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**Australian Academy of Science submission on**
***Australia's Productivity Pitch, Pillar 2: Building a skilled and adaptable workforce***

Australia's economy is one of the least differentiated in the world.[1] Australia's productivity growth has also slowed since the mid-2010s.[2] Over the same time, Australia's research and development (R&D) intensity has fallen.

Australia's falling productivity is partly caused by underinvestment in and underutilisation of science and research. Research drives prosperity through new innovations that improve lives. Investments in science and technology drives productivity and long-term economic growth.[3] However, the impact of these investments are not realised immediately—they are the result of patient investment and development of capability in Australia's scientific workforce.

To uplift Australia's scientific workforce to deliver productivity benefits, the Academy recommends that:

- Long-term, sustainable funding is needed for STEM (science, technology, engineering and mathematics) education programs to ensure teachers have access to the high-quality professional learning, resources and support they need to maximise impact on student outcomes.
- Training is provided to ensure that educators can teach students the necessary skills to responsibly use GenAI tools.
- Australia adopts a national STEM skills workforce strategy that trains, attracts and retains talent to build a diverse, highly skilled workforce to secure the nation's prosperity and innovation capability.

The Academy is currently undertaking a major initiative, 'Australian Science, Australia's Future: Science 2035' (ASAF) to examine the capability of Australia's science system to support our national ambitions. The Academy would welcome the opportunity to provide a briefing to the Productivity Commission on preliminary findings from this work. To discuss this, please contact Dr Hayley Teasdale, Head of Science Policy and Advice at hayley.teasdale@science.org.au.

## Australia can strengthen teacher capability and student engagement in STEM through sustained investment in evidence-based national education programs

The development of science and technology capability starts with science and mathematics education in primary and secondary schools. Preliminary analysis from 'Australian Science, Australia's Future: Science 2035' indicates that mathematics, biology, physics and chemistry underpin the key scientific capabilities needed to address our national needs by 2035.

However, Australia faces a persistent challenge in declining student participation and achievement in STEM subjects, which limits future workforce readiness and national innovation. Enrolments in higher-level mathematics courses in Year 12 are at an all-time low nationally.[4] There have also been declines in Year 12 enrolments in chemical sciences and physics since 2018.[5] While still sitting above the OECD (Organisation for

[1] The Atlas of Economic Complexity. *Country & Product Complexity Rankings*. Harvard University. Retrieved 28 May 2025 from https://atlas.hks.harvard.edu/rankings

[2] Australian Bureau of Statistics. *Productivity.* Retrieved 28 May 2025 from https://www.abs.gov.au/statistics/measuring-what-matters/measuring-what-matters-themes-and-indicators/prosperous/productivity

[3] Mazzucato, M. (2018). *The value of everything: Making and taking in the global economy*. Hachette UK.

[4] Marchant, T., & Kennedy, S. (2024) *The State of Mathematical Sciences 2024.* The University of Melbourne on behalf of the Australian Mathematical Sciences Institute. https://amsi.org.au/?publications=the-state-of-mathematical-sciences-2024-8th-discipline-profile-of-mathematics-and-statistics-in-australia

[5] Department of Industry, Science and Resources. *Year 12 subject enrolment in STEM and other fields.* Retrieved 2 June 2025 from https://www.industry.gov.au/publications/stem-equity-monitor/primary-and-secondary-school-data/year-12-subject-enrolment-stem-and-other-fields

Economic Co-operation and Development) average, Australia's PISA (Programme for International Student Assessment) scores in science have experienced a decline since 2009.[6]

Subject knowledge is a key attribute of highly effective teachers, yet many teachers are not adequately trained in the STEM disciplines they are expected to teach. In secondary schools, 32% of mathematics teachers and 22% to 29% of teachers in biology, chemistry and physics are teaching out-of-field.[7] When teachers are required to teach subjects outside their area of expertise without adequate support, it can reduce their confidence, lower their well-being, increase attrition and potentially impact student outcomes.[8]

Teachers require enhanced access to high-quality resources, professional development, and support to deliver STEM education effectively. Teachers also need support to recognise high-quality lesson planning and curriculum materials, especially when they are teaching out-of-field. They should be empowered to engage with the diversity of students including cultural and ethnic backgrounds and neurodiversity.

