

National Aboriginal and Torres Strait Islander Curricula Project

Astronomy

The National Aboriginal and Torres Strait Islander Curricula Project aims to empower *all* teachers to integrate Aboriginal and Torres Strait Islander perspectives into their classroom practice. This resource will assist teachers to implement the [Australian Curriculum](#). Bringing to life the [Aboriginal and Torres Strait Islander Histories and Cultures Cross-Curriculum Priority](#) in their classroom.

“It is our hope that this work will support teachers to include Aboriginal and Torres Strait Islander curriculum content in their classrooms — normalising inclusion — so it is seen as an integral element of their curriculum delivery.”
Professor Marcia Langton AM, Curricula Project Chair

Secondary

1. English
2. Mathematics
3. Science
4. Humanities and Social Sciences
5. The Arts
6. Technologies
7. Health and Physical Education

Note: This project is an Australian Government funded initiative delivered by the University of Melbourne through the Indigenous Studies Unit. The material within these resources includes the views, opinions and representations of third parties, and do not necessarily represent the views of the Australian Government. They are provided for consultation purposes and stakeholders are welcomed to provide feedback, including any potential concerns on copyright.

Secondary — English — Year 8

Summary

This guide focuses on the song series (songlines) of Australia.

Achievement Standard

This guide assists in meeting: “select evidence from the text to show how events, situations and people can be represented from different viewpoints” and “combining ideas, images and language features from other texts, students show how ideas can be expressed in new ways”.

Content Description

Recognise and explain differing viewpoints about the world, cultures, individual people and concerns represented in texts (ACELT1807).

Background

This guide has been designed as part of a series of classroom lessons to build students’ capacity to understand and appreciate the richness and variety of traditional knowledge and cultural expression, and how traditional knowledge continues in contemporary Australia through adaptations using modern media.

The open star cluster known as Seven Sisters, or the Pleiades, has been a source of fascination for people all over the world since ancient times. They are the first stars mentioned in literature- in China around 2350 BC, in the Bible, in ancient Greek and Egyptian writings and art (see http://www.pleiade.org/pleiades_02.html). Thousands of years before these accounts were produced, the Seven Sisters story had been painted on the red rocks of Walinynga, or Cave Hill, in the country of the Amata people of the Northern Territory (see <https://www.smh.com.au/lifestyle/the-tale-of-seven-sisters-how-a-community-project-is-preserving-indigenous-lore-of-the-land-20170831-gy8dm6.html>).

Resources

Indigenous song Twinkling Stars tell science of the seasons (ABC): <https://www.abc.net.au/news/science/2016-09-16/twinkling-stars-song-from-murray-island-tells-science-of-seasons/7754054>

The Songlines (National Film and Sound Archive of Australia): <https://dl.nfsa.gov.au/module/1566/>

Aboriginal Songlines helped draw the map in Australia (National Geographic):

<https://blog.education.nationalgeographic.org/2016/04/08/aboriginal-songlines-helped-draw-the-map-in-australia/>

We don’t need a map – Teacher Notes (SBS):

https://www.sbs.com.au/sites/sbs.com.au/home/files/sbs_learn_we_dont_need_a_map_final.pdf

Students will...

- investigate the role of storytelling in Aboriginal and/or Torres Strait Islander society
- analyse the way knowledge is conveyed in particular stories/songs

Questions for inquiry-based learning

- Why do different cultures use storytelling to teach lessons? How do they differ?
- Why are there many different versions of the Seven Sisters story?
- What are the implications of these multiple versions of the Seven Sisters story?

Example classroom task

Stories in the Stars: The Seven Sisters- a story for all cultures

Use the following resources to research the story of the Seven Sisters:

<http://songlines.nma.gov.au/tjanpi/story>

<http://www.nma.gov.au/exhibitions/songlines>

<http://www.nma.gov.au/audio/audio/songlines-tracking-the-seven-sisters>

Andrews, Munya, 2004, The seven sisters of the Pleiades: Stories from around the world. Melbourne: Spinifex Press

Students to create a storyboard of the Seven Sisters story. Students to suggest new ways the Seven Sisters story could be told.

