Aquatic Practices 2024 v1.0

Applied senior syllabus

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Queensland syllabuses for senior subjects

In Queensland, a syllabus for a senior subject is an official 'map' of a senior school subject. A syllabus's function is to support schools in delivering the Queensland Certificate of Education (QCE) system through high-quality and high-equity curriculum and assessment.

Syllabuses are based on design principles developed from independent international research about how excellence and equity are promoted in the documents teachers use to develop and enliven the curriculum.

Syllabuses for senior subjects build on student learning in the Prep to Year 10 Australian Curriculum and include General, General (Extension), Senior External Examination (SEE), Applied, Applied (Essential) and Short Course syllabuses.

Aquatic Practices is an Applied senior syllabus in the Sciences learning area.

General information about implementing syllabuses is available in the *QCE and QCIA policy and procedures handbook*.

More information about syllabuses for senior subjects is available at www.qcaa.qld.edu.au/senior/senior-subjects and in Section 4.1 of the *QCE and QCIA policy and procedures handbook v3.0*.

Teaching, learning and assessment resources will support the implementation of a syllabus for a senior subject. More information about professional resources for Applied senior syllabuses is available on the QCAA website and via the QCAA Portal.

Course overview

Rationale

Aquatic Practices provides opportunities for students to explore, experience and learn concepts and practical skills valued in aquatic workplaces and other settings. Learning in Aquatic Practices involves creative and critical thinking; systematically accessing, capturing and analysing information, including primary and secondary data; and using digital technologies to undertake research, evaluate information and present data.

Aquatic Practices students apply scientific knowledge and skills in situations to produce outcomes. Students build their understanding of expectations for work in aquatic settings and develop an understanding of career pathways, jobs and other opportunities available for participating in and contributing to aquatic activities.

Projects and investigations are key features of Aquatic Practices. Projects require the application of a range of cognitive, technical and reasoning skills and practical-based theory to produce real-world outcomes. Investigations follow scientific inquiry methods to develop a deeper understanding of a particular topic or context and the link between theory and practice in real-world and/or lifelike aquatic contexts.

By studying Aquatic Practices, students develop an awareness and understanding of life beyond school through authentic, real-world interactions to become responsible and informed citizens. They develop a strong personal, socially oriented, ethical outlook that assists with managing context, conflict and uncertainty. Students gain the ability to work effectively and respectfully with diverse teams to maximise understanding of concepts, while exercising flexibility, cultural awareness and a willingness to make necessary compromises to accomplish common goals. They learn to communicate effectively and efficiently by manipulating appropriate language, terminology, symbols and diagrams associated with scientific communication.

The objectives of the course ensure that students apply what they understand to explain and execute procedures, plan and implement projects and investigations, analyse and interpret information, and evaluate procedures, conclusions and outcomes.

Workplace health and safety practices are embedded across all units and focus on building knowledge and skills in working safely, effectively and efficiently in practical aquatic situations.

Syllabus objectives

The syllabus objectives outline what students have the opportunity to learn.

1. **Describe ideas and phenomena.**

   Students give an account of scientific ideas and phenomena and the skills and processes used to complete a scientific task. They express information in a variety of modes using aquatic language, representations and genre conventions.

2. **Execute procedures.**

   Students demonstrate skills and processes to complete an aquatic task. They collect and collate information from primary and secondary sources. Students follow workplace health and safety procedures and ethical and environmental considerations.

3. **Analyse information.**

   Students recognise a variety of forms of information produced from experiments and research, e.g. words, symbols, pictures, graphs. They identify the key features and components of information and apply processes to identify patterns, relationships, errors and limitations.

4. **Interpret information.**

   Students draw conclusions from their analysis of information from experiments and research. They identify expectations and requirements in scenarios.

5. **Evaluate conclusions and outcomes.**

   Students make judgments about conclusions and outcomes in terms of criteria such as efficiency, effectiveness, cost, safety, industry standards or social, ethical, cultural or environmental impacts. They make recommendations about future investigations and projects.

6. **Plan investigations and projects.**

   Students make decisions about methodologies, sources and processes to reach conclusions and achieve outcomes. They ensure that workplace health and safety and ethical and environmental considerations are incorporated into planning.

Designing a course of study in Aquatic Practices

Syllabuses are designed for teachers to make professional decisions to tailor curriculum and assessment design and delivery to suit their school context and the goals, aspirations and abilities of their students within the parameters of Queensland's senior phase of learning.

In this way, the syllabus is not the curriculum. The syllabus is used by teachers to develop curriculum for their school context. The term *course of study* describes the unique curriculum and assessment that students engage with in each school context. A course of study is the product of a series of decisions made by a school to select, organise and contextualise units, integrate complementary and important learning, and create assessment tasks in accordance with syllabus specifications.

It is encouraged that, where possible, a course of study is designed such that teaching, learning and assessment activities are integrated and enlivened in an authentic applied setting.

Course structure

Aquatic Practices is a four-unit course of study. This syllabus contains QCAA-developed units as options for schools to select from to develop their course of study, as outlined in Figure 1.

Figure 1: Selecting units to design a course of study

School	Syllabus selection	Unit 1	Unit 2	Unit 3	Unit 4
A Secondary College	**Selected unit**	Unit option B	Unit option A	Unit option E	Unit option C
	Assessment	B1 B2	A1 A2	E1 E2	C1 C2
A High School	**Selected unit**	Unit option D	Unit option F	Unit option C	Unit option B
	Assessment	D1 D2	F1 F2	C1 C2	B1 B2

Units and assessment have been written so that they may be studied at any stage in the course. All units have comparable complexity and challenge in learning and assessment. However, greater scaffolding and support may be required for units studied earlier in the course.

