



Victorian STEM investment critical for driving innovation

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Australian Academy of
Technological Sciences
& Engineering





Science, technology, engineering and mathematics (STEM) drives innovation and productivity

Australia must produce more scientifically skilled and literate adults. In Victoria, STEM professionals are needed to drive the energy transition, foster a productive and sustainable economy, protect and care for nature, and develop a globally competitive advanced manufacturing sector onshore.

STEM brings significant economic returns – every dollar spent on research and development brings \$3.50 back to the economy¹. We should aspire not just to meet our skills needs but to be the leading STEM state in Australia.

The Royal Society of Victoria, Australian Academy of Technological Sciences and Engineering, and the Science Teachers' Association of Victoria call on the Victorian Government to enhance the status of science in the Victorian Curriculum, support a higher standard of STEM teaching, and unlock access to more hands-on experience-based learning in the state to drive aspiration, access and attainment for more students. This could be underpinned by the establishment of a STEM Education Future Fund to provide dedicated resourcing.

While Victoria has fostered many remarkable Australians recognised for their outstanding contributions to scientific and technological discovery and innovation, we are not producing enough STEM- skilled professionals to meet current and future needs and aspirations.

Skilled migration can be utilised as a short-term solution for workforce needs, but global competition for STEM talent is fierce – and Australia is a small player.² We must act now to inspire, engage and educate more young Victorians for these opportunities to ensure Victoria has a STEM-skilled workforce in the decades to come. It is important to sustain a culture of innovation without an over-reliance on expertise from other countries, which may be in short supply in the future.

“Quality teachers inspire students and encourage a commitment to lifelong learning. Quality learning requires innovative teaching models and delivery tailored to students’ preferred mode of learning and cultural background.”

“Australians need access to a quality education and the skills they will need to participate in the workforces of tomorrow.”

“These include skills to innovate and adopt new technologies, best practice and global growth opportunities.”

Victorian Government submission in response to the Australian Universities Accord Discussion Paper

1. CSIRO, 2021. Quantifying Australia’s returns to innovation. Accessed from < <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation> >

2. Australian Academy of Technological Sciences and Engineering (ATSE), 2022. Submission to the Employment White Paper consultation. Accessed from < <https://www.atse.org.au/wp-content/uploads/2022/12/SBM-2022-12-01-Employment-White-Paper-submission.pdf> >

The National Skills Commission estimates that nine out of 10 new jobs created between 2023 and 2028 will require skills developed through post-secondary education and training.³ In Victoria, 39,300 new education and training workers, and 31,600 new professional, scientific and technical services workers will be needed by 2026 (from 2023) to meet labour market needs – representing two of the three fastest growing sectors.⁴

We must increase Victorian students' engagement with STEM

In its submission to the Australian Universities Accord Discussion Paper, the Victorian Government recommended “that the Commonwealth Government continues developing initiatives to encourage greater participation and diversity in STEM-related higher education courses.”⁵ This clearly cannot be achieved without first lifting enrolments and completion of STEM subjects in year 12, for all kinds of students, from across the state.



A good science education has also long been recognised as “the key to good citizenship”, providing a shared standard of truth.⁶ All Victorian primary and secondary students will need a solid, contemporary science education to ensure they can understand the increasingly complex world in which we live, engage with rapidly evolving technologies, make use of new and emerging technologies, critically engage with a deluge of information and misinformation and, in turn, develop upcoming generations of science-literate Australians.

A STEM education must be available to all Victorian students, including those from regional, rural and remote areas, and from low socio-economic backgrounds, whose STEM educational outcomes lag behind their peers.⁷ Lifting STEM participation should be inclusive of underrepresented cohorts, including girls, Aboriginal and Torres Strait Islander students, students from rural and regional areas, and students with disabilities.

“To increase the STEM workforce, three key policy levers are available: local recruitment, retention, and migration. Addressing the skilled migration backlog is an important short-term mechanism to alleviate skills shortages. For long-term planning for STEM-skilled jobs, the Government must design interventions to recruit, train, and retain Australians into these careers.”

