Lessons in the Gardens – Brisbane Botanic Gardens Mt Coot-tha

Dedicated to a better Brisbane

Overview

The Brisbane Botanic Gardens Mt Coot-tha offers a wide range of hands-on outdoor learning opportunities for early childhood, primary and senior school groups. Our lessons are aligned with both the Queensland Kindergarten Learning Guidelines and Australian Curriculum, and have been designed to suit specific early childhood, prep, primary and secondary levels. Help your students see science theory in action, explore geographical concepts, immerse themselves in botanical art and develop sustainable approaches to living with our trained and knowledgeable education staff.

We are currently in the process of re-writing the lessons to suit the v9.0 Australian Curriculum and are adding these as they are completed. Teachers are encouraged to contact the Education and Interpretation Coordinator on BotGardensEd@brisbane.qld.gov.au for more information.

Please note: you can use ‘Ctrl f’ (for PCs) or ‘Command f’ (for Macs) to search this document for specific words.

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Biological sciences and Biology (Year 7 and Years 10 – 12)

Where else would you explore the diversity of plant life, but at the botanic gardens? Your students will create and use dichotomous keys to classify the plants and animals living in the botanic gardens, travel back through the millennia to investigate botanical evolution through examining plant morphology using living specimens or investigate how plant DNA can be used to classify plants based on their evolutionary history (cladistics).

Lesson Details	Overview
Year 7 **Classifying plants and animals** **Delivery location:** Brisbane Botanic Gardens Mt Coot-tha **Duration:** 2 hours	Students investigate botanic gardens' habitats and participate in activities designed to develop an understanding of scientific classification (plant and animal) and how the use of dichotomous keys assist with this classification process. **Curriculum links:** ACARA v8.4 Biological sciences • Classification helps organise the diverse group of organisms (ACSSU111) ACARA v9.0 lesson currently in development.
Year 7 **Aquatic ecosystem health** **Delivery location:** Brisbane Botanic Gardens Mt Coot-tha **Duration:** 2 hours	The waterways of the botanic gardens are a critical resource in watering and maintaining its plant collections, enhancing the botanic gardens' aesthetic features, and providing important habitat for local wildlife. Students investigate the aquatic macroinvertebrate life and riparian zones of the botanic gardens' lakes and lagoons, to determine their environmental health. This lesson provides a fieldwork experience for students to collect and record data for one-off and longitudinal analyses that address the science inquiry content of the biological sciences unit.

Lesson Details	Overview

	Curriculum links:
	ACARA v9.0
	
	Biological sciences
	• Students learn to investigate the role of classification in ordering and organising the diversity of life on Earth and use and develop classification tools including dichotomous keys (AC9S7U01)
	• Students learn to use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations (AC9S7U02)
	
	HASS: Geography
	• Students learn about classification of environmental resources and the way that water connects and changes places as it moves through environments (AC9HG7K01)
	• Students learn about the location and distribution of water resources in Australia, their implications, and strategies to manage the sustainability of water (AC9HG7K02)
	• Students learn about how to collect, organise, and represent data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate (AC9HG7S02)
	
	Cross-curriculum priorities
	Years Prep-10:
	• Sustainability
	  ○ All life forms, including human life, are connected through Earth's systems (geosphere, biosphere, hydrosphere, and atmosphere) on which they depend for their wellbeing and survival (SS1)
	  ○ Sustainable patterns of living require the responsible use of resources, maintenance of clean air, water and soils, and preservation or restoration of healthy environments (SS2)

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Lesson Details	Overview
Year 7 <u>and</u> Years 10 – 12 **From algae to angiosperms** **Delivery location:** Brisbane Botanic Gardens Mt Coot-tha **Duration:** 2 hours	Investigate the principles of classification as students walk through the botanic gardens' living plant collections. Students use scientific sketching to explore and record the causal relationship between abiotic factors and plant evolution from algae through to angiosperms. ***Optional subcomponent:*** Discover how phylogenetic analysis (cladistics) of morphological and anatomical data allows students to understand how traditional views of plant classification have changed. **Curriculum links:** ACARA v9.0 Biological sciences, Year 7 • **Students learn to investigate the role of classification in ordering and organising the diversity of life on Earth** and use and develop classification tools including dichotomous keys (AC9S7U01) Biological sciences, Year 10 • Use the theory of evolution by natural selection to explain past and present diversity and analyse the scientific evidence supporting the theory (AC9S10U02) Biology, QCAA 2025 v1.3 (Unit 3, Topic 1: Biodiversity and populations) • Appreciate that: ○ methods of classification are directly related to the purpose for which the data will be used. Hierarchical systems, such as the Linnaean system, can be used to organise, analyse and communicate data about biodiversity. For example, the hierarchical nature of the Linnaean system allows scientists to infer similarities between species; however, as the system was originally based primarily on physical features, the categorisation of species does not always reflect evolutionary relatedness. Species may be re-classified as new information becomes available.

