

Aboriginal and Torres Strait Islander histories and cultures resources: Mathematics

Supporting the implementation of the
Australian Curriculum cross-curriculum priorities

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www.qsa.qld.edu.au

Queensland Studies Authority

What are the Australian Curriculum cross-curriculum priorities?

The Australian Curriculum¹ 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. 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 inter-connected 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.

Mathematics

The Australian Curriculum: Mathematics values Aboriginal and Torres Strait Islander histories and cultures. It provides opportunities for students to appreciate that Aboriginal societies and Torres Strait Islander societies have sophisticated applications of mathematical concepts.

Students will explore connections between representations of number and pattern and how they relate to aspects of Aboriginal cultures and Torres Strait Islander cultures. They will investigate time, place, relationships and measurement concepts in Aboriginal contexts and Torres Strait Islander contexts. Students will deepen their understanding of the lives of Aboriginal peoples and Torres Strait Islander peoples through the application and evaluation of statistical data.

The Australian Curriculum: Mathematics is organised around the interaction of three content strands and four proficiency strands.

The content strands are:

- Number and Algebra
- Measurement and Geometry
- Statistics and Probability.

The proficiency strands are:

- Understanding
- Fluency
- Problem Solving
- Reasoning.

The proficiency strands describe the actions in which students can engage when learning and using the content. They are incorporated into the content descriptions of the three content strands. This approach has been adopted to ensure students' proficiency in mathematical skills develops as they progress through the curriculum and becomes increasingly sophisticated over the years of schooling.

Aboriginal and Torres Strait Islander frameworks

A Mathematics 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 on the Queensland Studies Authority (QSA) website at: www.qsa.qld.edu.au/3035.html

Holistic approach to Indigenous studies	<p><i>My Land My Tracks: A framework for the holistic approach to Indigenous studies</i> 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.</p> <p>education.qld.gov.au/schools/indigenous/services/cultural-local.html</p>
Approaches: conceptual, holistic and spiralling	<p>The approaches outlined in the QSA <i>Aboriginal and Torres Strait Islander Studies Handbook 2010</i> 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.</p> <p>www.qsa.qld.edu.au/8848.html#teaching</p>
Indigenous inquiry skills	<p>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:</p> <ul style="list-style-type: none"> • reciprocating knowledge • deep listening • reflecting and revisiting • respectful interactions • managing and recognising community protocols. <p>Indigenous principles such as community responsibility, lifelong learning, cross-generational resonance and revisiting inform the development of these skills.</p> <p>www.qsa.qld.edu.au/12798.html</p>
8 Aboriginal Ways of Learning	<p>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.</p> <p>8ways.wikispaces.com</p>

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: Mathematics. The resources are organised by content strand and adaptable to multiple year levels.

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.

Number and Algebra

<p>Content strand <i>Number and Algebra</i></p>	<p><i>Culture and mathematics</i>, available on the QSA website, unpacks <i>Maths as Storytelling (MAST)</i> which is a pedagogical approach that explores new ways of teaching algebra to students who are underachieving. The approach focuses on stories and explores how symbols and their meanings can communicate these stories. www.qsa.qld.edu.au/3035.html > Resources > Culture and mathematics</p> <p>Traditional Aboriginal society in Western Australia did not use the decimal (base 10) "two hand" number system. Instead, it used a base five or "one hand" number system. The GECKOS website provides an explanation of how to use the "one hand" number system. geckos.ceo.wa.edu.au/secondary/mathematics/Pages/number.aspx</p> <p>The 2010 Australian Council for Educational Research Conference focused on teaching Mathematics. The session titled <i>Using mental representations of space when words are unavailable: Studies of enumeration and arithmetic in Indigenous Australia</i> describes the nature and use of spatial strategies in an addition task, comparing children who speak only languages in which counting words are not available with children who were raised speaking English. Speakers of Warlpiri and Anindilyakwa at two remote sites in the Northern Territory were tested. These children used spatial strategies extensively. English-speaking children used spatial strategies very infrequently, but relied on an enumeration strategy supported by counting words to do the addition task. research.acer.edu.au/research_conference/RC2010/17august/3/</p> <p>The Australian Association of Mathematics Teachers (AAMT) Inc. has established a four-year project called <i>Make it count</i> to develop an evidence base of practices that improve Indigenous students' learning in Mathematics and numeracy. makeitcount.aamt.edu.au <i>Make it count</i> resources include interactive websites, videos, conference presentations and links and papers about embedding Indigenous perspectives and improving teaching and learning outcomes. makeitcount.aamt.edu.au/Resources/Indigenous-education</p>
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Measurement and Geometry

Content strand <i>Measurement and Geometry</i>	<p>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/</p> <p>The QSA provides 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.</p>
	<p>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 to tell time. www.assa.org.au/nacaa > Astronomy and Australian Indigenous People.</p>
	<p>The Australian Association of Mathematics Teachers (AAMT) Inc. has established a four-year project called <i>Make it count</i> to develop an evidence base of practices that improve Indigenous students' learning in Mathematics and numeracy. makeitcount.aamt.edu.au</p> <p><i>Make it count</i> resources include interactive websites, videos, conference presentations and links and papers about embedding Indigenous perspectives and improving teaching and learning outcomes. makeitcount.aamt.edu.au/Resources/Indigenous-education</p>
	<p>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.</p> <p>This webpage gives an outline of lessons about shapes, symbols and patterns. 8ways.wikispaces.com/Basic+maths+remedial</p>

Statistics and Probability

Content strand <i>Statistics and Probability</i>	<p>The Australian Association of Mathematics Teachers (AAMT) Inc. has established a four-year project called <i>Make it count</i> to develop an evidence base of practices that improve Indigenous students' learning in Mathematics and numeracy. makeitcount.aamt.edu.au</p> <p><i>Make it count</i> resources include interactive websites, videos, conference presentations and links and papers about embedding Indigenous perspectives and improving teaching and learning outcomes. makeitcount.aamt.edu.au/Resources/Indigenous-education</p>
	<p>A paper titled <i>The Mathematics of Indigenous Card Games: Implications for Mathematics Teaching</i> was presented at the 27th Annual Conference of the Mathematics Education Research Group of Australasia (2004). It explores the mathematical nature of two probability card games played by Indigenous children and explores the potential of these games to foster mathematical understandings. www.merga.net.au/node/38?year=2004 > Research papers.</p>

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