Aboriginal and Torres Strait Islander histories and cultures resources: Science

Supporting the implementation of the Australian Curriculum cross-curriculum priorities

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Queensland Government
Queensland Studies Authority

What are the Australian Curriculum cross-curriculum priorities?

The Australian Curriculum[1] has been written to equip young Australians with the skills, knowledge and understanding that will enable them to engage effectively with and prosper in a globalised world. Students will gain personal and social benefits, be better equipped to make sense of the world in which they live and make an important contribution to building the social, intellectual and creative capital of our nation.

Accordingly, the Australian Curriculum must be both relevant to the lives of students and address the contemporary issues they face. With these considerations and the *Melbourne Declaration on Educational Goals for Young Australians* in mind, the curriculum gives special attention to these three priorities:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability.

Cross-curriculum priorities are embedded in all learning areas and they will have a strong but varying presence depending on their relevance to the learning areas.

Aboriginal and Torres Strait Islander histories and cultures

Aboriginal and Torres Strait Islander communities are strong, rich and diverse. Aboriginal and Torres Strait Islander identity is central to this priority and is intrinsically linked to living, learning Aboriginal and Torres Strait Islander communities, deep knowledge traditions and holistic world view.

A conceptual framework based on Aboriginal and Torres Strait Islander Peoples' unique sense of identity has been developed as a structural tool for the embedding of Aboriginal and Torres Strait Islander histories and cultures within the Australian curriculum. This sense of identity is approached through the interconnected aspects of Country/Place, people and culture. Embracing these elements enhances all areas of the curriculum.

The Aboriginal and Torres Strait Islander cross-curriculum priority provides opportunities for all learners to deepen their knowledge of Australia by engaging with the world's oldest continuous living cultures. This knowledge and understanding will enrich their ability to participate positively in the ongoing development of Australia.

[1] The following introductory information is taken from the Australia Curriculum v4.2: www.australiancurriculum.edu.au/CrossCurriculumPriorities/Aboriginal-and-Torres-Strait-Islander-histories-and-cultures

Organising ideas

For each cross-curriculum priority, a set of organising ideas reflects the essential knowledge, understandings and skills for the priority. The organising ideas are embedded in the content descriptions and elaborations of each learning area as appropriate.

Code	Organising ideas
Country/Place	
OI.1	Australia has two distinct Indigenous groups, Aboriginal Peoples and Torres Strait Islander Peoples.
OI.2	Aboriginal and Torres Strait Islander communities maintain a special connection to and responsibility for Country/Place throughout all of Australia.
OI.3	Aboriginal and Torres Strait Islander Peoples have unique belief systems and are spiritually connected to the land, sea, sky and waterways.
Culture	
OI.4	Aboriginal and Torres Strait Islander societies have many Language Groups.
OI.5	Aboriginal and Torres Strait Islander Peoples' ways of life are uniquely expressed through ways of being, knowing, thinking and doing.
OI.6	Aboriginal and Torres Strait Islander Peoples have lived in Australia for tens of thousands of years and experiences can be viewed through historical, social and political lenses.
People	
OI.7	The broader Aboriginal and Torres Strait Islander societies encompass a diversity of nations across Australia.
OI.8	Aboriginal and Torres Strait Islander Peoples have sophisticated family and kinship structures.
OI.9	Australia acknowledges the significant contributions of Aboriginal and Torres Strait Islander people locally and globally.

Relationship between the organising ideas

The organising ideas are interconnected and inform and support each other. Teachers will combine aspects of them in different ways to provide young people with learning experiences that meet their needs and interests. For example, if teaching a novel about or written by an Aboriginal person and/or Torres Strait Islander person, a teacher would draw on aspects of Country/Place, culture and people and consider how these shape and influence identity.

These organising ideas can be used as pinpoints when mapping Aboriginal and Torres Strait Islander perspectives across Australian Curriculum planning documents in schools. For example, teachers could undertake a reflective process to audit the junctures where Aboriginal and Torres Strait Islander histories and cultures and the associated organising ideas have been addressed in a unit of work or subject area.