Lesson Details	Overview
	Biology, QCAA 2025 v1.3 (Unit 4, Topic 2: Continuity of life on Earth) • **Determine episodes of evolutionary radiation** and mass extinctions **from an evolutionary timescale of life on Earth (approximately 3.5 billion years).** • Appreciate that ○ scientific theories are explanations of the natural world that have been repeatedly tested and corroborated in accordance with the scientific method. Models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power. Contemporary evidence for evolution comes from palaeontology, biogeography, developmental biology, morphology and genetics.
Years 11 – 12 **Investigating cladistics - real world applications** **Delivery location:** Brisbane Botanic Gardens Mt Coot-tha **Duration:** 2 hours	Building on 'From algae to angiosperms' students firstly examine the (floral) morphology (historical basis of classification) and then the DNA sequences (modern basis of classification) of a selection of plant species to construct cladograms representing the evolutionary relationships between them. This hands-on lesson provides students with an understanding of the recent changes to species classification methods; and considers how scientific methodologies are refined and updated as new scientific technology and information is made available. **Curriculum links:** Biology, QCAA 2025 v1.3 (Unit 3, Topic 1: Biodiversity and populations) • Appreciate that: ○ methods of classification are directly related to the purpose for which the data will be used. Hierarchical systems, such as the Linnaean system, can be used to organise, analyse and communicate data about biodiversity. For example, the hierarchical nature of the Linnaean system allows scientists to infer similarities between species; however, as the system was originally based primarily on physical features, the categorisation of species does not always reflect evolutionary relatedness. Species may be re-classified as new information becomes available.

Lesson Details	Overview

	Biology, QCAA 2025 v1.3 (Unit 4, Topic 2: Continuity of life on Earth)
	• Infer species relatedness from cladograms, phylograms and molecular sequence data.
	• Appreciate that
	  ○ ICTs such as genetic databases and The Basic Local Alignment Search Tool (BLAST) have allowed large-scale mapping and analysis of DNA and protein sequences. Technological developments in the fields of comparative genomics, comparative biochemistry and bioinformatics have enabled identification of further evidence for evolutionary relationships
	  ○ scientific theories are explanations of the natural world that have been repeatedly tested and corroborated in accordance with the scientific method. Models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power. Contemporary evidence for evolution comes from palaeontology, biogeography, developmental biology, morphology and genetics.

Years 11 – 12 **Investigating abiotic factors and soil/leaf litter invertebrate biodiversity** **Delivery location:** Brisbane Botanic Gardens Mt Coot-tha **Duration:** 2 hours	Soil is one of the most complex ecosystems in nature; yet remains poorly researched and understood. The diverse range of organisms residing in our soils are crucial in supporting terrestrial ecosystem functions, and an understanding of the impact abiotic factors have on soil biodiversity is required, if we are to maintain biodiversity under Australia's predicted hotter and drier climate. During this hands-on, fieldwork-based excursion, students will explore the causal relationship between abiotic factors and soil/leaf litter invertebrate biodiversity across two different garden areas (representing two different 'forest' types). This lesson can be used as part of the Senior Biology fieldwork component, or as a data collection point: • to determine the diversity of species using Simpson's diversity index, • for an extended experimental investigation, • to interpret data from an experiment investigating how abiotic factors affect the distribution, abundance and/or biodiversity of species in an ecosystem.

Lesson Details	Overview

	Curriculum links:
	
	Biology, QCAA 2025 v1.3 (Unit 3, Topic 1: Biodiversity and populations)
	• Describe genetic, species and ecosystem diversity.
	• Describe how sampling can be used to investigate the species diversity of a given area, considering the most appropriate:
	  ○ sampling method: random, systematic, stratified
	  ○ sampling technique: quadrats, line transect, belt-transect, capture-recapture
	  ○ strategies to minimise bias: size and number of samples, random-number generators, counting criteria, calibrating equipment and noting associated precision
	  ○ measure/s of diversity.
	• Describe how the distribution and abundance of species in an ecosystem are influenced by
	  ○ biotic factors — food availability, competition for resources, predation, disease
	  ○ abiotic factors — space, shelter, availability of water, nutrients, environmental conditions.
	• Explain that ecosystems are composed of varied habitats, including microhabitats, which may impact the distribution of species (e.g. uniform, random or clumped), and therefore the validity and reliability of different sampling methods/techniques.