Each unit has been developed with a notional time of 55 hours of teaching and learning, including assessment.

Curriculum

Applied syllabuses set out only what is essential while being flexible so teachers can make curriculum decisions to suit their students, school context, resources and expertise.

Schools have autonomy to decide:

- which four units they will deliver
- how and when the subject matter of the units will be delivered
- how, when and why learning experiences are developed, and the context in which the learning will occur
- how opportunities are provided in the course of study for explicit and integrated teaching and learning of complementary skills such as literacy, numeracy and 21st century skills
- how the subject-specific information found in this section of the syllabus is enlivened through the course of study.

Giving careful consideration to each of these decisions can lead teachers to craft units that are rich, engaging and relevant for their students.

Assessment

Applied syllabuses set out only what is essential while being flexible so teachers can make assessment decisions to suit their students, school context, resources and expertise.

Applied syllabuses contain assessment specifications and conditions for the two assessment instruments that must be implemented with each unit. These specifications and conditions ensure comparability, equity and validity in assessment.

Schools have autonomy to decide:

- specific assessment task details within the parameters mandated in the syllabus
- assessment contexts to suit available resources
- how the assessment task will be integrated with teaching and learning activities
- how authentic the task will be.

Teachers make A–E judgments on student responses for each assessment instrument using the relevant instrument-specific standards. In the final two units studied, the QCAA uses a student's results for these assessments to determine an exit result.

More information about assessment in Applied senior syllabuses is available in Section 7.3.1 of the *QCE and QCIA policy and procedures handbook*.

Subject matter

Each unit contains a unit description, unit objectives and subject matter. Subject matter is the body of information, mental procedures and psychomotor procedures (see Marzano & Kendall 2007, 2008) that are necessary for students' learning and engagement with the subject. Subject matter itself is not the specification of learning experiences but provides the basis for the design of student learning experiences.

Subject matter has a direct relationship with the unit objectives and provides statements of learning that have been constructed in a similar way to objectives.

Subject matter can be organised into topics, themes, modules or a variety of other structures. In the Applied senior syllabuses, subject matter has been organised using schemata related to the body of knowledge, industry or practical domain relevant to the subject.

Aboriginal perspectives and Torres Strait Islander perspectives

The QCAA is committed to reconciliation in Australia. As part of its commitment, the QCAA affirms that:

- Aboriginal peoples and Torres Strait Islander peoples are the first Australians, and have the oldest living cultures in human history
- Aboriginal peoples and Torres Strait Islander peoples have strong cultural traditions and speak diverse languages and dialects, other than Standard Australian English
- teaching and learning in Queensland schools should provide opportunities for students to deepen their knowledge of Australia by engaging with the perspectives of Aboriginal peoples and Torres Strait Islander peoples
- positive outcomes for Aboriginal students and Torres Strait Islander students are supported by successfully embedding Aboriginal perspectives and Torres Strait Islander perspectives across planning, teaching and assessing student achievement.

Guidelines about Aboriginal perspectives and Torres Strait Islander perspectives and resources for teaching are available at www.qcaa.qld.edu.au/k-12-policies/aboriginal-torres-strait-islander-perspectives.

Where appropriate, Aboriginal perspectives and Torres Strait Islander perspectives have been embedded in the subject matter.

Complementary skills

Opportunities for the development of complementary skills have been embedded throughout subject matter. These skills, which overlap and interact with syllabus subject matter, are derived from current education, industry and community expectations and encompass the knowledge, skills, capabilities, behaviours and dispositions that will help students live and work successfully in the 21st century.

These complementary skills are:

- literacy — the knowledge, skills, behaviours and dispositions about language and texts essential for understanding and conveying English language content
- numeracy — the knowledge, skills, behaviours and dispositions that students need to use mathematics in a wide range of situations, to recognise and understand the role of mathematics in the world, and to develop the dispositions and capacities to use mathematical knowledge and skills purposefully
- 21st century skills — the attributes and skills students need to prepare them for higher education, work, and engagement in a complex and rapidly changing world. These skills include critical thinking, creative thinking, communication, collaboration and teamwork, personal and social skills, and digital literacy. The explanations of associated skills are available at www.qcaa.qld.edu.au/senior/senior-subjects/general-subjects/21st-century-skills.

It is expected that aspects of literacy, numeracy and 21st century skills will be developed by engaging in the learning outlined in this syllabus. Teachers may choose to create additional explicit and intentional opportunities for the development of these skills as they design the course of study.

Additional subject-specific information

Additional subject-specific information has been included to support and inform the development of a course of study.

Field work

It is anticipated that approximately five hours of field work will be required for learning and assessment in each unit.

Inquiry and project-management skills

The following list identifies skills that students will typically develop throughout the course of study in Aquatic Practices. This list is:

- not prescriptive — only skills that are relevant to the investigations and projects that students perform should be taught
- not exhaustive — other skills may be relevant.

Describe ideas and phenomena and execute procedures

- Work with others.
- Implement plans, including risk assessments and protocols for working with Aboriginal communities and Torres Strait Islander communities.
- Use specialised equipment to collect primary data and complete processes.
- Avoid or manage bias in data collection.
- Use research tools (e.g. library resources, search engines) to identify sources of secondary information.
- Record information using appropriate units of measurement.
- Present processed information using appropriate representations, e.g. tables, graphs and diagrams.
- Use technology (e.g. word processors, spreadsheets) to collate and process information.
- Process information from primary sources using descriptive statistics such as
  - percentages
  - measures of central tendency, e.g. mean, median and mode
  - measures of dispersion, e.g. range and standard deviation.
- Use appropriate genre conventions, e.g. report format.
- Acknowledge sources, e.g. using in-text referencing, reference lists, bibliographies.