Secondary — Mathematics — Year 8

Summary

Students will learn how Aboriginal and Torres Strait Islander peoples have developed and maintained knowledge over thousands of years by exploring the complexity of solar and lunar eclipses. Students will also come to understand how the sun, earth and moon relate to each other in terms of size and motion.

Achievement Standard

This guide assists in meeting: *“name the features of circles and calculate the areas and circumferences of circles”*.

Content Description

Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area (ACMMG197).

Background

Circles are the basis of all physical processes on the planet and are central to Aboriginal and Torres Strait Islander knowledges. Aboriginal and Torres Strait Islander people understand the world as a complex network (or pattern) of relationships where all things are interconnected and see themselves as part of this network of relationships. Aboriginal and Torres Strait Islander people are the world’s oldest astronomers. Aboriginal and Torres Strait Islander people have developed intricate systems for detailing the patterns of movements of the stars, planets, sun and moon. These systems - many of which are still actively utilised today - assist in navigating by land and sea, informing complex seasonal calendars, forecasting the weather, and understanding associated natural phenomena. Astronomical knowledge is intimately tied to knowledge of other natural processes, such as animal migrations and breeding cycles; best seasons for fishing, planting, and hunting; predicting tides using the phases of the Moon; and forecasting weather and seasonal changes. All of this knowledge is interwoven and connected through story, law, science, and spirituality.

Resources

Australian Indigenous Astronomy: <http://www.aboriginalastronomy.com.au/>; Stellarium (free open source planetarium): <https://stellarium.org/>; A Guide to Aboriginal Astronomy (Australian Geographic, 2017): <https://www.australiangeographic.com.au/topics/science-environment/2017/07/a-guide-to-aboriginal-astronomy/>; The Astronomy of Aboriginal Australia (Norris and Hamacher, 2011): <https://www.cambridge.org/core/journals/proceedings-of-the-international-astronomical-union/article/astronomy-of-aboriginal-australia/5ED8859B98BC481C89140333C692B443>

Students will...

- Compare and contrast the size of the moon, earth and sun.
- Explore the motion of the moon, earth and sun including distance travelled.
- Gain a rudimentary understanding of how and when solar and lunar eclipses occur.
- Contrast this knowledge with Aboriginal stories of the sun and moon and stories about solar and lunar eclipse.

Questions for inquiry-based learning

- What is the difference between a lunar and solar eclipse?
- Why does a lunar eclipse occur more often than a solar eclipse?
- Given that solar eclipses occur once every 375 years, how have Aboriginal peoples developed an understanding/theory about solar eclipses? What would have been required to maintain this knowledge?

Example classroom task

- “How big are the Earth, Sun and Moon?”. Provide students with the radius for each and allow them to calculate the circumferences. Provide an object that represents the Sun (e.g. Exercise Balls) and task students with finding an object that represent the Earth and the Moon. Note: compromises will have to be made to find a workable model.
- “What is the distance travelled by the Earth when it moves around the Sun?”. Provide students with the distance between the Earth and the Sun. Draw a diagram to work out the radius of the path and, assuming a circular path, calculate the distance and speed travelled by the earth. Do a similar process for the Moon orbiting around the Earth. Use this information to answer the above ‘Questions for inquiry-based learning’.

Secondary — Science — Year 8

Summary

This guide focuses on planning for a scientific investigation to increase students' understanding of Astronomy through the lens of Aboriginal and Torres Strait Islander knowledge systems (for example oral traditions). By taking traditional stories students explore the scientific knowledge that the story imparts and how it connects people to Country.

Achievement Standard

This guide assists in meeting: *“identify and construct questions and problems that they can investigate scientifically”* and *“appropriate language and representations to communicate science ideas, methods and findings in a range of text types”*.

Content Description

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (AC SIS139).