*ATSE submission to the
Employment White Paper*

3. Jobs and Skills Australia, 2023. Employment Projections. Accessed from <<https://www.jobsandskills.gov.au/data/employment-projections>>

4. Victorian Skills Authority, 2024. State of the Victorian Labour Market. Accessed from <<https://content.vic.gov.au/sites/default/files/2023-10/State-of-the-Victorian-labour-market-report.pdf>>

5. Victorian Government, 2023. Victorian Government Submission in Response to the Australian Universities Accord Discussion Paper. Accessed from <<https://www.education.gov.au/system/files/documents/submission-file/2023-05/Victorian%20Government.pdf>>

6. Fawns, R. (1998). The Badge of Utility and the Key to Good Citizenship - The Argument for a General Science in England and Australia 1935 - 1945. *Melbourne Studies in Education*, 39(2), 115-140. doi:10.1080/1750848980956320

7. Weink, M 2020. The State of Mathematical Sciences 2020. Australian Mathematical Sciences Institute. Accessed from <<https://amsi.org.au/wp-content/uploads/2020/05/amsi-discipline-profile-2020.pdf>>

A crisis in STEM engagement and in science teaching

Participation rates in senior secondary science and mathematics courses have declined nationally since 2019⁸, despite various efforts to uplift enrolments.⁹

We are concerned that this reveals the poor cultural status of scientific knowledge and skills in Victoria, which is associated with a low regard for the intrinsic value of learning and teaching and, in turn, the status of the teaching profession in our state.¹⁰

Teachers and coordinators of Science and STEM play a pivotal role in educating students and fostering their understanding and appreciation of science, providing the foundation of the skilled workforce Victoria seeks to secure. As Victoria seeks to revitalise the teaching workforce generally, we propose measures to improve the status and conditions of the profession in order to secure both the development and retention of a highly skilled workforce and optimal outcomes for Victorian students. We seek to attract, develop, reward and retain more skilled professionals in science teaching to build a thriving community of passionate educators, who will inspire the next generation. These recommendations are drawn from the collective expertise of our organisations, including from ATSE's 2022 Our STEM Skilled Future report, which engaged over 120 leaders across industry, academia and government.¹¹

What is working well

- Victorian Government support for Tech Schools and Specialist Science Centres
- Victorian Government support for enrolment in teaching degrees by providing scholarships for students entering secondary teacher education since beginning of 2024
- Victorian Government support for professional learning for in-service teachers and teacher leaders (e.g., [Victorian Academy of Teaching and Leadership](#), [Primary Maths Science Specialists program](#), [Secondary Maths and Science Initiative for out-of-field teachers](#).)



8. Department of Industry, Science and Resources, n.d. Year 12 subject enrolment in STEM and other fields. Accessed from < <https://www.industry.gov.au/publications/stem-equity-monitor/primary-and-secondary-school-data/year-12-subject-enrolment-stem-and-other-fields> >

9. Kennedy, J., Lyons, T., & Frances, Q. (2014). The continuing decline of science and mathematics enrolments in Australian high schools. *Teaching Science*, 60(2), 34-46. Retrieved from <https://eprints.qut.edu.au/73153/>

10. Cooper, G., & Berry, A. (2020). Demographic predictors of senior secondary participation in biology, physics, chemistry and earth/space sciences: students' access to cultural, social and science capital. *International Journal of Science Education*, 42(1), 151-166. doi:10.1080/09500693.2019.1708510

11. Australian Academy of Technological Sciences & Engineering (ATSE), 2022. Our STEM skilled future – An education roadmap for an innovative workforce. Accessed from < <https://www.atse.org.au/research-and-policy/publications/publication/our-stem-skilled-future-an-education-roadmap-for-an-innovative-workforce/> >

What is needed to make STEM aspirational, accessible and attainable for more Victorian students?

RECOMMENDATION 4

Enhance the status of STEM in the Victorian Curriculum.

- Provide sufficient resources, including a suitable allocation of teaching staff, to enforce the requirement for science education up to the end of Year 10.
- Develop strong incentives for students to continue to study science and mathematics in Years 11 and 12.
- Emphasise science education as core to the early and primary years curriculum, elevating it alongside the status of numeracy and literacy.



RECOMMENDATION 2

Provide quality resources for teacher professional development and communities of practice, for teachers across the state.

