

SCIENCE & TECHNOLOGY AUSTRALIA

POLICY SUBMISSION

26 APRIL 2023

PATHWAY TO DIVERSITY IN STEM REVIEW

Science & Technology Australia thanks the Department of Industry, Science and Resources for the opportunity to offer input on the Pathway to Diversity in STEM review.

Science & Technology Australia is the peak body for the nation's science and technology sectors, representing 144 member organisations and more than 115,000 scientists and technologists. We connect science and technology with governments, business and the community to advance science's role in solving some of humanity's greatest challenges. We are a longstanding champion of equity, diversity and inclusion in STEM.

KEY POINTS

- Australia must draw on its full talent pool or we rob ourselves of some of the best talent – the best science and innovation is fuelled by strong diversity of ideas and perspectives.
- Bigger strides to advance diversity, equity and inclusion are crucial to secure the talent pipeline needed to meet Australia's urgent STEM-skilled workforce needs.
- Some of the greatest current challenges to achieving stronger diversity in STEM are:
 - a lack of consistent visibility of diverse role-models;
 - chronic job insecurity in the STEM research workforce;
 - challenging workplace conditions and work cultures;
 - the need for sustained long-term commitment to bring about change.
- These challenges are deep-rooted and systemic. Change on all levels – from pursuing structural and cultural improvements in workplaces as well as nurturing the success of individuals and groups in STEM - will be key to truly “shift the dial” on diversity in STEM.
- Deep and enduring change to drive diversity gains will require long-term commitment and support from Governments – including sustained funding for effective diversity programs.

SCIENCE & TECHNOLOGY AUSTRALIA RECOMMENDATIONS

1. Given Science & Technology Australia's Superstars of STEM program's strong return on investment and stellar success at promoting a diverse range of role-models to media and school students, the Government should extend support for the program to 2030 to enable continuity and scale-up.
2. Foster a more secure research workforce by doubling Australia's competitive research grants schemes' budgets over the next four years – and lift Research Block Grant funding commensurately. At the same time, shift more research grants to longer terms of 5–10 years, with employers required to issue contracts that span the full grant length, or a minimum of three years.

3. Use the evidence base from current work commissioned by the Office of the Chief Scientist on research evaluation metrics and STEM career pathways to confirm best practice and effective policy levers – e.g. mandated reporting requirements – to influence institutional change to improve workplace practices and cultures.
4. Acknowledge the need for consistent, long-term resourcing for interventions that drive the deep systemic and cultural change required to shift the dial on diversity in STEM. Ensure programs and initiatives are funded securely on longer timeframes beyond the forward estimates cycle.
5. The Government should fund the National Indigenous STEM Professionals Network to support Aboriginal and Torres Strait Islander people's greater participation in STEM study and careers.
6. Implement initiatives spanning all levels of education, through to the research sector, that will create a meaningful STEM future with First Nations people (further detail provided below).

DRIVING DIVERSITY GAINS: AN URGENT IMPERATIVE

A strong STEM talent pipeline that draws on Australia's full talent pool is key to scientific excellence. The best science and engineering happens when teams draw on a diverse range of ideas, perspectives and knowledge.

Advancing equity and inclusion – from all under-represented groups – will not only strengthen our existing STEM workforce, but also help secure the larger talent pipeline needed to meet Australia's future STEM-skilled labour needs. Australia also needs to tap into the pool of people not currently working in STEM areas but could identify as STEM, retrain or update STEM qualifications.

Those STEM-skilled labour needs – particularly in some specialised STEM areas – are acute. Data released in October 2022 from the National Skills Commission highlighted a [sharp rise in vacancies](#) across the labour market. Several of the top 20 occupations with significant skills shortages are in the STEM sector, and rely on either university or VET trained STEM professionals. Other work indicates potentially critical shortages in [cybersecurity](#) and [engineering](#).