Analyse and interpret information

- Analyse scenarios to identify components and relationships.
- Identify patterns and relationships in information from
  - primary sources, e.g. direct or inverse correlation, percentage difference
  - secondary sources, e.g. similarities, differences.
- Identify the limitations of information from
  - primary sources, e.g. error, uncertainty
  - secondary sources, e.g. relevance, credibility.
- Interpret texts.
- Interpret scenario requirements to select processes, materials and tools.
- Draw conclusions.

Evaluate and plan investigations and projects

- Identify criteria for the evaluation of
  - methodologies, e.g. efficiency, cost, safety
  - sources, e.g. credibility, relevance, age
  - processes, e.g. efficiency, cost, safety.
- Evaluate methodologies, sources, processes and outcomes against identified criteria
- Make recommendations for future investigations and projects.
- Set goals.
- Conduct background research.
- Identify independent variables and dependent variables.
- Select methodologies for experiments.
- Select sources for research.
- Decide on the type and amount of information to be collected.
- Identify appropriate equipment, materials and sources for investigations.
- Manage time and resources to deliver products and performances.
- Manage risk, including
  - identifying hazards
  - selecting appropriate personal protective equipment (PPE)
  - adapting standard operating procedures (SOPs)
  - proposing suitable modifications
  - planning responses to injuries and accidents.
- Apply ethical principles.
- Plan protocols for working with Aboriginal communities and Torres Strait Islander communities.

Unit option A: Aquatic ecosystems

In this unit, students explore the rich biodiversity that exists in aquatic ecosystems, including the biotic and abiotic components that create this diversity. They explain the processes that form, degrade and restore ecosystems and the wide variety of ecological relationships they each contain. Students build skills in identifying species, measuring water quality, conducting risk assessments and identifying threats to ecosystems. They gain an appreciation and awareness of the cultural significance of waterways to Aboriginal peoples, Torres Strait Islander peoples and Australian communities. Students develop their understanding of conservation and management techniques for aquatic ecosystems. They evaluate the effectiveness of current management of aquatic ecosystems and consider ways this could be improved.

Unit objectives

1. Describe ideas and phenomena in aquatic ecosystems.
2. Execute procedures in aquatic ecosystems.
3. Analyse information in aquatic ecosystems.
4. Interpret information in aquatic ecosystems.
5. Evaluate procedures, conclusions and outcomes in aquatic ecosystems.
6. Plan investigations and projects in aquatic ecosystems.

Subject matter

Concepts

- Describe
  - biotic components of aquatic environments, including organisms, communities and populations
  - abiotic components, e.g. temperature, light, pH, dissolved oxygen, salinity
  - diversity of aquatic environments, e.g. lakes, streams, estuaries, coastal
  - aquatic processes that define aquatic environments, e.g. longshore drift, wave action, currents, flow rates, stratification, chemical and physical erosion, reef formation
  - relationships between biotic and abiotic components
  - interdependent relationships between aquatic organisms
  - ecosystems and habitats of aquatic organisms
  - aquatic organisms' behavioural, structural and functional adaptations suited to their habitat
  - factors that affect ecosystem condition, including aquatic pests, e.g. crown-of-thorns starfish, toxic algae, European carp, *Salvinia*
  - the variety of uses of aquatic organisms, e.g. food, fertiliser, compost and mulch, bioremediation
  - definitions of *conservation*, *sustainability* and *environmental remediation*
  - areas of ongoing research, e.g. impact of global warming on coral reefs, migration and mating habits of whales and sharks
  - digital technology and digital systems that can extend, enhance or make possible specific aspects of an aquatic role or task and create new opportunities
  - different values, beliefs, perspectives and behaviours in relation to conservation strategies
  - the significance of waterways to local Aboriginal peoples and Torres Strait Islander peoples and their spiritual and cultural relationships with, connections to and understanding of waterways, e.g. use of fish traps, shell middens
  - Aboriginal communities' and Torres Strait Islander communities' knowledge and practices that support ecosystem condition, e.g. ceremonial purposes, sustainable living
  - pathways, relevant qualifications and career opportunities in aquatic ecosystems.

Information

- Analyse and interpret
  - information from practicals, projects and investigations
  - ecological survey data (e.g. macro-invertebrate survey results) and visitation survey data (e.g. Great Barrier Reef tourism statistics)
  - the significance of biotic and abiotic data in terms of the ecology of a waterway, the health of the waterway and human impacts on the chosen waterway
  - sustainability of current usage

- data gathered relating to the ecology of a chosen aquatic environment or ecosystem assessment
- impacts of algal bloom and nutrient loading on ecosystem condition
- information relating to the public benefits of citizen science programs, e.g. heightened public awareness of environmental issues, tourism.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - identification and classification of common local aquatic organisms
  - identification of aquatic threats, injuries and emergencies, e.g. hypothermia, hyperthermia, marine stings, drowning
  - gathering of primary and/or secondary information relating to the ecology of the chosen environment, e.g.
    - measuring of water quality parameters, e.g. pH, dissolved oxygen, nitrates
    - survey techniques, e.g. transect sampling, quadrats, random sampling
    - library and/or online research
  - participation in a citizen science project.
- Evaluate
  - survey techniques for aquatic environments
  - the importance of aquatic environments to society, culture, industry and the wider environment
  - how aquatic industries affect their environment, e.g. overfishing, aquatic runoff, human erosion activities
  - management strategies used to conserve and sustain aquatic ecosystems, e.g. marine parks, native titles, fishing rules and regulations
  - investigations and projects to make recommendations.
- Plan
  - management of risks and hazards
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into aquatic ecosystems, e.g. How healthy is a local aquatic ecosystem?
  - projects in aquatic ecosystems, e.g. contribute to a citizen science project.