Background

Science is not viewed in the same way in all cultures. Different cultures define, gather and organise data and evidence differently. Aboriginal and Torres Strait Islander people have a longstanding scientific knowledge tradition, which has given them a deep understanding about the world. Aboriginal and Torres Strait Islander knowledge and wisdom and Western modern science are both concerned about nature and naturally occurring events. For example Aboriginal and Torres Strait Islander people understood about the Sun, Moon and the visible planets (Mercury, Venus, Mars, Jupiter and Saturn) and their complex motions. They linked the positions and motions (including retrograde motion) of celestial bodies to time, calendars, seasons, navigation, subsistence and social applications. This knowledge was recorded and passed to successive generations through oral traditions, song and dance, craftsmanship, social practices) to ensure that the integrity of their stories and lessons are preserved.

Resources

The crossroads: Aboriginal knowledge and modern science: <https://rsv.org.au/aboriginal-knowledge/>; Kindred skies: ancient Greeks and Aboriginal Australians saw constellations in common: <https://theconversation.com/kindred-skies-ancient-greeks-and-aboriginal-australians-saw-constellations-in-common-74850>; Astronomy in Indigenous knowledge: <https://phys.org/news/2014-12-astronomy-indigenous-knowledge.html>; True Story Of Volcanic Eruption Told By Aboriginal People For 7,000 Years: <https://www.iflscience.com/environment/true-story-volcanic-eruption-told-aboriginals-7000-years/>; Australian Indigenous Astronomy – Volcanic eruptions and geomythology: <http://aboriginalastronomy.blogspot.com/2011/07/volcanic-eruptions-geomythology.html>; When the Bullin shrieked: Aboriginal memories of volcanic eruptions thousands of years ago: <https://theconversation.com/when-the-bullin-shrieked-aboriginal-memories-of-volcanic-eruptions-thousands-of-years-ago-81986>

Students will...

- explore Aboriginal and Torres Strait Islander ways of knowing and develop an experimental task to explore an aspect of Aboriginal Astronomy (or vulcanology) that connects observational data with a story.

Questions for inquiry-based learning

- What is an Aboriginal and Torres Strait Islander science knowledge system and how is this knowledge derived?
- How reliable are “oral traditions” in preserving cultural heritage in Aboriginal and Torres Strait Islander knowledge systems? – refer to the resources about Aboriginal stories of volcanoes.
- What are the roles of folklore, mythology, stories, rituals, and songs in Aboriginal and Torres Strait Islander knowledge systems?

Example classroom task

Students identify an astronomical or geological question they want to investigate. Divide the class into small groups. Each team investigates and explores the same question using a different method of inquiry, including Aboriginal and Torres Strait Islander methods of inquiry. For example, each method would include questions such as: What data/evidence do I need to collect? How can I compile and interpret the data. How can I communicate my understanding? Compare the results from the different approaches. Discuss the implications for social, cultural, economic or moral aspects of different ways of knowing.

Secondary — Humanities and Social Sciences — Year 8

Summary

Students will learn about the astronomical knowledge of Torres Strait Islanders, about cartography and navigation by using star positions and the time of day to determine their position on Earth.

Achievement Standard

This guide assists in meeting: “*explain geographical processes that influence the characteristics of places and explain how places are perceived and valued differently*” and “*explain interconnections within environments and between people and places*”.

Content Description

Spiritual, aesthetic and cultural value of landscapes and landforms for people, including Aboriginal and Torres Strait Islander Peoples (ACHGK049).