Several other Australian economic sectors have an urgent need for more STEM-skilled professionals. Our mining and agri-food sectors have an ongoing need for both university and VET-trained STEM professionals. Australia's defence sector has an ever-growing need for mathematicians, data scientists and physicists, plus people skilled in electronic hardware and software programming, computer science and communications and specialised modelling. Delivering the AUKUS program and maximising Australia's returns from our investments in it will also require a new cohort of highly specialised STEM professionals across the government, academic and VET sectors.

Science & Technology Australia recognises the many and varied forms diversity takes across Australian society – representation from all facets of our diverse society is essential. While many challenges and barriers to diversity in STEM are common across all groups, there is also a need for focussed interventions or supports that are appropriate to specific groups. In many cases, intersectionality further compounds barriers. This submission speaks to some of the more general cross-cutting issues, along with a more detailed focus on elevating and investing more deeply in First Nations people's engagement and leadership in STEM.

The [Women in STEM Decadal Plan](#), published in 2019, comprehensively describes key issues and potential solutions to improve gender equity in STEM. Science & Technology Australia is a proud champion of this plan, and a broader leadership champion of diversity, equity and inclusion in STEM. Many other STEM advocacy groups have specific expertise in the key challenges for diverse communities in Australian STEM – including the [Aboriginal and Torres Strait Islander Mathematics Alliance](#), [Deadly Science](#), the [National Aboriginal and Torres Strait Islander STEM Professionals](#)



[Network](#), [Queers in Science](#), [STEM Sisters](#), [iSTEM Co](#), [Stairway to STEM](#) and the [Australian Disability Clearinghouse on Education and Training](#) among a wide array.

Visibility and role models

Stereotypes start young. For all under-represented groups, if children can't see examples of people working in STEM who look like them, or come from similar backgrounds, aiming for a career in STEM when they grow up seems much less possible. It's hard to be what you can't see.

Diverse role models are important at all education and career stages, from primary school right through to the workplace. Stereotypes that often begin in the early years of school – that maths is hard, science is for people in white lab coats – must be addressed through showing children, students and their parents that STEM is for everyone.

This lack of role-models is particularly relevant to the chronic under-representation of women in STEM. Science & Technology Australia's acclaimed world-leading program [Superstars of STEM](#) has been a game-changer to start to boost the visibility and prominence of women – from many different backgrounds – in STEM. This program promotes women and non-binary people working in STEM and turbo-charges their media and public profiles. Since the program began in 2017, [it has boosted the numbers](#) of diverse role models in STEM, showcasing to girls (and everyone else) that women can be successful scientists – and encourages girls to consider a STEM career. The program works on many levels to tackle key elements of the wicked problem of fixing the under-representation in STEM. Its training equips the Superstars with skills to undertake school visits, significantly boost their mainstream and social media profiles, and accelerates promotions and career progression.

Science & Technology Recommendation 1:

Given Science & Technology Australia's Superstars of STEM program's strong return on investment and stellar success at promoting a diverse range of role-models to media and school students, the Government should extend support for the program to 2030 to enable continuity and scale-up.

Research workforce security

At the same time as encouraging more people from diverse backgrounds to consider STEM careers, it is imperative to create secure and supportive STEM workplaces. Work cultures must progress beyond inclusivity to create places and cultures of belonging, where people from all backgrounds feel welcome

Chronic job insecurity is a significant barrier to attracting and retaining women in the STEM research workforce. Repeated cycles of short-term funding contracts – especially during the early years of a science research career – undermine the conditions for Australia's scientists to make truly ground-breaking discoveries and seize new economic opportunities for Australia.

This insecurity in science is driving great Australian scientists and technologists overseas – or out of research altogether. It's also a major factor driving women from the STEM research workforce in the early- and mid-career stages.

One way to start fixing this is to significantly boost Australia's major research grant agencies – the Australian Research Council and the National Health and Medical Research Council – budgets to create a deeper pool of funding available to researchers. At the same time, more research grants should be shifted to longer terms of five, seven or 10 years. Employers of researchers should be required to issue employment contracts that span the full grant length, or a minimum of three years, as a condition of Australian Government research grant funding. This would be a significant step to improve workforce security and move towards a more supportive work environment.