Unit option B: Coastlines and navigation

In this unit, students observe the properties of waves and explain types of currents and their importance to the distribution of resources in the ocean. They model geological features of Earth, the coastal processes of erosion, and the function of coastal engineering structures. Students explore traditional and modern methods of navigation and communication. They explain components and functions of marine technology and develop practical skills in operating equipment to determine location, plot courses and navigate.

Students plan projects and investigations to develop an understanding of the effect of waves on shorelines and evaluate the effect of coastal engineering on coastlines. They interpret legislation, weather and tide information to safely plan a voyage.

Unit objectives

1. Describe ideas and phenomena in coastlines and navigation.
2. Execute procedures in coastlines and navigation.
3. Analyse information in coastlines and navigation.
4. Interpret information in coastlines and navigation.
5. Evaluate procedures, conclusions and outcomes in coastlines and navigation.
6. Plan investigations and projects in coastlines and navigation.

Subject matter

Concepts

- Describe
  - types of ocean currents and how they are driven by temperature, wind and gravity
  - wave formation, types of waves and properties of waves
  - the effect of waves and currents (e.g. longshore drift) on coastlines
  - types of coastal engineering structures, e.g. rock walls, groynes, breakwaters
  - river processes, e.g. erosion, transportation, deposition
  - the importance of ocean currents for life in the ocean, e.g. distribution of water, heat and nutrients
  - equipment requirements for boats, e.g. communication and navigation equipment
  - development of aquatic technologies over time, e.g. navigation
  - digital technology and digital systems that can extend, enhance or make possible specific aspects of an aquatic role or task and create new opportunities
  - legislation, rules and regulations relevant to navigation
  - information and advice from relevant government departments and authorities, e.g. boating licences
  - changes to industry guidelines and standards over time, e.g. licence requirements
  - characteristics of charts
  - bearing, position, chart datum, waypoints and variation
  - risks, e.g. collisions and hazards such as submerged reefs or sandbanks
  - the significance of waterways to local Aboriginal peoples and Torres Strait Islander peoples and their spiritual and cultural relationships with, connections to and understanding of waterways and navigation
  - pathways, relevant qualifications and career opportunities in coastlines and navigation.

Information

- Analyse and interpret
  - information from practicals, projects and investigations
  - charts
  - weather and tide data
  - navigational aids data, e.g. radio frequency, AIS, FLIR, radars to assist in planning voyages
  - the effect of water depth and structures on the properties of waves
  - thermoclines and haloclines
  - the effect of sediment from rivers
  - types of sand.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - modelling of geological features of Earth, e.g. ocean floor, tectonic plate movements and the formation of landforms
  - modelling of coastal processes of physical and chemical erosion
  - identification of sand dune plants
  - skills required to operate watercraft, e.g. collision regulations, buoys and buoyage
  - use of navigation technologies and instruments, e.g. GPS, radar, AIS, sextant
  - steering of a compass course
  - procedures for operating a marine radio
  - radio protocols.
- Evaluate
  - the effect of coastal engineering (e.g. rock walls, groynes, breakwaters) on sediment flow
  - investigations and projects to make recommendations.
- Plan
  - management of risks and hazards
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into coastlines and navigation, e.g. How does a chosen factor (e.g. distance, weather, topography) affect radio range?
  - projects in coastlines and navigation, e.g. navigate a course through a local waterway.

Unit option C: Recreational and commercial fishing

In this unit, students explore recreational and commercial fishing. They explain the significance of fishing, different fishing techniques, causes of fishery declines and sustainable management strategies. Students analyse and interpret the status of fisheries species and the importance of artificial reefs to fishery populations. They identify common aquatic organisms, model capture–recapture scenarios, use safe seafood handling techniques, and evaluate the use of digital technology in fisheries.

Students plan projects and investigations to develop an understanding of the types and use of fishing gear, factors that affect fishery populations, the impact of fisheries on the ocean environment, and preparation of seafood dishes.

Unit objectives

1. Describe ideas and phenomena in recreational and commercial fishing.
2. Execute procedures in recreational and commercial fishing.
3. Analyse information in recreational and commercial fishing.
4. Interpret information in recreational and commercial fishing.
5. Evaluate procedures, conclusions and outcomes in recreational and commercial fishing.
6. Plan investigations and projects in recreational and commercial fishing.

Subject matter

Concepts

- Describe
  - different types of fishing and fishing gear
  - development of fishing techniques used in recreational and commercial fishing
  - food chains and food webs
  - the life cycle of a recreational or commercial fish species
  - the interdependent relationships between organisms in an ecosystem, e.g. reef or mangrove area
  - factors that affect the distribution of fish populations, e.g. nutrient dispersal, currents, temperature, rugosity
  - the significance of recreational and commercial fishing, e.g.
    - cultural factors, e.g. Aboriginal peoples' and Torres Strait Islander peoples' spiritual and cultural relationships with waterways
    - economic factors, e.g. food, fertiliser, tourism, licences, cost of fishing tackle
    - social factors, e.g. recreational fishing clubs, wellbeing, intergenerational transfer
  - the effect of recreational and commercial fishing on the ocean environment
  - the criteria used to design marine protected areas
  - the use of aquatic resources as food sources
  - Aboriginal peoples' and Torres Strait Islander peoples' methods for gathering, preparing and cooking food from the sea
  - causes of fishery declines, e.g. overfishing, illegal fishing, destructive fishing practices, pollution (ballast water, oil pollution), habitat destruction
  - management strategies used to conserve and support sustainable fisheries, e.g. zoning, licences, permits, size limits, catch limits, longitudinal monitoring, marine parks, native title
  - pathways, relevant qualifications and career opportunities in recreational and commercial fishing.

