
Ch 30 Saving the sea	Reef guardians, drain spraying, media project, seaweek display, worm farms
<p>Year 3</p>	
Introduction	Decorate the room with marine related gear from chapters to be studied this year
Ch 5 Living in the sea	Marine ecology excursion report, deep sea animal project, ecosystem wall mural
Ch 26 Animals without backbones	Make a marine invertebrate, digital photograph collection
Ch 27 Marine vertebrates	Excursion to sea world, underwater world, marine aquarium
Ch 14 Aquaculture farm designs	Convert the school oval into a aquaculture farm project
Ch 16 Marine industries	Visit to a marine industry, port, marina, boat building factory
Ch 17 Marine employment	Work experience for one week in a local marine industry
Ch 9 Fishing	Build a fishing rod, bait bag, lobster pot, catching fish, make a tackle book
Ch 15 Food from the sea	Seafood cooking, visit to a fish marketing board
Ch 22 Coastal engineering	Excursion to marina, port, groyne, canal estate, model making/ research project
Ch 20 Coastlines and marine life	Rocky shore excursion, digital photograph collection, wall mural of zonation
Ch 21 Estuaries and marine life	Mangroves or seagrass excursion, digital photograph collection, mangrove mud

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