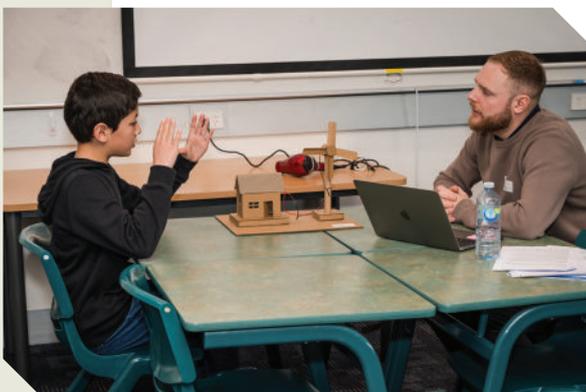
- Develop a centralised repository of self-serve, quality-assessed STEM professional development resources and learning and teaching resources (such as the Australian Science Teachers Association's ScienceAssist information support service).
- Reverse the decline in Victorian Government financial support for teacher subject associations, including the Science Teachers' Association of Victoria (STAV).
- Increase investment in STEM-specific professional development sessions and mentoring, with time-release for teachers in the public system.
- Provide STEM professional development tailored to early and primary years teachers, including out-of-field teachers, filling the gap created by the termination of the science stream of the Primary Maths and Science Specialist (PMSS) program.
- Establish a curriculum-aligned engagement program (or scale up an existing program) between active researchers, STEM industry leaders, science teachers, university STEM students and pre-tertiary students to maintain awareness by educators of developments in fast-evolving knowledge domains, and prepare young people (including from regional, rural and remote areas) for participation in tertiary education and the STEM workforce.



RECOMMENDATION 3

Unlock more hands-on, experiential learning in STEM classrooms across the state.

- Enhance resource provision, including in regional, rural and remote schools, for hands-on STEM learning, for example through provision of the ATSE [STELR](#) program, which includes equipment, curriculum resources and teacher support, and supporting the STAV [Science Talent Search](#).
- Increase investment in support staff (such as teacher aides) and qualified laboratory technicians to improve quality, safety, and alleviate teacher time pressure.
- Provide adequate funding to primary and secondary schools for building and maintaining laboratory facilities, and supplies and consumables for laboratory experiences.



- Set and work towards a target for science class sizes to promote safety, adequate workspace and effective teaching and learning.
- Increased resourcing to connect the teaching and learning of science, mathematics and integrated STEM to the community through real-life experiences, exposure to science careers, and place-based learning.

RECOMMENDATION 4

Uplift recognition for STEM teachers.

- Improve recognition of top teachers of Science and STEM, such as through a new category of the Victorian Education Excellence Awards or through the establishment of a Teaching category of the Victoria Prize for Science & Innovation.
- Develop and deliver a public campaign to address negative media portrayal of teachers and gain public support for the importance of science teachers and teaching.
- Improve understanding of the science teaching profession, including by mapping the number of teachers of Science and STEM in each subject and out-of-field teachers.



About the Submitting Organisations

Three organisations collaborated to craft this submission. Each organisation has significant presence in Victoria, with collective deep experience in STEM education and attainment at all levels of education and careers. We stand ready to support the Victorian Government to implement the recommendations in this paper.



Founded 1943

The Science Teachers' Association of Victoria (STAV) is the peak body for Science and STEM teachers in Victoria, delivering high-quality professional development from K-12, with an eighty-year track record in advancing science education and raising the profile and public recognition of science teaching in Victoria. STAV is a founding member of The Australian Science Teachers' Association (ASTA).

stav.org.au



Australian Academy of
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The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy made up of almost 900 Fellows elected by their peers. ATSE brings together Australia's leading experts in applied science, technology and engineering to provide impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity. ATSE is committed to growing Australia's capacity to innovate and use technology by inspiring and fostering young people to pursue STEM careers.

atse.org.au



The Royal Society of Victoria is our State's scientific society, brokering engagement between practitioners of Science, Technology, Engineering, Mathematics & Medicine (STEMM) and the broader Victorian community, seeking to improve general scientific literacy, evidence-based decision making and the translation of scientific knowledge into purposeful actions in our State.

rsv.org.au