Background

Torres Strait Islanders utilise stars and constellations to inform them about cardinal directions and how to travel long distances by sea. The importance of navigational stars is featured on the Torres Strait Islander flag, which features a 5-pointed star inside the *dhari* - a ceremonial headdress, representing the 5 major island groups of the Torres Strait (this is where students can learn about symbolism in national flags). Two major constellations are used to find north and south - *Baidam/Beizam* (the shark) and the left hand of *Tagai* - the Southern Cross. Students will learn how to find North and South using these stars, and understand that each star sets at a certain position on the horizon, which helps navigators find their position. This is very similar to the techniques used by Polynesians and Micronesians to navigate long distances across the Pacific Ocean. The stars tell Islanders when to plant their gardens, when to hunt turtle and dugong, when the monsoon season arrives, when the winds change, and many other important aspects of daily life. For example, when *Tagai's* left hand (the Southern Cross) dips into the sea, Islanders know the wet season (*Kuki*) is about to begin. The rising of *Usal* and *Utimal* (*Pleiades* and *Orion*) in mid-November tells Islanders that turtle and dugong are mating and that it's time to plant their gardens in anticipation of the coming *Kuki* season. Lunar phases also inform the Islanders of the best times to fish. See Hamacher (2013) below.

Resources

Aboriginal Astrophysicists, Researchers and Educators; <http://www.aboriginalastronomy.com.au/people/>; Star Stories of the Dreaming <http://www.aboriginalastronomy.com.au/wp-content/uploads/2018/05/Star-Stories-of-the-Dreaming-Guide.pdf>; Stellarium (<https://stellarium.org/>) online interactive planetarium; Australian Tide Tables - Bureau of Meteorology (BOM): (<http://www.bom.gov.au/australia/tides/>); A Shark in the Stars by Dr Duane H. Hamacher (2013): <https://theconversation.com/a-shark-in-the-stars-astronomy-and-culture-in-the-torres-strait-15850>; *Stars of Tagai: The Torres Strait Islanders*, by Nonie Sharp, (Canberra) Aboriginal Studies Press, 1993; *Torres Strait Islanders: custom and colonialism*, by Jeremy Beckett, (Cambridgeshire) University Press, 1987.

Students will...

- become aware of the stars and constellations in the night sky, their movement, and how they are also understood in Torres Strait Islander astronomy.
- develop an understanding of the complexity of Aboriginal and Torres Strait Islander knowledge.

Questions for inquiry-based learning

- How do Torres Strait Islander peoples use their knowledge of the night sky to navigate at sea?
- How does knowledge of Torres Strait Islander astronomy help students to understanding the movement of stars?

Example classroom task — The Night Sky

- Students study the night sky and create their own map of the night sky from their home.
- Students will learn how to determine spatial distances from stars by calculating angle measurement with their hands. For instance, the width of the Sun and Moon is half the diameter of the little finger held out at arm's length. The altitude of the South Celestial Pole is used to determine your latitude. On the big island of Hawaii, navigators knew that the distance between their extended little finger and thumb is about 20 degrees from the horizon to Polaris - the latitude of the island. Students can practice finding the South Celestial Pole and learning how to calculate their latitude (locally) using this technique.

Secondary — The Arts — Year 7/8

Summary

This guide focuses on art works as conveying Aboriginal and Torres Strait Islander narratives and providing connection to country and metaphysical or spiritual dimensions.

Achievement Standard

This guide assists in meeting: *“identify and analyse how other artists use visual conventions and viewpoints to communicate ideas and apply this knowledge in their art making”* and *“demonstrate use of visual conventions, techniques and processes to communicate meaning in their artworks”*.

Content Description

Experiment with visual arts conventions and techniques, including exploration of techniques used by Aboriginal and Torres Strait Islander artists to represent a theme, concept or idea in their artwork (ACAVAM118).

Background

In the Visual Arts, Aboriginal and Torres Strait Islander narratives are shared through symbols and with materials made from and of Country. Art works convey the narrative but also provide a connection to country and a portal to a metaphysical or spiritual dimension.

Rather than mimic the work of Aboriginal and Torres Strait Islander artists or preference one geographical region or linguistic group of Aboriginal and Torres Strait Islander cultural practice, this guide encourages students to think more abstractly about the importance of symbols, alternative epistemological frameworks and narrative tools. This allows students to think critically about Western artistic practice and promotes metacognition and a personal exploration of cultural values and social systems.

The practical classroom suggestion easily translates to many media allowing a teacher to work with their own artistic strengths and the resources available at the school.

