



## THE MATHEMATICAL SCIENCES IN AUSTRALIA: A VISION FOR 2025 Decadal plan for Mathematical Sciences (2016–2025)

### Annual report: year 3 (2018–19)

The report aligns developments within the Australian Mathematical Sciences with specific recommendations of the Decadal Plan. During the 3<sup>rd</sup> year subsequent to the release of the plan, new developments and initiatives can similarly be aligned.

*1.1 Australian governments, schools and universities should urgently increase their provision of professional development for existing out-of-field school teachers of mathematics and enhance their commitment to the recruitment and retention of new, properly qualified staff*

In June 2018, the Victorian Department of Education and Training published the 'Literacy and Numeracy Strategy Phase 2: Achieving Excellence and Equity in Literacy and Numeracy'. The strategy supports teachers to engage in ongoing professional learning that enhances their practice. In 2018–2019 the Victorian Government allocated \$22.1 million to the strategy's implementation across a four-year period, for purposes including

- The Victorian Numeracy Portal—this includes the Mathematics Curriculum Companion, which assembles online resources and teaching ideas.
- Other professional learning opportunities delivered through the Bastow Institute of Educational Leadership (Bastow) that target schools' literacy and numeracy leaders.

The Victorian Government allocated an additional \$187 million to the Middle Years Literacy and Numeracy Support Initiative in October 2018. The initiative aims to provide intensive, individualised support to students in Years 8 to 10 that are at risk of finishing school without the foundational skills needed for future work or study. From 2019, nominated teachers will receive professional learning through Bastow to improve literacy and numeracy outcomes for these students.

*1.2 Universities, governments and the mathematics teaching profession should set national standards to ensure that mathematics teachers are properly qualified and to ensure that there are universities capable of preparing mathematics teachers in every state and territory.*

On July 9<sup>th</sup> 2018, the Federal Government announced that high schools would have to employ maths teachers who have studied mathematics at university level.

- <https://ministers.education.gov.au/birmingham/address-conference-australian-science-teachers-association-conasta>
- <https://www.abc.net.au/news/2018-07-09/every-high-school-to-get-specialist-maths-science-teachers/9956880>

The Minister's speech draws attention to report headed by David Gonksi AC:

- [https://www.appa.asn.au/wp-content/uploads/2018/04/20180430-Through-Growth-to-Achievement\\_Text.pdf](https://www.appa.asn.au/wp-content/uploads/2018/04/20180430-Through-Growth-to-Achievement_Text.pdf)

Through growth to achievement: 'Report of the review to achieve educational excellence in Australian Schools' (Gonski 2.0 Review; March 2018) as well as that Chaired by Australia's Chief Scientist Dr Alan Finkel:

- <http://www.educationcouncil.edu.au/site/DefaultSite/filesystem/documents/Reports%20and%20publications/Publications/Optimising%20STEM%20Industry-School%20Partnerships%20-%20Final%20Report.pdf>

Optimising STEM industry-school partnerships: inspiring Australia's next generation. The Executive summary of the latter contains statements of relevance to recommendation 2.1 of the decadal plan; see below.

Some reactions: Dr Anne Forbes (Macquarie) : 'In NSW, primary teacher education students are able to complete NESA (New South Wales Education Standards) recognized teaching specialization in a priority area, which includes mathematics, or science and technology, so surely we can at least expect the same for high school teachers'.

- <https://www.theeducatoronline.com/k12/news/experts-respond-to-specialist-teachers-plan/252187>

*1.3 Governments and other teacher employers should ensure that there are rewarding career paths for mathematics teachers in primary and secondary schools by providing excellent teachers with opportunities for promotion, allowing the best to lead the ongoing development of mathematics teaching within their school, across school clusters, and at regional and state/territory levels.*

From the Minister's speech (<https://www.education.gov.au/alternative-pathways>) cited in recommendation 1.2 above:

'We're also looking at ways in which we can support more high performing individuals who have outstanding skills in fields such as science, technology or coding into our classrooms. As part of the 2018-19 Budget, our Government has announced that we'll be supporting alternative pathways into teaching through the High Achieving Teachers Program. Providers who'll be selected through a tender process, will be funded to select, develop and place around 200 participants who have the potential to become high quality teachers in Australian secondary schools experiencing- schools who may be experience teach workforce challenges, such as a shortage of STEM teachers.'

