

MATHEMATICAL SCIENCES: FOUNDATION FOR AUSTRALIA'S FUTURE

Policy Priorities
realising
AMSI's long-term
strategic goals

OCTOBER 2020

About AMSI

In high demand across all industry sectors, expertise in the mathematical sciences is central to powering Australia's STEM capability, enabling new technologies and innovation.

As Australia's only not-for-profit national voice and champion for mathematics and statistics, the Australian Mathematical Sciences Institute (AMSI) is working with schools, universities, industry, philanthropists, government and the community in shaping policy and skilling Australia for the future.

Building engagement and capability, AMSI is driving programs strengthening the mathematical disciplines—enhancing their impact and importance in Australian education, research, innovation and industry.

A collaboration of Australia's university mathematics departments, AMSI's influential and growing membership network comprises over 30 universities together with mathematics societies and government agencies.

Vision

That Australia values mathematics, and mathematical sciences propel Australia

Mission

Championing the mathematical sciences for Australia's advancement

AMSI's Long-term Goals

Australia recognises and enjoys the benefit of mathematical sciences

Australia values mathematical sciences research and its contributions

Overall participation in high-level mathematical sciences at schools and universities meets Australia's needs

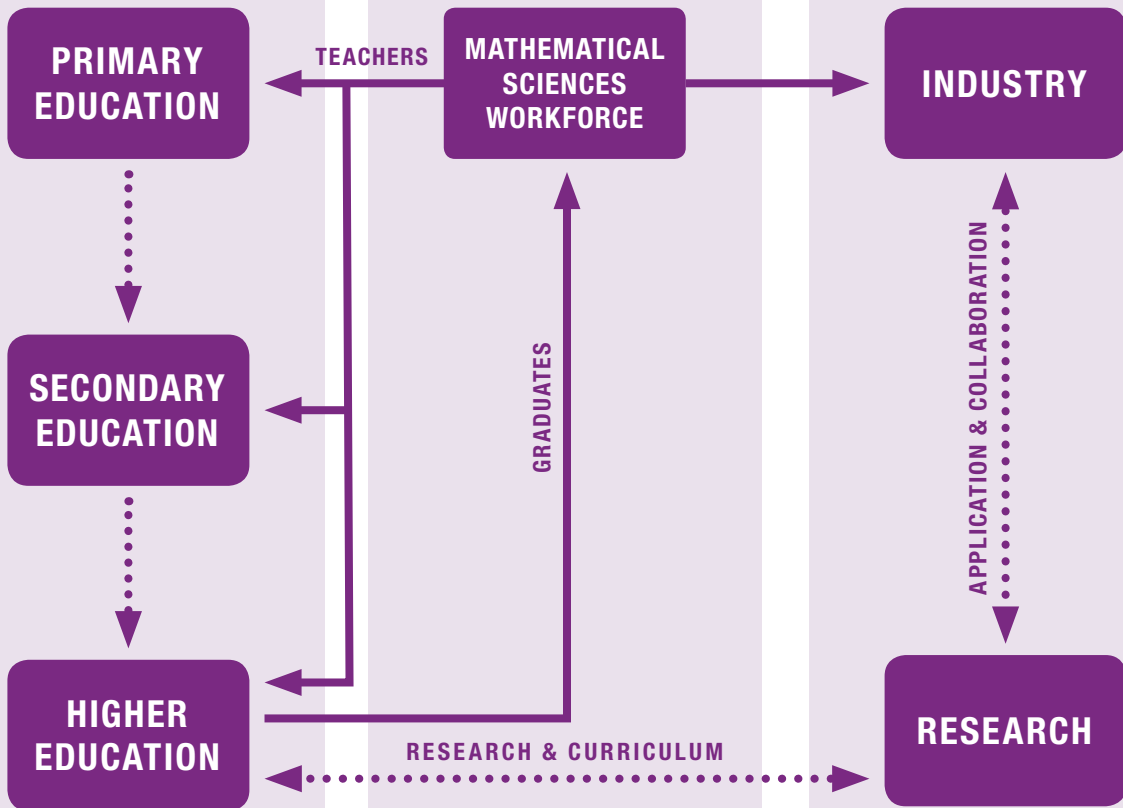
Australia recognises the necessity for diversity in the mathematical sciences workforce

Australia has balanced supply and demand for the Australian mathematical sciences workforce

Equity and Diversity

Mathematical Education

Industry Engagement



A Foundation for **Australia's future**

Human civilisation would not be what it is today without mathematical sciences

Grown from the imagination of mathematicians and philosophers, mathematics attempts to make sense of the world by studying motions and shapes, discovering patterns and ordering information by using logic and reasoning. An enduring source of beauty and elegance, mathematics and statistics are also the key to the sciences: a powerful source of techniques and insights, inspiring and underpinning much of modern progress.

The COVID-19 pandemic has once again underscored mathematical sciences' fundamental importance, as scientists trained in computational epidemiology assist governments and health authorities in their planning and decision making.

Mathematics and statistics cover a broad range of activities at different levels

To navigate life successfully in modern-day Australian society everyone uses certain numerical and analytical skills as a minimum. Those with careers in a range of disciplines, such as engineering, science and commerce will apply more advanced mathematical and statistical skills. Researchers in pure and applied statistics and mathematics seek to stretch the human knowledge that informs innovations in society and industry.