The Academy has been delivering professional learning programs for teachers in science and mathematics for over thirty years. These programs have delivered measurable outcomes supporting a strong foundation in STEM teaching and learning in Australia, such as improved enjoyment, confidence and comfort in teaching science.[9] Long-term sustained investment in impactful programs can maximise teacher's positive impact on students and outcomes—strengthening the pipeline of future scientists.

## Australian educators need to be equipped to teach students to use GenAI tools responsibly

Generative artificial intelligence (GenAI) is already enhancing productivity in Australian science by augmenting and automating research tasks such as literature reviews, data analysis, and bibliometric analysis. This automation could lead to a more productive use of scientists' time, allowing them to focus on higher-level tasks that require human insight.

However, promoting the responsible and ethical adoption of AI is essential to preparing Australia's future workforce and the science system. Students need to be supported not just to use Gen AI tools, but also to develop the skills required to identify, comprehend, and manage the potential risks and integrity challenges. This includes plagiarism and the generation and use of biased or false data. Training is needed to ensure GenAI tools are used effectively and responsibly.

Educators at all levels must be equipped to teach these new skills effectively. The Australian Human Rights Commission has emphasised the importance of providing professional development and training for teachers and introducing programs that equip students with the necessary skills to engage with GenAI tools responsibly and ethically.[10]

## Australia needs a comprehensive STEM skills workforce strategy

Australia is in a global race for scientific and technological talent, in a constrained market.

Australia lacks a coordinated national strategy to develop, attract and retain STEM talent across the education and workforce pipeline, risking future economic competitiveness and innovation capacity. Australia needs a

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[6] Organisation for Economic Co-operation and Development. *PISA Data Explorer.* Retrieved 2 June 2025 from https://pisadataexplorer.oecd.org/ide/idepisa/dataset.aspx

[7] Australian Teacher Workforce Data. (2024). *National Trends: Teacher Workforce.* Australian Institute for Teaching and School Leadership. Retrieved 2 June 2025 from https://www.aitsl.edu.au/research/australian-teacher-workforce-data/atwd-reports/national-trends-teacher-workforce

[8] Hobbs, L., & Porsch, R. (2021). Teaching out-of-field: challenges for teacher education. *European Journal of Teacher Education*, *44*(5), 601–610. https://doi.org/10.1080/02619768.2021.1985280

[9] Peter Aubusson, Keith Skamp, Paul F. Burke, Kimberley Pressick-Kilborn, Wan Ng, Tracey-Ann Palmer, Andy Goodall, and Jennifer Fergusson (2019). *Primary Connections: Linking science with literacy Stage 6 research evaluation final report.* Prepared for Steering Committee of Primary Connections, Australian Academy of Science.

[10] Australian Human Rights Commission. (2023). *Utilising ethical AI in the Australian Education System.* Retrieved from https://humanrights.gov.au/sites/default/files/inquiry_into_the_use_of_generative_artificial_intelligence_in_the_australian_education_system_14_july_2023_0.pdf

comprehensive 'raise, train, attract and retain' STEM skills strategy to embed scientific literacy from early learning through to postgraduate levels and into the workforce.

Graduates need to not only be prepared for the jobs of the present, but must also possess the flexibility of mind, resilience and ability to adapt or learn new skills to be prepared for the jobs of the future. A strong, diverse and mobile STEM workforce is necessary to meet Australia's national ambitions and respond to uncertainty.

The Job-ready Graduates scheme, introduced in 2021, has distorted student incentives by altering the cost of university places to students and the resources provided to STEM disciplines. Contrary to its stated aim, the Job-ready Graduates scheme has not shifted enrolments toward areas of national need. Instead, it has created perverse financial incentives, devaluing science degrees and disincentivising universities from offering places in disciplines where Australia faces capability gaps. The Job-ready Graduates scheme should be ended with urgency. Alternatives should be explored to strategically align skills and research being developed by universities with Australia's national needs.

Inadequate support for higher degree students, limited workforce mobility between sectors, and persistent barriers to participation and diversity are constraining Australia's STEM potential. Australia needs to increase investment in higher degree students by ensuring competitive stipends and creating clear, viable career pathways across academia, government and industry.

To discuss or clarify any aspect of this submission, please contact science.policy@science.org.au