Science

The Australian Curriculum: Science values Aboriginal and Torres Strait Islander histories and cultures. It acknowledges that Aboriginal peoples and Torres Strait Islander peoples have longstanding scientific knowledge traditions.

Students will have opportunities to learn that Aboriginal peoples and Torres Strait Islander peoples have developed knowledge about the world through:

- observation
- using all the senses
- prediction and hypothesis
- testing (trial and error)
- making generalisations within specific contexts.

These scientific methods have been practised and transmitted from one generation to the next. Students will develop an understanding that Aboriginal peoples and Torres Strait Islander peoples have particular ways of knowing the world and continue to be innovative in providing significant contributions to development in Science. They will investigate examples of Indigenous Science and the ways traditional knowledge and non-Indigenous scientific knowledge can be complementary.

The Australian Curriculum: Science has three interrelated strands:

- Science Understanding
- Science as a Human Endeavour
- Science Inquiry Skills.

Together, the three strands of the Australian Curriculum: Science provide students with understanding, knowledge and skills through which they can develop a scientific view of the world. Students are challenged to explore Science, its concepts, nature and uses through clearly described inquiry processes.

Aboriginal and Torres Strait Islander frameworks

A Science course may incorporate many frameworks that will enable a deeper understanding and connectedness to the subtleties and complexities of the distinct Aboriginal and Torres Strait Islander cultures and identities.

The table below provides examples of Aboriginal and Torres Strait Islander frameworks developed and used by Indigenous people. They illustrate:

- how knowledge and knowing are integrated and holistic
- tools for supporting teachers in embedding Aboriginal and Torres Strait Islander ways of working into the curriculum.

Community engagement is the key to success in implementing these frameworks. Information presented as a flowchart about how to engage with local communities and how to access information on consultation protocols can be found in the Queensland Studies Authority (QSA) website at: www.qsa.qld.edu.au/3035.html

Holistic approach to Indigenous studies	*My Land My Tracks: A framework for the holistic approach to Indigenous studies* was developed by Ernie Grant, Dijirabal/Djirrabal Elder and published by the Innisfail and District Education Centre. The holistic approach to learning promotes cross-cultural understanding. education.qld.gov.au/schools/indigenous/services/cultural-local.html
Approaches: conceptual, holistic and spiralling	The approaches outlined in the QSA *Aboriginal and Torres Strait Islander Studies Handbook 2010* illustrate how knowledge and knowing are integrated and holistic. They are not an exhaustive set of strategies, but tools to gain further insight into how the worldviews of Aboriginal peoples and Torres Strait Islander peoples need to be and can be incorporated into the planning, design and delivery of teaching and learning. The approaches are outlined in detail in Section 4. www.qsa.qld.edu.au/8848.html#teaching
Indigenous inquiry skills	Indigenous inquiry skills are used to explore knowledge uniquely associated with inquiry into and with Aboriginal communities and Torres Strait Islander communities. These skills are associated with: • reciprocating knowledge • deep listening • reflecting and revisiting • respectful interactions • managing and recognising community protocols. Indigenous principles such as community responsibility, lifelong learning, cross-generational resonance and revisiting inform the development of these skills. www.qsa.qld.edu.au/12798.html
8 Aboriginal Ways of Learning	8 Aboriginal Ways of Learning is a framework involving narrative-driven learning, visualised learning processes, hands-on/reflective techniques, use of symbols/metaphors, land-based learning, indirect/synergistic logic, modelled/scaffolded genre mastery, and connectedness to community. 8ways.wikispaces.com

Resources to support the Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority

The following table provides resources to support the Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority in the Australian Curriculum: Science. Ideas for relevant learning experiences and links to useful web-based resources are also included. These are not the only opportunities to embed Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority in the curriculum.

Note: Some resources are intended for teachers' background information and may not be suitable for use with students in the classroom without significant prior support or scaffolding.