*2.1 Australian universities should immediately plan for the staged reintroduction of at least Year 12 intermediate mathematics subjects as prerequisites for all bachelors programs in science, engineering and commerce. This will send an unequivocal message to school communities and significantly improve educational outcomes for tertiary students.*

The Chief Scientist report 'Optimising STEM industry-school partnerships: inspiring Australia's next generation' referred to in recommendation 1.2 above state, in the Executive Summary, that 'the decline in the number of Australian students selecting advanced subjects in upper secondary to

maximise their tertiary career choices is occurring because they are receiving the wrong signals from the tertiary sector. [One such] unhelpful signal is the erosion of mathematics prerequisites over the years. The submissions and consultations did not recommend compulsory mathematics, nor did they recommend that prerequisites for physics and chemistry be reinstated. They did, however, consistently recommend that mathematics prerequisites be applied to courses and specialisations that require mathematics, on the basis that mathematics is the language of science and that mathematics skills need constant development and cannot be acquired effectively in a short bridging course.'

In the Minister's address referred to in recommendation 1.2, it is said 'Incentives to stick at maths and science have diminished as universities have dropped or withdrawn prerequisites, though recently I was very pleased, very pleased with the announcement by the Australian National University that it is making maths and English prerequisites for future admissions. And I also welcome the University of Sydney's planned requirement for students across a number of STEM courses to have passed at least intermediate level maths at a minimum from 2019.'

*2.2 Subject scaling should not discourage students from choosing advanced subjects while at high school, and mathematical awareness programs made available demonstrating the career choice benefits and financial and social advantages of completing advanced courses.*

A Sydney Morning Herald editorial on this issue, dating from May 2015, can be found at

- <https://www.smh.com.au/national/high-school-maths-and-atar-solutions-are-a-nobrainier-20150521-gh6c1x.html>

In the year 1 report, an ATAR bonus for taking higher level maths subjects from universities in Western Australia was noted.

From 2019 a similar initiative, referred to as the Universities Language, Literacy and Mathematics Scheme, is being offered by universities in South Australia and the Northern Territory.

- <https://www.satac.edu.au/adjustment-factors>

*3.1 Australian universities should collaborate with the discipline to source seed funding for a new national research centre in mathematical sciences with the objective of enhancing connectivity with industry and strengthening the international collaboration and visibility of Australian research in mathematics and statistics.*

During 2018 donor support made possible the formation of the University of Sydney Mathematical Research Institute.

- <https://sydney.edu.au/research/centres/mathematical-research-institute.html>

The institute's visitor program funds more than 30 visiting researchers each year in all areas of the mathematical sciences.

*4.1 Universities, governments, funding councils and peak industry groups should review and seek to address the causes of low participation in the mathematical sciences among girls and young women, and among Australians living in rural and regional areas.*

On September 11<sup>th</sup> 2018, a joint media release by the Minister for Industry, Science and Technology Karen Andrews, and the Minister for Women, Kelly O'Dwyer, announced funding for a 10-year plan for women in STEM. This is one of a suite of new measures and \$4.5 million in new funding to encourage more women to pursue STEM education careers.

- <https://ministers.pmc.gov.au/odwyer/2018/10-year-plan-women-stem>

The response of the University of Melbourne on this decadal plan can be found at

- [https://about.unimelb.edu.au/\\_data/assets/pdf\\_file/0031/59836/UoM\\_Submission\\_Women\\_in\\_STEM\\_Decadal\\_Plan.pdf](https://about.unimelb.edu.au/_data/assets/pdf_file/0031/59836/UoM_Submission_Women_in_STEM_Decadal_Plan.pdf)

Also relevant is that, as part of the \$1.1 billion [National Innovation and Science Agenda](#), the Australian Government has allocated over \$64 million to fund early learning and school STEM initiatives under the Inspiring all Australians in Digital Literacy and STEM measure. This includes two measures: Embracing the Digital Age (school initiatives – \$51 million) and Inspiring STEM Literacy (early learning initiatives – \$14 million).

**Prepared by the National Committee for Mathematical Sciences, Australian Academy of Science**

**July 2019**