Science & Technology Recommendation 2:

Foster a more secure research workforce by doubling Australia's competitive research grants schemes' budgets over the next four years – and lift Research Block Grant funding commensurately. At the same time, shift more research grants to longer terms of 5–10 years, with employers required to issue contracts that span the full grant length, or a minimum of three years.

Career progression and workplace culture

This chronic job insecurity is compounded by stresses caused by a constrained research funding system and the current metrics-driven promotion and progression system in research. The pressure to work long hours, constantly generate a stream of high-impact research publications, alongside outreach, teaching or mentoring all contribute to a research work culture that is unsustainable.

Perceptions that STEM professions are unwelcoming to women and put a low value on work-life balance and family life deter some women from starting STEM careers – and these perceptions also affect other under-represented groups in STEM. A [survey published by Professionals Australia in 2021](#) found women leave the STEM workforce due to factors including:

- difficulty accessing flexible working arrangements at senior levels;
- career penalty for part-time work;
- gender pay gap;
- hostile or discriminatory workplace cultures;
- lack of recognition;
- limited opportunities for career development;
- high levels of workplace sexual harassment; and
- being regarded as less technically competent than male colleagues.

These issues are systemic, deeply structural and not unique to the STEM workforce. Yet, it's imperative to Australia's future prosperity that we nurture diversity and equity in our STEM workplaces – and make STEM the profession of choice for the next generations of talent. Until we see a seismic shift in workplace cultures, systems and practices to create environments that are truly diverse, inclusive and foster a sense of belonging where everyone can thrive, progress will be limited.

While there are many initiatives currently performing strongly on an individual or cohort level to support enhanced diversity in STEM (including Science & Technology Australia's Superstars of STEM program), truly shifting the dial must work on these knotty challenges at every level. This includes investing in transforming the experiences of under-represented people and groups in the STEM system. But it must also be squarely focussed on fixing employment cultures and structures that currently make it vastly harder to achieve stronger equity gains. Striving for deep systemic structural change is essential, while at the same time maintaining focus on targeted and effective support for under-represented groups to better navigate the system.

Changing institutional cultures requires long-term and concerted efforts. However, some changes can be made easily, and often improvements that support one particular target group can have a spillover effect to supporting diversity across the board. For example, implementing gender equity procedures that make promotion policies and requirements clearer and more transparent supports not only women, but people from other under-represented groups as well – people who may not have the same level of familiarity with the system or as strong a network of co-workers supplying informal advice and information. Clear articulation of policies and goals levels the playing field and gives equal access to information for everyone.

Another way to improve transparency – and encourage cultural change – is for organisations to publicly publish data on equity and diversity. This would showcase organisations with best practice, and encourage others to improve.



Science & Technology acknowledges the work being done by the Office of the Chief Scientist to develop improved understandings of the role of metrics in research evaluations and an analysis of STEM career pathways. These pieces of work will be important to determine how best to influence institutional change to improve workplace practices and cultures.

Science & Technology Australia recommendation 3:

Use the evidence base from current work commissioned by the Office of the Chief Scientist on research evaluation metrics and STEM career pathways to confirm best practice and effective policy levers – e.g. mandated reporting requirements – to influence institutional change to improve workplace practices and cultures.

Deep change requires long-term commitment

Shifting the dial on diversity is not an overnight job. Deep systemic change requires long-term commitment – and often, long-term investment. Science & Technology Australia welcomes the concurrent evaluation of Government funded gender equity programs and initiatives – it’s imperative to ensure public funding is put to good use on effective programs. However, some programs will take longer to achieve the intended goals and long-term Government resourcing may be needed to ensure success. Hasty decisions evaluating programs on short-term success rates could well be detrimental in the long-term.

