



Australian Curriculum Review Consultation

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 sta.org.au
ABN: 71 626 822 845



To the Australian Curriculum, Assessment and Reporting Authority,

Thank you for the opportunity to provide feedback in the Australian Curriculum Review Consultation.

Science & Technology Australia (STA) is the nation's peak body for the science and technology sectors. Through our 85 member organisations, we represent more than 88,000 scientists, mathematicians, engineers and technologists. Our members include specialist scientific societies, research institutes, groups of maths and science educators, and research strategy bodies such as councils of deans.

Strong skills in maths and science will be crucial for the next generations of young Australians to compete for current and new jobs. This is especially true for major new emerging technologies such as AI, machine learning and quantum computing. These frontier technologies are poised to reshape almost every job across our economy in the decades ahead. We must equip Australia's children with strong maths and science skills to give them the very best chance to succeed.

Recent Australian results in international benchmark tests in science and mathematics are of deep concern. They show Australian students are slipping backwards in these core capabilities compared to their peers in our economic competitor nations.

A review of the national curriculum is an opportune moment to ensure Australian students are getting a world-class education that makes them competitive in a global marketplace. Many of the proposed changes seek to do exactly that.

In that context, however, STA's member organisation - the Australian Mathematical Sciences Institute (AMSI) - has expressed some concerns about some of the proposed revisions to the maths curriculum. STA understands AMSI has offered to consult with ACARA to further refine the proposed maths curriculum changes - and we encourage ACARA to accept this offer.

In line with our strong commitment to reconciliation, STA supports the proposed changes to update the cross-curriculum priority on Aboriginal and Torres Strait Islander Histories and Cultures. Every Australian student should have access to a high-quality curriculum and teaching materials which deepens their understanding and pride in Australia's long history as home to the world's oldest continuing cultures. This is important to the citizenship of every young Australian.

We thank ACARA for its careful consideration of our feedback.

Yours sincerely,

Associate Professor Jeremy Brownlie
President
Science & Technology Australia

Misha Schubert
CEO
Science & Technology Australia

Proposed revisions to the Foundation to Year 10 (F–10)

Australian Curriculum: Science

Science & Technology Australia supports many of the changes outlined in proposed revisions to the Foundation-to-Year 10 (F–10) Australian Curriculum: Science.

We specifically highlight our support for the proposed addition of:

- New content to expand students' understanding of climate systems;
- Further material on the nature of science; and
- Deepening student understanding of intercultural protocols in research and fieldwork.

STA also supports a proposed change to include content as early as the primary school years on career choices - noting student interests are increasingly developed at a young age.

However, we would also urge ACARA to retain an express focus on science careers, rather than rolling science careers into broader careers content - noting this is an area of national priority workforce development for Australia.

The introduction of climate systems.

Climate change is an urgent challenge in Australia and internationally. Today's generations of young Australians will need to have a deeper understanding of climate change prevention, mitigation and adaptation than those before them.

The magnitude of this challenge makes understanding climate systems a fundamental part of every child's education.

Amid evidence that children are growing increasingly anxious about the scale of the climate challenge, introducing curriculum content that helps students to deepen their knowledge of climate systems and strategies to tackle climate change can help to reduce such anxiety.

Nature of Science

STA strongly supports the reframing of content for students up to year 6 on the nature of science.

This would extend students' knowledge beyond basic scientific principles to also include scientific thinking and how scientists go about their work.

Being able to understand the scientific process, experimentation, developing theories and evaluating evidence are useful skills that can be applied in a wide array of fields.

A proposed focus on the evaluation of evidence for years 7 - 10 is an important next step in this evolution of science education.

In combination, these proposed changes would ideally build a solid foundation both for students who go on to study science at a tertiary level - but also for our entire future workforce.

Intercultural science

The inclusion of new content on intercultural science from year 5-10 is a positive development.

It is important that all students understand some basic principles of how to work across cultures and to build mutual understanding. In the wider work of science, there have been important

developments in protocols for conducting research and fieldwork and with Aboriginal and Torres Strait Islander communities.

A strong and growing body of evidence also highlights that strong diversity in teams and organisations is linked to innovation, productivity and excellence. Encouraging students to consider problems from diverse angles and viewpoints is important for good design thinking.

Science Careers

STA agrees that teaching students about careers should begin as early as primary school.