It is recommended that when using these resources connections are made and relationships are built with local Aboriginal communities and Torres Strait Islander communities.

All web addresses correct at the time of publication.

Foundation (Prep) Australian Curriculum: Science

Strand *Science Understanding* **Sub-strand** *Earth and space sciences* **Content description** Daily and seasonal changes in our environment, including the weather, affect everyday life	**Example learning experience** Children investigate how Aboriginal concepts and Torres Strait Islander concepts of time and weather patterns explain how things happen in the world around them. **Example resources to support this learning experience** The Bureau of Meteorology's Indigenous weather knowledge webpages offer information about Indigenous Australian seasonal calendars based on the local sequence of natural events. www.bom.gov.au/iwk/ The QSA has developed posters that show key elements of the changing seasons in the Torres Strait. www.qsa.qld.edu.au/3035.html > Readings > Torres Strait Islander seasonal calendar. **Other resources that may support this content description** The Bureau of Meteorology's Indigenous weather knowledge webpages offer information on the way Indigenous Australians view the weather and climate of Australia. It provides knowledge of plant and animal cycles, and contains details of the intricate connections between these, which Indigenous people have observed over thousands of years and passed down from generation to generation. www.bom.gov.au/iwk/climate_culture/Clim_Cult.shtml The ABC Science website unpacks the Indigenous Weather Knowledge project. It explores the approach to the weather taken by Indigenous Australians, which links to food supply, shelter and the land in general. www.abc.net.au/science/features/indigenous/

Year 1 Australian Curriculum: Science

Strand *Science Understanding* **Sub-strand** *Earth and space sciences* **Content description** Observable changes occur in the sky and landscape	**Example learning experience** Children work with local Aboriginal and/or Torres Strait Islander community members to investigate Indigenous knowledge about the sun and moon and the day and night skies. **Example resources to support this learning experience** The Astronomical Society of South Australia website provides information and activities about how Aboriginal peoples and Torres Strait Islander peoples apply their knowledge of stars, constellations and the moon. www.assa.org.au/nacaa > Astronomy and Australian Indigenous People. The QSA's Calendar of stars poster details key seasonal changes in stars. www.qsa.qld.edu.au/3035.html > Readings > Torres Strait Islander seasonal calendar: Calendar of stars. The QSA website provides information on how to engage with local communities, and access information on consultation protocols. www.qsa.qld.edu.au/3035.html > Resources > Building relationships with local communities. **Other resources that may support this content description** The Questacon website provides stories from Aboriginal peoples and Torres Strait Islander peoples from around Australia relating to different astronomical observations. www.questacon.edu.au/starlab/aboriginal_astronomy.html
Strand *Science Understanding* **Sub-strand** *Physical sciences* **Content description** Light and sound are produced by a range of sources and can be sensed	**Example learning experience** Children explore different ways to produce sound using the different musical instruments used by Aboriginal peoples and Torres Strait Islander peoples. **Example resource to support this learning experience** The Aboriginal Art Online website gives information about traditional Aboriginal instruments, including boomerang clapsticks, percussion sticks, hollow log drums, seed rattles and the didgeridoo. www.aboriginalartonline.com/culture/amusic2.php **Other resources that may support this content description** The sun is a source of light. Dreaming stories relate things that have happened, how the universe came to be, how human beings were created and how the Creator intended for humans to function within the cosmos. The Australianhistory.org website tells the story of how the sun was made. www.australianhistory.org/dreamtime

Strand *Science as a Human Endeavour* **Sub-strand** *Use and influence of science* **Content description** People use science in their daily lives, including when caring for their environment and living things	**Example learning experience** Children investigate ways that Indigenous science knowledge is used in the care of the local environment. **Example resource to support this learning experience** The clip “We are caretakers”, available on the Share our pride website, explains how Aboriginal peoples and Torres Strait Islander peoples see themselves as caretakers, not owners, of the land, animals, plants or nature, and how this belief has led to effective ways to use and sustain resources. shareourpride.reconciliation.org.au/sections/our-culture/ >scroll down to section titled “The environment”.
	Other resources that may support this content description The technologies used by Aboriginal peoples and Torres Strait Islander peoples require an understanding of how materials can be used to make tools and weapons. This Australian Government website offers information about Aboriginal technologies and Torres Strait Islander technologies, the understanding of the natural environment inherent in them and the need to design tools and technology that are flexible and adaptable. australia.gov.au/about-australia/australian-story/austn-indigenous-tools-and-technology