Information

- Analyse and interpret
  - information from practicals, projects and investigations
  - weather and tide data
  - different fishing equipment and how it works, e.g. casting
  - the importance of artificial reefs
  - fisheries legislation, e.g. size limits, catch restrictions, closed seasons, zoning restrictions
  - information on the bioaccumulation of toxins in seafood.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - identification of common local aquatic organisms
  - selection and use of fishing gear
  - a model capture–recapture scenario
  - dissection of seafood species
  - safe seafood preparation and handling techniques
  - choosing fresh seafood
  - preserving caught seafood.
- Evaluate
  - how digital technology can be employed in fisheries, e.g. fish finders, electric monitoring
  - the incorporation of traditional ecological knowledge (TEK) into fishery management practices
  - investigations and projects to make recommendations.
- Plan
  - management of risks and hazards
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into recreational and commercial fishing, e.g. Which tackle is most appropriate for a chosen species or location?
  - projects in recreational and commercial fishing, e.g. prepare a seafood meal for guests.

Unit option D: Aquariums and aquaculture

In this unit, students investigate the historical and cultural significance of aquaculture in its many forms. Students develop their understanding of the biotic and abiotic components that need to be monitored and maintained in an aquarium, aquaculture, aquaponics or mariculture system. They develop practical skills in testing and analysing the results of water quality parameters. Students learn about how the aquaculture industry is managed and regulated in Australia, including the regulation of aquaculture activities by the government. They analyse the processes of producing, processing and marketing aquaculture products. Students explore career and business opportunities relating to aquaculture and develop skills to prepare them to participate in this industry.

Students plan and conduct projects and investigations into the structure, operation or products of an aquaculture system.

Unit objectives

1. Describe ideas and phenomena in aquariums and aquaculture.
2. Execute procedures in aquariums and aquaculture.
3. Analyse information in aquariums and aquaculture.
4. Interpret information in aquariums and aquaculture.
5. Evaluate procedures and conclusions in aquariums and aquaculture.
6. Plan investigations and projects in aquariums and aquaculture.

Subject matter

Concepts

- Describe
  - Aboriginal peoples' and Torres Strait Islander peoples' relationships with aquaculture
  - how aquarium and aquaculture organisms are used in a variety of cultures
  - requirements to support healthy organisms in aquarium and aquaculture systems, including abiotic factors (e.g. food, temperature, light, pH, dissolved oxygen, filtration, salinity) and biotic factors (e.g. population, interspecies and intraspecies interactions)
  - types of aquariums, e.g. cold water, planted, tropical, marine, public
  - types of aquaculture systems, e.g. hatcheries, ponds, sea cages
  - the use of aquaculture produce as food sources
  - the importance of quarantining
  - the functions of relevant authorities, e.g. establishing recreational fishing rules and regulations for Queensland
  - pathways, relevant qualifications and career opportunities in aquariums and aquaculture.

Information

- Analyse and interpret
  - information from practicals, projects and investigations
  - changes in organisms, e.g. growth rates, appearance, signs of illness, changes in population
  - causes of ill health and disease, e.g. biofouling, parasites, water quality
  - legislation, rules and regulations relevant to aquatic activities, e.g. relating to animal ethics
  - nutritional data for aquaculture species
  - trends in consumption of aquaculture products, e.g. aquaculture vs. wild-caught production, algae vs. shellfish, Australia vs. global
  - labels and marketing information for aquaculture and wild-caught seafood
  - market values for various types of seafood.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - maintaining water quality parameters, e.g. pH, dissolved oxygen, nitrates
  - regular testing and adjustment of water quality, e.g. temperature
  - meeting dietary needs of different stock
  - observations to check on species' health, e.g. measure growth, observe behaviour
  - aspects of production of an aquaculture or aquaponics product
  - preparation and handling techniques
  - growth measurements, e.g. fork length, biomass, weight.
- Evaluate
  - the layout of an aquaculture or aquarium system
  - the effectiveness of strategies to prevent and treat disease, e.g. cleaning tanks, altering pH, administering supplements
  - logistics of transporting live produce to market
  - consumer perception of aquaculture vs. wild-caught seafood
  - different methods, e.g. cage/pond farming, open/closed systems
  - the impact of aquaculture on the environment
  - the opportunities for digital technology to enhance aquaculture and aquarium systems
  - investigations and projects to make recommendations
- Plan
  - management of risks and hazards
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into aquariums or aquaculture, e.g. How suitable is a chosen organism for aquariums or aquaculture?
  - projects in aquariums and aquaculture, e.g. demonstrate maintenance procedures for an aquarium.

Unit option E: Using the aquatic environment

In this unit, students explore the variety of ways that humans interact with the aquatic environment. Schools choose from aquatic activities that complement their community, such as boating, snorkelling, surfing and kayaking. Students learn about specialised aquatic equipment and how to safely use and maintain that equipment. Students investigate pathways that can lead to employment in the aquatic environment. They analyse the many factors that affect recreational and commercial activities. Students analyse the conditions that contribute to safety and enjoyment for recreational users and business operators.

Unit objectives

1. Describe ideas and phenomena in using the aquatic environment.
2. Execute procedures in using the aquatic environment.
3. Analyse information in using the aquatic environment.
4. Interpret information in using the aquatic environment.
5. Evaluate procedures and conclusions in using the aquatic environment.
6. Plan investigations and projects in using the aquatic environment.