Resources

Gulumbu Yunupingu Gumatj/Rrakpala peoples 'Garak I (The Universe)' 2004

<https://www.youtube.com/watch?v=Y6z5Ga-Aa6M>, National Gallery of Australia, Published on 16 Dec 2010.

QAGOMA, <https://www.qagoma.qld.gov.au/goma10hub/artists/gulumbu-yunupingu>, Accessed 11 November 2018

Students will...

- become aware of the importance of materials in maintaining the connection to Country, that art materials hold their own literal and metaphorical importance as they come from and are part of country.
- develop an understanding of the complexity of Aboriginal and Torres Strait Islander aesthetics and cultural practice.

Questions for inquiry-based learning

- How do Aboriginal and Torres Strait Islander peoples use symbols in art work?
- How does the art work incorporate Aboriginal and Torres Strait Islander peoples' knowledge of astronomy in their work?

Example classroom task

- Students study the night sky and create their own map of the night sky from their home.
- Students will translate this map of the star systems to a large blank piece of paper and using a wax crayon or candle place star systems and the moon into a night sky, across the top two thirds of a piece of watercolour or heavy gsm paper.
- Using dilute inks of different colours representing the night sky; black, dark blue, purple, grey students gently create a wash background for their night sky. The areas drawn in wax will repel the ink and shine through like stars.

Secondary — Technologies — Year 8

Summary

In this guide, students will come to know about star maps, how they are used as a tool, and how Aboriginal and Torres Strait Islander people mapped the night sky.

Achievement Standard

This guide assists in meeting the following aspects of the achievement standard for Years 7 and 8 Technologies (Design and Technologies): *“create and adapt design ideas, make considered decisions and communicate to different audiences using appropriate technical terms and a range of technologies and graphical representation techniques”*

Content Description

Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment (ACTDEK034).

Background

Star maps are maps of the night sky. It is one of the most important tools a stargazer can use. Star maps are used to locate constellations and celestial bodies such as stars, galaxies and nebulae. They have been used as a calendar, to predict seasonal change, and for human navigation. People throughout history and across all cultures have used myths and stories to name constellations.

Aboriginal and Torres Strait Islander people use the star maps to navigate across the country, to serve as a calendar and to predict seasonal change.

Aboriginal Astronomy, 2018, <http://www.aboriginalastronomy.com.au/content/topics/starmaps/>

Resources

How the sky works: A beginner’s guide to finding stars and planets: <https://www.abc.net.au/news/science/2017-04-04/a-beginners-guide-to-finding-planets-and-constellations/8373718>; Make your own planisphere by Museums Victoria: <https://museums victoria.com.au/media/1865/the-seasons-make-your-own-planisphere-activity.pdf>; A Wergaia (Boorong) Planisphere: An Educational Tool: <http://aboriginalastronomy.blogspot.com/2011/06/wergaia-planisphere-educational-tool.html>; Stories in the sky – the night sky of the Boorong people: https://docs.wixstatic.com/ugd/28d974_88640ed46dc34054a32ae856dafa504b.pdf

Students will...

- explore the constellations of Aboriginal and Torres Strait Islander peoples
- learn how to find their way around the night sky, spotting stars, planet and galaxies.

Questions for inquiry-based learning

- What myths and stories did Aboriginal and Torres Strait Islander peoples use to name constellations?
- How did Aboriginal and Torres Strait Islander peoples use star maps?
- How do current day astronomers acknowledge and incorporate Aboriginal and Torres Strait Islander peoples’ knowledge of astronomy in their work?

Example classroom task

- Students make a planisphere with two discs: the first shows Western names for constellations, the second shows Aboriginal names for constellations.

A planisphere is a simple hand-held device (technology) that can be used as a guide to help identify individual stars and constellations which are visible in the night sky. A planisphere can be used throughout the year and at any time of night. It is used to help the students determine what stars are in the sky throughout the night at various times of the year, find directions, and tell time. Recourses for making a planisphere are given below.

- Students explore Aboriginal constellations and compare them to Western constellations. Resources for Aboriginal constellations are given below.