Grass-roots networks or mentoring communities are critical to support under-represented groups in STEM. For people navigating a workplace or work culture that may be new, unfamiliar or unwelcoming, these groups provide safe spaces and connections to others with shared experience.

A powerful example of this is the [National Indigenous STEM Professionals Network](#). This Indigenous-led and Indigenous-run network aims to provide invaluable support and peer mentorship to Indigenous STEM researchers across Australia. The past two years have seen concerted efforts across the sector to establish the network. To reach their ambitions, the network requires secure funding.

Many other factors required to enact deep systemic and cultural change also require long-term commitment. These include:

- a shift in leadership, supervision and mentoring practices to be more supportive and inclusive;
- a shift in research practice, career progression measurement and recruitment procedures to be less focused on metrics and consider a more comprehensive assessment of a research career;
- considering positive discrimination in hiring practices; and
- proactive support for people with caring responsibilities.

All these reforms require sustained commitment from all levels of management, as well as strong engagement from grassroots levels.

Science & Technology Australia recommendation 4:

Acknowledge the need for consistent, long-term resourcing for interventions that drive the deep systemic and cultural change required to shift the dial on diversity in STEM. Ensure programs and initiatives are funded securely on longer timeframes beyond the forward estimates cycle.

Science & Technology Australia recommendation 5:

The Government should fund the National Indigenous STEM Professionals Network to support Aboriginal and Torres Strait Islander people’s greater participation in STEM study and careers.



A focus on elevating and investing in First Nations STEM expertise

Current work on the [Australian Universities Accord](#), the [National Science and Research Priorities](#) refresh, and the [Review of the Australian Research Council Act 2001](#) has a strong focus on improving university access, participation and success for First Nations people and elevating First Nations Knowledge. This work is closely related to this diversity review.

STEM and STEM education in Australia has started to build connections with First Nations people and networks - and build relationships between the two knowledge systems. This has been advanced through initiatives including:

- research grants, journals and publications centred on Indigenous knowledges in connection with a science discipline;
- ARC and NHMRC grants that focus on Indigenous research and increasing the numbers of Indigenous researchers;
- newly-established FoR codes in Indigenous research across all discipline areas;
- a Universities Australia push to ensure all universities have First Nations curriculum with clear learning outcomes across discipline areas; and
- the inclusion of the Aboriginal and Torres Strait Islander Histories and Culture Cross-Curriculum Priority in the national curriculum across all subject learning areas including science and mathematics.

These important steps forward, focussed on equity and inclusion, need to progress even further to create a STEM future in relationship with First Nations people.

The following recommendations were also included in [Science & Technology Australia's submission to the Australian Universities Accord](#) consultation.

Science & Technology Australia recommendations to create a meaningful STEM future with First Nations people:

- Show First Nations youth a future in STEM: invest in pre-service and in-service teacher professional training that connects the teaching and learning of STEM with First Nations knowledges;
- Invest in First Nations people to become teachers in STEM;
- Ensure bilingual education in First Nations languages is an integral part of the Australian education system and ensure national education initiatives like NAPLAN can cater for students in this type of education;
- Develop clear educational pathways for all First Nations students to go to university regardless of where they come from i.e. rural, remote and urban;
- Invest in the development of a National First Nations STEM Network for First Nations people who are working or being educated in STEM;
- Require universities to develop relationships with Indigenous communities to develop programs in Indigenous-led, community-driven research where benefits of the research flow back to community;
- Create dedicated funding streams: The ARC and NHMRC should create funding streams to forge meaningful relationships with First Nations communities, promote Indigenous-led and community-driven research, protect Indigenous intellectual property and develop potential business/employment opportunities on Country to strengthen Country; and
- Create First Nations STEM careers: that support the values of First Nations Communities and work towards a sustainable future for all Australians.



Given the need for more STEM-skilled people to drive Australia’s future workforce needs, creating more diverse and supportive work cultures is imperative – not just for equity but for Australia’s future success, economic prosperity and wellbeing.

Science & Technology Australia looks forward to further engagement on the subsequent components of this important review process.



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