We do however think it is important to continue to emphasise career opportunities in science, noting this is a national priority workforce area for Australia. This should include encouragement for students from a wide diversity of backgrounds to pursue careers in science.

Important strides have been made to tackle the under-representation of women and girls in STEM in recent decades. After 50 years of the “draw a scientist” study, we are now seeing 58% of 11-year old girls drawing a woman when asked to draw a scientist (Miller et al. 2018). This shift in perception has been driven by dedicated efforts to show children (and girls in particular) that STEM is for them (Cheryan et al. 2014).

Providing education on science careers should not only have a focus on women in science but other areas of diversity. By providing students with access to science role-models that are women, people of colour, people with disabilities, LGBTQIA+ scientists and Aboriginal and Torres Strait Islander peoples, students in these cohorts are more likely to see themselves in future science careers.

STEM jobs are being created at 1.5 times the rate of non-STEM jobs, and skills gained through STEM education will be essential in many of the new jobs in the years and decades ahead. In this context it is vital that we promote the opportunities and applicability of STEM in career pathways so that Australian students are prepared for the future ahead.

Proposed revisions to the Foundation to Year 10 (F–10) Australian Curriculum: Mathematics

STA acknowledges ACARA’s intention to ensure the mathematics curriculum not only teaches core foundational maths skills and knowledge - but also enhances students problem-solving skills. This includes an ability to apply strong core maths skills and knowledge to the world around them.

STA’s member organisation the Australian Mathematical Sciences Institute (AMSI) has articulated some concerns with the proposed removal of some core mathematical concepts. AMSI has also suggested the justifications for these changes are not sufficiently clear or detailed.

STA understands AMSI has offered to consult with ACARA to further refine the proposed maths curriculum changes - and we encourage ACARA to accept this offer. Such consultations would have the added benefit of identifying what core maths skills are needed to enhance the problem-solving and applied learning approach which ACARA seeks.

Both fundamental and applied mathematical skills are important. Fundamental maths is a core skill needed by a specialised future workforce - particularly in emerging and frontier technologies. Applied maths skills enable students to apply maths skills and reasoning to a wide array of real-world challenges.

Proposed update to the cross-curriculum priority on Aboriginal and Torres Strait Islander Histories and Cultures

This proposed update to the curriculum evolves the content covered in the existing [cross-curriculum priority on Aboriginal and Torres Strait Islander histories and cultures](#).

The previous cross-curriculum priority included education resources on [how science and maths are embedded in Aboriginal and Torres Strait Islander knowledges, practices and cultures](#). This is a treasure trove of resources.

The new content would update the organising ideas in this cross-curriculum priority - and STA supports the proposed updated content.

Among other changes, it would include recognition that Aboriginal and Torres Strait Islander peoples have occupied this continent for at least 60,000 years - and are custodians of the world's oldest continuing cultures.

It would also recognise the Native Title Act 1993 - a legislative watershed that followed the landmark Mabo Judgement of the High Court of Australia in 1992. This Act shapes the Australian modern legal framework on traditional ownership of land and a complex array of land ownership and use agreements.

As the peak body for the science and technology sector, Science & Technology Australia strongly supports teaching of Aboriginal and Torres Strait Islander histories and culture to all students.

This includes how science and mathematics are embedded in our country's deep knowledge systems.

STA proposes one further improvement to this cross-curriculum priority. While the proposed updates mention the sophisticated political, economic and social organisation systems, there is no mention of the unique scientific, technological or mathematical advances which Aboriginal and Torres Strait Islander Peoples have developed.

Aboriginal and Torres Strait Islander peoples have made significant contributions in science and technology including curation and active management of land and ecology through to naming the stars and constellations in the sky. We propose that Aboriginal and Torres Strait Islander advancements in science and technology be included in the organising ideas.

References

- Cheryan, Sapna, Sianna A. Ziegler, Victoria C. Plaut, and Andrew N. Meltzoff. 2014. "Designing Classrooms to Maximize Student Achievement." *Policy Insights from the Behavioral and Brain Sciences* 1 (1): 4–12. <https://doi.org/10.1177/2372732214548677>.
- Miller, David I., Kyle M. Nolla, Alice H. Eagly, and David H. Uttal. 2018. "The Development of Children's Gender-Science Stereotypes: A Meta-Analysis of 5 Decades of U.S. Draw-A-Scientist Studies." *Child Development* 89 (6): 1943–55. <https://doi.org/10.1111/cdev.13039>.