With the aid of an Aboriginal and Torres Strait Islander language map of Australia, students are made aware of the diverse range of Aboriginal cultures and astronomies across the continent and emphasise the lack of a single Aboriginal “astronomy” or viewpoint.

Secondary — Health and Physical Education — Year 8

Summary

In this guide students will explore selected star stories of Aboriginal and Torres Strait Islander peoples and make connections between those stories and how they connect people and their communities to each other and to Country (land, sky, sea, animals, spirits).

Achievement Standard

This guide assists in meeting: *“investigate strategies and practices that enhance their own, others’ and community health, safety and wellbeing”* and *“examine how connecting to the environment can enhance health and wellbeing”*.

Content Description

Plan and implement strategies for connecting to natural and built environments to promote the health and wellbeing of their communities (ACPPS078).

Background

The holistic nature of the Aboriginal and Torres Strait Islander concepts of health involves key concepts such as cultural understandings of the body, health and ill health developed by observing of physiological, social, mental and spiritual conditions, traditional healing and medicine, cultural practices such as caring for country, death and grief (Sorry Business), Law, Men’s and Women’s Business, and ancestral stories (or ‘Dreamings’), and particularly maintaining links to traditional lands and waters. The concept of ‘caring for country’ is a significant cultural complex of knowledge, beliefs and practices that has been shown by researchers to influence the wellbeing of Aboriginal people. In many Aboriginal and Torres Strait Islander Knowledge Systems, some ritual practices and cultural beliefs are associated with transient celestial phenomena, such as aurorae, cosmic impacts, meteors, eclipses, and comets. These associations are typically linked with death, omens, disease, and malevolent beings. Meteors often represent the souls of the recently deceased or evil spirits that hunt for the souls of the living. In the Torres Strait Islands, meteors are an important component of this knowledge in Meriam traditions having relevance to death and mortuary practices, with information about the recently deceased informed by the various physical properties of bright meteors. (Guedes & Hamacher, 2018).

Resources

Guedes and Hamacher, Death and Maier: meteors and mortuary rites in the eastern Torres Strait, *Australian Journal of Indigenous Issues*, Vol. 21(3), pp. 39 59, 2018: https://www.academia.edu/37652871/Death_and_Maier_meteors_and_mortuary_rites_in_the_eastern_Torres_Strait_Eud_kerker_na_korep_maierira_asmer_opged_Torres_Straitge; M. Salmon, K. Doery, P. Dance, J Chapman, R. Gilbert, R. Williams & R. Lovett. 2018. Defining the Indefinable: Descriptors of Aboriginal & Torres Strait Islander Peoples’ Cultures & their Links to Health & Wellbeing, ANU: Canberra, <http://dx.doi.org/10.25911/5bdbcdf5c89a7>; Health InfoNet: <https://healthinonet.ecu.edu.au/learn/cultural-ways/>; Schulz et al, Caring for country and the health of Aboriginal and Torres Strait Islander Australians, *MJA* 207 (1) j 3 July 2017; https://webcache.googleusercontent.com/search?q=cache:jZkJ75wf28QJ:https://www.mja.com.au/system/files/issues/207_01/10.5694mja16.00687.pdf+&cd=4&hl=en&ct=clnk&gl=au&client=firefox-b

Students will...

- Gain an appreciation of the connections between Aboriginal and Torres Strait Islander Peoples and their stories and connection to Country and develop an awareness of how pressure on the connections can impact an individual or community’s health and well-being.

Questions for inquiry-based learning

- How do stories link to health and well-being?
- How do we then create/allow for opportunities for Aboriginal and Torres Strait Islander Peoples’ to maintain/re-establish connections to promote individual and community health and well-being?

Example classroom task

Investigate star stories for what they tell people about how they live and the connections to Country. Develop a cyclical diagram that shows the connection between people, story and country. Consider the forces that may put pressure on the cycle and the impact that a break in the cycle may have on an individuals and/or community’s health and wellbeing. Develop strategies that may promote connections to culture and therefore increase health and wellbeing.