Year 2 Australian Curriculum: Science

Strand *Science Understanding* **Sub-strand** *Physical sciences* **Content description** A push or a pull affects how an object moves or changes shape	**Example learning experience** Children investigate traditional Aboriginal games and activities that use the forces of push or pull. **Example resource to support this learning experience** The Australian Sports Commission website provides a guide to traditional Aboriginal games from Aboriginal communities and Torres Strait Islander communities. www.ausport.gov.au/participating/indigenous/resources/games_and_activities/individual_games **Other resources that may support this content description** The Questacon website's "Aboriginal technology" page has information about labour-saving technologies that Aboriginal peoples have developed. www.questacon.edu.au/indepth/clever/aboriginal_technology.html
Strand *Science as a Human Endeavour* **Sub-strand** *Use and influence of science* **Content description** People use science in their daily lives, including when caring for their environment and living things	**Example learning experience** Children research how Aboriginal peoples and Torres Strait Islander peoples use science knowledge to meet their needs, including food supply. **Example resource to support this learning experience** Video clips, from the *australianscreen* website, introduce the concept of five seasons. The different seasons mark different interactions with the land and different food sources. • aso.gov.au/titles/documentaries/5-seasons/clip1 • aso.gov.au/titles/documentaries/5-seasons/clip3 **Other resources that may support this content description** The *Women with clever hands: Gapuwiyak Miyalkurruwurr Gong Djambatjmala* exhibition explores how Aboriginal women from Gapuwiyak in northeast Arnhem Land make dyes and pigments by mixing materials. www.wagga.nsw.gov.au/art-gallery/exhibitions/exhibitions-2010/women-with-clever-hands-gapuwiyak-miyalkurruwurr-gong-djambatjmala > scroll down to Education resources.

Year 3 Australian Curriculum: Science

Strand *Science as a Human Endeavour* **Sub-strand** *Nature and development of science* **Content description** Science involves making predictions and describing patterns and relationships	**Example learning experience** Students research how knowledge of astronomy has been used by some Aboriginal peoples and Torres Strait Islander peoples. **Example resources to support this learning experience** The Astronomical Society of South Australia website provides information about how Aboriginal peoples and Torres Strait Islander peoples use astronomy to, among other things, give directions, tell time, forecast the weather or provide calendar for changing seasons. www.assa.org.au/nacaa > Astronomy and Australian Indigenous People. The QSA has developed posters that show key elements of the changing seasons in the Torres Strait. The Calendar of events poster shows winds, bird migrations, sea animals and plant life. The Calendar of stars poster shows the changing position of Tagai, a key zugubal (constellation), throughout the year. www.qsa.qld.edu.au/3035.html > Readings > Torres Strait Islander seasonal calendar. **Other resources that may support this content description** The ABC's Lost Seasons site discusses the validity of Indigenous weather knowledge and information on the sort of signs Aboriginal peoples and Torres Strait Islander peoples use to tell if a season is changing. www.abc.net.au/science/features/indigenous
Strand *Science as a Human Endeavour* **Sub-strand** *Use and influence of science* **Content description** Science knowledge helps people to understand the effect of their actions	**Example learning experience** Students investigate how specific plants are used by Aboriginal communities and Torres Strait Islander communities. **Example resource to support this learning experience** Many local botanical gardens have an Aboriginal plant trail. For example, the Brisbane Botanic Gardens Mt Coot-tha has a trail that explores the Australian Rainforest area, which features some of the plant types used by Aboriginal communities. A virtual tour of the Aboriginal Plant Trail can be accessed on the Brisbane City Council website. www.brisbane.qld.gov.au/facilities-recreation/parks-and-venues/parks/brisbane-botanic-gardens-mt-coot-tha/self-guided-walks/index.htm **Other resources that may support this content description** The Bangerang Cultural Centre website provides a table of Aboriginal bush tucker including where, when and how to catch and prepare it. home.vicnet.net.au/~bangercc/bushtuckerlist.html The Terrain.org website introduces The bush foods project, which will marry the food and horticultural methods of the Aboriginal peoples who have inhabited Central Australia for more than 35 000 years with modern scientific approaches. www.terrain.org/articles/16/cribb_latham_ryder.htm