The mathematical sciences workforce covers a wide range of professions, from education in schools and universities to mathematical applications in industry and fundamental research.

The Australian Mathematical Sciences Institute (AMSI) advocates for a strong, healthy and inclusive mathematical sciences discipline in Australia at all levels

A healthy discipline should include a diverse mathematical workforce that offers attractive career paths. To be inclusive, it also requires the provision of a high-quality education in mathematics for all Australians, regardless of their background, and increased engagement with more advanced levels of mathematics in senior secondary schools. Lastly, a strong discipline presupposes mutual understanding and engagement between industry and the mathematical sciences as well as innovative fundamental research.

Based on evidence published in the *State of Mathematical Sciences 2020 – 7th discipline profile of mathematics and statistics in Australia* AMSI proposes immediate action in three areas of priority in line with AMSI's long-term strategic goals for the mathematical sciences in Australia:

- **Equity and diversity**
- **Mathematical education**
- **Industry engagement in university teaching and research**

These priority areas inform AMSI's current advocacy for the mathematical sciences and add to its ongoing programs to support mathematical research and education in schools and at universities.

Policy Priority

Equity and Diversity

1. Diversity in participation of under-represented groups in education and in the workforce

- A nationwide campaign to increase careers awareness, including among female students, parents, teachers, career professionals, industry and the general community, promoting the value of mathematics for career options and as a pathway to national prosperity.
- A focus on the retention and promotion of women in the academic disciplines in Science, Technology, Engineering and Mathematics through measures including those recommended by the Science in Australia Gender Equity (SAGE) initiative and the Australian Mathematical Society, in particular its Women in Mathematics Special Interest Group.
- Targeted measures aimed at increasing retention of female and gender-diverse mathematical sciences students that support their progression from undergraduate study to Honours, Masters and PhD.
- Targeted measures aimed at increasing participation of culturally and linguistically diverse people.

2. Access to a high-quality mathematics education for all, including students in rural, remote and socio-economically disadvantaged communities

- A national strategy to increase mathematics capacity for primary and secondary teachers in regional and remote Australia.
- Mathematics professional development programs for teaching support staff, especially ATSI staff, in regional and remote areas with high ATSI enrolments and high teacher turnover.
- Shared provision, through distance education, of intermediate and higher mathematics subjects in Years 11 and 12 in regions with low enrolments in these subjects.

Policy Priority

Mathematical Education

3. Increased confidence of educators teaching maths in primary schools

- Improvement, standardisation and training-support of mathematics content in pre-service primary teacher training.
- Cooperation between AMSI, AMSI member universities, mathematics teacher associations and school systems to provide professional development for primary teachers to enhance competency and reduce mathematics anxiety.
- Embedded, appropriately trained mathematics specialists in every primary school.

4. A strong mathematics teaching workforce in secondary schools

- Data collection by teacher registration boards to understand teacher discipline competencies and enable workforce planning to deal with mathematics teacher shortages.
- Support and training for out-of-field teachers, and teachers who obtained mathematics teacher qualifications without taking subjects from formal mathematics departments, to grow content knowledge and pedagogical expertise to teach mathematics.
- Financial and other incentives to students training to become mathematics teachers.
- Early career support and structured and ongoing professional learning for mathematics teachers, including discipline content delivered by subject matter experts.
- Embedded mathematics discipline leaders in every secondary school.

5. Increased participation by senior secondary school students in the most appropriate level of mathematics necessary for their further education and careers

- Structural impediments, disincentives or disinformation preventing students from choosing mathematics in Year 12 at the intermediate or higher level to be identified and, where possible, removed.
- Universities to provide clear and timely information to secondary schools, students, career professionals and parents about the level of mathematics necessary to undertake degrees and subjects so that students can make informed subject choices in Years 11 and 12.
- Universities to provide incentives to secondary school students to participate in intermediate or higher mathematics subjects, preferably through clearly stated degree or subject prerequisites, or alternatively via bonus or ATAR adjustments, or other means.
- Universities to provide achievable pathways for students without the necessary prior mathematics knowledge from secondary school to gain the knowledge needed for successful participation in those university subjects or degrees.

Policy Priority

Industry Engagement in University Teaching and Research

6. Optimal work-readiness of mathematics graduates at all levels (Bachelor to PhD)

- Dialogue between mathematical sciences departments and graduate employers to improve technical and generic skills of graduates and establish research collaboration pathways.
- Industry and agency collaborations with mathematical sciences departments in computationally driven developments including big data, large scale and long-term simulations, industrial optimisation and design.
- Embedding of commercialisation programs into existing university research training along with STEM research internships.
- Exploration by the learned societies of professional accreditation of mathematical sciences degrees.

7. Increased research impact and collaboration with industry

- Broad measures of research impact that reward outcomes of commercial engagement while continuing to reward successful academic performance in both fundamental and applied research.
- Identification of mechanisms to boost Linkage Grant applications by mathematical sciences departments.

For further information
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Government Agencies

Australian Bureau of Statistics
Bureau of Meteorology
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Societies

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Australian Mathematical Society (AustMS)
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Mathematics Education Research Group of Australia (MERGA)
Statistical Society of Australia (SSA)

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List of members as of October 2020