Subject matter

Concepts

- Describe
  - specialised equipment and materials for a range of aquatic activities, e.g. boating, fishing, snorkelling, sailboarding, kitesurfing, foil boarding, canoeing, surfing
  - digital technology that can facilitate aspects of an aquatic role or task
  - factors that affect the safety of aquatic activities, e.g. weather, water visibility, swell, tides
  - the difference between risks and hazards
  - duty of care for customers and employees
  - implications of differing values, beliefs, perspectives and behaviours towards aquatic environments
  - functions of relevant authorities
  - changes to industry guidelines and standards over time, e.g. licence requirements
  - the significance of waterways to local Aboriginal peoples and Torres Strait Islander peoples and their spiritual and cultural relationships with, connections to and understanding of waterways
  - pathways, relevant qualifications and career opportunities in using the aquatic environment.

Information

- Analyse
  - information from practicals, projects and investigations
  - factors that determine availability of activities, e.g. weather, water visibility, swell, tides
  - skills required to use equipment, e.g. following collision regulations, paddling, snorkelling.
- Interpret
  - legislation, rules and regulations relevant to aquatic activities and how they can improve tourism and employment, e.g. use of PFDs, give way rules, native title, marine parks, licences and permits
  - operation manuals for service instructions and information, e.g. following maintenance schedules, everyday servicing and maintenance of equipment
  - roles, rights, procedures and expectations of established industries.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - safe use of equipment, e.g. following collision regulations; paddling and snorkelling; obtaining necessary certificates, registrations and licences
  - procedures to protect equipment against the natural environment
  - procedures to deal with injuries and emergencies
  - safety measures in aquatic contexts.
- Evaluate
  - outcomes of decisions
  - areas of importance to aquatic activities
  - economic, social and cultural impacts of maritime industries and activities, e.g. whale watching, snorkelling, jetboating
  - the effectiveness of risk management
  - investigations and projects to make recommendations.
- Plan
  - management of risks and hazards, including preventative actions to prevent injuries and emergencies, e.g. hypothermia, hyperthermia, marine stings, drowning
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into using the aquatic environment, e.g. Can surfers and jetski operators safely use the same location?
  - projects in using the aquatic environment, e.g. present a safety brief for an aquatic activity.

Unit option F: Marine vessels

In this unit, students explore oceanography, vessel design and marine engineering. Students explain the different hull shapes and the principles of mechanical and non-mechanical boat propulsion systems. Students analyse and interpret the effects of hull shape on performance and the impact of salt water on marine equipment. They fabricate a model boat and use marine engines.

Students plan projects and investigations into the impacts of shipping on waterways and analyse the impacts of shipping and shipwrecks on marine environments

Unit objectives

1. Describe ideas and phenomena in marine vessels.
2. Execute procedures in marine vessels.
3. Analyse information in marine vessels.
4. Interpret information in marine vessels.
5. Evaluate procedures and conclusions in marine vessels.
6. Plan investigations and projects in marine vessels.

Subject matter

Concepts

- Describe
  - different vessel types for different situations
  - range of aquatic vessels, e.g. fishing boats, sailboards, canoes, surfboards
  - major hull types, e.g. displacement, planing
  - different hull shapes that are used for different purposes, e.g. punt for sheltered estuary water, deep-v hulls for open water
  - how materials for vessel construction depend on purpose, e.g. rubber, alloy, wood, fibreglass, steel
  - development of boat-building technologies
  - types of watercraft from different cultures
  - relevant industry pathways, e.g. boat-building, naval architecture, marine engineer
  - types and uses of propulsion systems and marine engine installations, e.g. inboard, outboard, sterndrive, jet
  - principles of mechanical and non-mechanical boat propulsion, e.g. powered, non-powered craft
  - operation of different forms of internal combustion engine, e.g. two-stroke (two-cycle), four-stroke (four-cycle), diesel, turbine, steam
  - operating principles of engine support systems, e.g. fuel, ignition, cooling, lubrication and charging systems
  - components of the aquatic environment that affect equipment, e.g. salt, water, air, sunlight, living things
  - important waterways to aquatic industries and activities
  - pathways, relevant qualifications and career opportunities in marine vessels.

Information

- Analyse and interpret
  - information from practicals, projects and investigations
  - information on factors affecting aspects of boat performance, e.g. hull shape (affecting buoyancy); weather (affecting boat stability); salt, water and air (affecting corrosion of marine equipment); sacrificial anodes (affecting corrosion of marine equipment)
  - sources of aquatic pollution and associated threats, e.g. ballast water, oil pollution, fouling organisms, quarantine breaches
  - data from model boat testing
  - effect of modern shipping on local ecosystems
  - effect of abiotic factors on the preservation of shipwrecks.

Procedures and skills

- Execute
  - risk management plans
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - testing of the physical law of buoyancy
  - application of tools to fabricate a model boat
  - use of marine engines
  - use of operation manuals for service instructions and information, e.g. following maintenance schedules, everyday servicing, maintenance of equipment
  - mapping of trade routes, immigration routes, cargo and shipwrecks from the past
  - identification of vessel types.
- Evaluate
  - selection of propulsion systems
  - the use of different hulls or boats for different purposes
  - impact of shipwrecks, e.g. on tourism, marine organisms, communities, ecosystems and habitats
  - functions of relevant authorities, regulations and legislation for shipwrecks
  - investigations and projects to make recommendations.
- Plan
  - management of risks and hazards
  - protocols for working with Aboriginal communities and Torres Strait Islander communities
  - investigations into marine vessels, e.g. How does a chosen factor (e.g. hull shape, material) affect boat construction?
  - projects in marine vessels, e.g. demonstrate aspects of a recovery plan for an oil spill.