Year 4 Australian Curriculum: Science

Strand *Science as a Human Endeavour* **Sub-strand** *Nature and development of science* **Content description** Science involves making predictions and describing patterns and relationships	**Example learning experience** Students identify and collect evidence of seasonal change using observations of animal life cycles, e.g. crocodile nesting, turtle nesting, magpie and plover attacks. **Example resource to support this learning experience** The Bureau of Meteorology's Indigenous weather knowledge webpages offer information on the way Indigenous Australians view the weather and climate of Australia. It provides knowledge of plant and animal cycles, and contains details of the intricate connections between these, which Indigenous Australians have observed over thousands of years and passed down from generation to generation. www.bom.gov.au/iwk/climate_culture/Clim_Cult.shtml **Other resources that may support this content description** Ideas of classification that are used in Science are not shared by Aboriginal peoples. This link provides access to two articles about examples of Aboriginal ways of organising and classifying knowledge. http://members.ozemail.com.au/~mmichie/engag_class.htm

Year 5 Australian Curriculum: Science

Strand *Science as a Human Endeavour* **Sub-strand** *Nature and development of science* **Content description** Important contributions to the advancement of science have been made by people from a range of cultures	**Example learning experience** Students explore Indigenous knowledge about dark areas or shadows in the sky (known today as dark nebulae) and how these areas are included when patterns in the sky are described. **Example resource to support this learning experience** The Questacon website contains an explanation of the cultural story of the emu, one of the largest shapes in the sky and a dark constellation. www.questacon.edu.au/starlab/the_emu.html **Other resources that may support this content description** Ray Norris's article "Were Aboriginal Australians the world's first astronomers" is about archaeoastronomy, which is defined as the study of how past people have understood the sky. It discusses Aboriginal knowledge of the sun, moon and stars. www.atnf.csiro.au/people/rnorris/papers/papers.htm > Publications > A112: Were Aboriginal Australians the world's first astronomers.

Year 6 Australian Curriculum: Science

Strand *Science as a Human Endeavour* **Sub-strand** *Nature and development of science* **Content description** Important contributions to the advancement of science have been made by people from a range of cultures	**Example learning experience** Students investigate and collect information about Aboriginal peoples' and Torres Strait Islander peoples' use of plants for medicinal purposes and compare these remedies with non-Indigenous ones. **Example resource to support this learning experience** The World Wide Wattle website provides information on traditional uses of Australian acacias. www.worldwidewattle.com/infogallery/utilisation/aboriginal.php **Other resources that may support this content description** "The Narran Lakes (Dharriwaa) System with Ted Fields" documentary is part of the *Through Our Eyes* series, where Elders describe the land management practices and social, spiritual and cultural knowledge that enabled their people to care for the country for tens of thousands of years. This clip discusses the impact of changing the physical conditions of an ecosystem. www.youtube.com/watch?v=Zec3r8M5S5k