Assessment

Assessment A1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in aquatic ecosystems.
2. Execute procedures in aquatic ecosystems.
3. Analyse information in aquatic ecosystems.
4. Interpret information in aquatic ecosystems.
5. Evaluate procedures and conclusions in aquatic ecosystems.
6. Plan investigations in aquatic ecosystems.

Specifications

This task requires students to:

- investigate a question that
  - is related to aquatic ecosystems
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment A2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in aquatic ecosystems.
2. Execute procedures in aquatic ecosystems.
3. Analyse information in aquatic ecosystems.
4. Interpret information in aquatic ecosystems.
5. Evaluate procedures and outcomes in aquatic ecosystems.
6. Plan projects in aquatic ecosystems.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about aquatic ecosystems
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Assessment B1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in navigation and coastlines.
2. Execute procedures in navigation and coastlines.
3. Analyse information in navigation and coastlines.
4. Interpret information in navigation and coastlines.
5. Evaluate procedures and conclusions in navigation and coastlines.
6. Plan investigations in navigation and coastlines.

Specifications

This task requires students to:

- investigate a question that
  - is related to navigation and coastlines
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment B2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in navigation and coastlines.
2. Execute procedures in navigation and coastlines.
3. Analyse information in navigation and coastlines.
4. Interpret information in navigation and coastlines.
5. Evaluate procedures and outcomes in navigation and coastlines.
6. Plan projects in navigation and coastlines.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about navigation and coastlines
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Assessment C1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in recreational and commercial fishing.
2. Execute procedures in recreational and commercial fishing.
3. Analyse information in recreational and commercial fishing.
4. Interpret information in recreational and commercial fishing.
5. Evaluate procedures and conclusions in recreational and commercial fishing.
6. Plan investigations in recreational and commercial fishing.

Specifications

This task requires students to:

- investigate a question that
  - is related to recreational and commercial fishing — food from the ocean
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment C2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in recreational and commercial fishing.
2. Execute procedures in recreational and commercial fishing.
3. Analyse information in recreational and commercial fishing.
4. Interpret information in recreational and commercial fishing.
5. Evaluate procedures and outcomes in recreational and commercial fishing.
6. Plan projects in recreational and commercial fishing.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about recreational and commercial fishing
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Assessment D1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in aquariums and aquaculture.
2. Execute procedures in aquariums and aquaculture.
3. Analyse information in aquariums and aquaculture.
4. Interpret information in aquariums and aquaculture.
5. Evaluate procedures and conclusions in aquariums and aquaculture.
6. Plan investigations in aquariums and aquaculture.

Specifications

This task requires students to:

- investigate a question that
  - is related to aquariums and aquaculture
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment D2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in aquariums and aquaculture.
2. Execute procedures in aquariums and aquaculture.
3. Analyse information in aquariums and aquaculture.
4. Interpret information in aquariums and aquaculture.
5. Evaluate procedures and outcomes in aquariums and aquaculture.
6. Plan projects in aquariums and aquaculture.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about aquariums and aquaculture
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Assessment E1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in using the aquatic environment.
2. Execute procedures in using the aquatic environment.
3. Analyse information in using the aquatic environment.
4. Interpret information in using the aquatic environment.
5. Evaluate procedures and conclusions in using the aquatic environment.
6. Plan investigations in using the aquatic environment.

Specifications

This task requires students to:

- investigate a question that
  - is related to using the aquatic environment
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment E2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in using the aquatic environment.
2. Execute procedures in using the aquatic environment.
3. Analyse information in using the aquatic environment.
4. Interpret information in using the aquatic environment.
5. Evaluate procedures and outcomes in using the aquatic environment.
6. Plan projects in using the aquatic environment.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about using the aquatic environment
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Assessment F1: Applied investigation

Students investigate a research question by collecting, analysing and interpreting primary or secondary information.

Assessment objectives

1. Describe ideas and phenomena in marine vessels.
2. Execute procedures in marine vessels.
3. Analyse information in marine vessels.
4. Interpret information in marine vessels.
5. Evaluate procedures and conclusions in marine vessels.
6. Plan investigations in marine vessels.

Specifications

This task requires students to:

- investigate a question that
  - is related to marine vessels
  - has scope to be refined further
- document the investigation process and conclusion, including
  - selecting a methodology or sources
  - collecting information
  - analysing information
  - drawing a conclusion based on the analysis of information
  - making recommendations for future investigations.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides research questions that students select and investigate.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- If students are using primary information, the following aspects of the task may be completed as a group
  - selecting methodology
  - collecting primary information.

Response requirements

One of the following:

- Multimodal (at least two modes delivered at the same time): up to 7 minutes, 10 A4 pages, or equivalent digital media
- Written: up to 1000 words

Instrument-specific standards

Execution	Interpretation	Evaluation	Grade
The student work has the following characteristics:			
• selection of sufficient and relevant methodology/sources • efficient, effective and safe execution of experimental/research methodology • efficient collection and effective collation of information	• thorough and appropriate identification of patterns and relationships in information • thorough and appropriate identification of errors/limitations of information • conclusion supported with relevant evidence	• recommendations for effective future investigations supported with relevant evidence • fluent and concise use of aquatic language • effective use of representations and genre conventions	**A**
• selection of relevant methodology/sources • effective and safe execution of experimental/research methodology • collection and collation of information	• appropriate identification of patterns or relationships in information • appropriate identification of errors/limitations of information • conclusion related to evidence	• recommendations for appropriate future investigations related to evidence • competent use of aquatic language • appropriate use of representations and genre conventions	**B**
• selection of methodology/sources • safe execution of experimental or research methodology • collection of information	• identification of patterns or relationships in information • identification of errors/limitations of information • conclusion to the research question	• recommendations for future investigations • use of aquatic language • use of representations and genre conventions	**C**
• guided selection of methodology/sources • guided execution of given experimental or research methodology	• statements about patterns or relationships in information • statements about errors or limitations • statement about the research question	• statement about investigations • use of language • disjointed use of basic representations and conventions	**D**
• directed execution of given experimental or research methodology.	• statement related to the research question.	• partial description of investigation.	**E**

Assessment F2: Practical project

Students use practical skills to complete a project in response to a scenario.

Assessment objectives

1. Describe ideas and phenomena in marine vessels.
2. Execute procedures in marine vessels.
3. Analyse information in marine vessels.
4. Interpret information in marine vessels.
5. Evaluate procedures and outcomes in marine vessels.
6. Plan projects in marine vessels.

Specifications

This task requires students to:

- complete a project
  - that is related to a scenario about marine vessels
  - with an outcome of either a physical product or the performance of a skill
- document the process used to complete the project, including
  - analysing and interpreting the given scenario
  - describing the relevant concepts and procedures
  - selecting a procedure to follow
  - executing skills and processes to deliver an outcome
  - evaluating the outcome
  - making recommendations for future projects.

It is recommended that this task is designed so that students can develop a response in approximately 10–15 hours of class time.

Stimulus specifications

The teacher provides a scenario that students respond to.

Conditions

- Students can develop their responses in class time and their own time.
- This is an individual task.
- The following aspects of the task may be completed as a group
  - analysing and interpreting the scenario
  - selecting a procedure to follow.
  - executing the procedure.

Response requirements

Completed project

One of the following:

- Product: 1
- Performance: up to 4 minutes

Documented process

Multimodal (at least two modes delivered at the same time): up to 5 minutes, 8 A4 pages, or equivalent digital media

Instrument-specific standards

Planning	Execution	Evaluation	Grade
The student work has the following characteristics:			
• identification of components and relationships in scenarios • selection of effective and appropriate processes, materials and tools • justified decisions	• confident and precise execution of skills • integration of skills into effective processes • management of risks and ethical issues	• fluent and concise description of ideas, skills and processes • discerning evaluation of outcome against appropriate criteria • recommendations for future effective projects	**A**
• identification of relevant information in scenarios • selection of relevant processes, materials and tools • considered decisions	• competent execution of skills • co-ordination of skills in relevant processes • assessment of risks and ethical issues	• competent description of ideas, skills and processes • reasonable evaluation of outcome against identified criteria • recommendations for appropriate future projects	**B**
• identification of task components • selection of processes, materials and tools • appropriate decisions	• execution of skills • execution of processes • execution of safe and ethical processes	• description of ideas, skills and processes • evaluation of outcome • recommendations for future projects	**C**
• identification of basic information in scenarios • guided selection of processes, materials and tools • inappropriate decisions	• guided execution of skills • guided execution of processes • guided execution of safe and ethical processes	• basic description of ideas, skills or processes • statements about outcome • ideas about future projects	**D**
• directed implementation of given processes.	• directed execution of individual skills.	• incomplete description of ideas, skills or processes.	**E**

Reporting standards

Reporting requirements in senior syllabuses are provided in Section 11.1 of the *QCE and QCIA policy and procedures handbook v3.0*.

Reporting standards are summary statements that describe typical performance at each of the five levels (A–E).

A
The student selects sufficient and relevant sources, processes, materials and tools to plan for aquatic tasks. They use fluent and concise aquatic language to describe ideas, skills and processes. The student demonstrates confident and precise skills and processes to efficiently, effectively and safely execute experimental/research methodology. They efficiently collect and effective collate information and provide recommendations about future investigations and projects, supported with relevant evidence.
B
The student selects relevant sources, processes, materials and tools to plan for aquatic tasks. They competently use aquatic language to describe ideas, skills and processes. The student demonstrates competent skills and processes to effectively and safely execute experimental/research methodology. They collect and collate information and provide recommendations about future investigations and projects, related to evidence.
C
The student selects sources, processes, materials and tools to plan for aquatic tasks. They use aquatic language to describe ideas, skills and processes. The student demonstrates skills and processes to safely execute experimental/research methodology. They collect information and provide recommendations about future investigations and projects.
D
The student is guided by the teacher when selecting sources, processes, materials and tools to plan for aquatic tasks. They use disjointed language to provide a basic description of ideas, skills and processes. The student is guided by the teacher when executing skills and processes experimental/research methodology. They provide statements about investigations and projects.
E
The student is directed by the teacher when executing given processes. They provide an incomplete description of ideas, skills or processes and a partial description of investigations and projects.

Determining an exit result

When each student exits the course of study, the QCAA determines an A–E exit result for them.

Schools enter an overall instrument A–E result for each of the four summative internal assessments into the Student Management app. The QCAA uses these assessment results to determine the exit result.

Table 1 shows how exit results are determined.

Table 1: Determining an exit result

Exit result	Minimum combination standards
A	Standard A in any two instruments and no less than a B in the remaining instruments
B	Standard B in any two instruments and no less than a C in the remaining instruments
C	Standard C in any two instruments and no less than a D in the remaining instruments
D	At least Standard D in any two instruments and an E in the remaining instruments
E	Standard E in three instruments

More information about determining an exit result is available in Section 11 of the *QCE and QCIA policy and procedures handbook v3.0*.

Glossary

The syllabus glossary is available at www.qcaa.qld.edu.au/downloads/senior-qce/common/snr_glossary_cognitive_verbs.pdf.

Version history

Version	Date of change	Information
1.0	January 2023	Released for familiarisation and planning