Year 7 Australian Curriculum: Science

Strand *Science Understanding* **Sub-strand** *Biological sciences* **Content description** Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions	**Example learning experience** Students research the traditional use of fire by Aboriginal peoples and the impact of this practice on food chains and food webs. **Example resource to support this learning experience** The CSIRO website has vast information resources, including a section on Aboriginal wetland burning in Kakadu, which highlights how traditional ecological knowledge is being used in powerful combination with non-Indigenous Science to enhance the biodiversity and cultural values of wetlands in Kakadu National Park in the Northern Territory. www.csiro.au/science/KakaduWetlandBurning.html **Other resources that may support this content description** The "Life on the river with Lionel (Charlie) Williams" documentary is part of the *Through Our Eyes* series, where Elders describe the land management practices and social, spiritual and cultural knowledge that enabled their people to care for the country for tens of thousands of years. This clip explains the impact of the Brewarrina weir on water quality and fish numbers. www.youtube.com/watch?v=k1zOoJki7vQ&feature=channel
Strand *Science as a Human Endeavour* **Sub-strand** *Nature and development of science* **Content description** Science knowledge can develop through collaboration and connecting ideas across the disciplines of science	**Example learning experience** Students investigate how land management practices of Aboriginal peoples and Torres Strait Islander peoples can help inform sustainable management of the environment. **Example resource to support this learning experience** Aboriginal peoples and Torres Strait Islander peoples have diverse relationships with, connections to, and understandings of the Australian environment. Some of these relationships are based on the traditional knowledges and practices that have been passed down from generation to generation, while others have resulted from the various impacts of colonisation. The QSA has developed a resource that explains Aboriginal peoples and Torres Strait Islander peoples relationships to Country. www.qsa.qld.edu.au/3035.html > Resources > Relationships to country: Aboriginal people and Torres Strait Islander people. **Other resources that may support this content description** The CSIRO's ECOS magazine (Issue 125) offers an article on ways that Aboriginal knowledge informs sustainability knowledge and practice. ecosmagazine.com/nid/206/issue/2106.htm > A burgeoning role for Aboriginal knowledge.

Strand *Science as a Human Endeavour* **Sub-strand** *Use and influence of science* **Content description** Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management	**Example learning experience** Students investigate how Aboriginal knowledge and Torres Strait Islander knowledge is being used to inform scientific decisions, e.g. care of waterways. **Example resources to support this learning experience** The Wet Tropics Management Authority is an organisation that works on developing and improving relationships with local Aboriginal peoples, which assists in forging sustainable futures for both the World Heritage Area and the Aboriginal peoples in that area. www.wettropics.gov.au/caring-for-country-1 The CSIRO has an Indigenous engagement strategy which aims to achieve greater Indigenous participation in CSIRO activities. www.csiro.au/en/Portals/About-CSIRO/Who-we-are/CSIRO-Indigenous-Engagement.aspx **Other resources that may support this content description** The "Using fire to care for Country with Roy Barker" documentary is part of the *Through Our Eyes* series, where Elders describe the land management practices and social, spiritual and cultural knowledge that enabled their people to care for the country for tens of thousands of years. This clip explains how fire was traditionally used to manage Country. www.youtube.com/watch?v=J6BfapESWXw

Year 8 Australian Curriculum: Science

Strand *Science as a Human Endeavour* **Sub-strand** *Use and influence of science* **Content description** Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management	**Example learning experience** Students investigate how Aboriginal peoples recognise relationships in ecosystems by using fire to promote new growth, attract animals and afford easier hunting and food gathering. **Example resource to support this learning experience** The ABC Science website provides information on Aboriginal fire-farming and land management. www.abc.net.au/science/articles/2005/06/22/1398157.htm **Other resources that may support this content description** The CSIRO website shows how Indigenous knowledge of ecological and environmental process can prove valuable in understanding environmental change and the effects of development pressures. www.csiro.au/Portals/About-CSIRO/Who-we-are/CSIRO-Indigenous-Engagement/Publications.aspx

Years 9 and 10 Australian Curriculum: Science

The Australian Curriculum identifies (using icons/tags) where the cross-curriculum priorities have a natural fit within the content descriptions in each learning area. In the Years 9 and 10 Australian Curriculum: Science, opportunities to explore the Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority have not been identified.

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