SUBMISSION

Submission to the Department of Industry, Science and Resources

Submission to the Diversity in STEM review: draft recommendations

8 September 2023

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

The science, technology, engineering and mathematics (STEM) sector should reflect the diversity of our nation. It is important for our knowledge-creating and problem-solving capabilities, and important for our workforce pressures. Failure to address this urgent priority would represent an enormous missed opportunity, setting Australia back for years to come. Hundreds of activities and programs across Australia have attempted to address disparity in STEM sectors over many years. The Diversity in STEM Review is an important opportunity to scale up, connect, prioritise, incentivise and resource Australia's attempts to boost and support the participation of women and other underrepresented groups across the STEM sector. The 11 objectives and 19 draft recommendations released in August 2023 demonstrate a high-level, strategic approach to increasing diversity in STEM. ATSE welcomes the draft recommendations of the Diversity in STEM Review, noting almost all the draft recommendations align with ATSE's recommendations to the review and with recommendations ATSE has advocated for through other avenues. These recommendations, if implemented, will help to create transformative change across the STEM sector, supercharging our knowledge and innovation capability and giving greater opportunities to groups that have encountered barriers to inclusion. The details of implementation will be vital to ensuring success. ATSE urges the review to ensure its final report goes beyond simply stating recommendations, by outlining clear actions and accountability measures to ensure their successful implementation.

Ensuring these recommendations are successfully implemented will require robust accountability mechanisms and clear lines of responsibility. A national strategic approach to diversity in STEM, as in draft recommendation 2a, must be based on the best available evidence and tied to long-term, strategic outcomes. As the parallel ACIL Allen report notes, many initiatives aim to create generational change; therefore, a long-term lens is required in both designing and assessing the impact of these programs. The national strategy should target all aspects of the STEM ecosystem, from exciting and attracting a range of young people to STEM, through to systemic and structural reform, and - importantly – genuine cultural changes at all levels of STEM academia and industry. Programs underpinning this approach will need clear assessment metrics aligned with long-term outcomes and should have their ongoing long-term funding tied to meeting these metrics. Those programs that are demonstrating impact should be invested in to achieve meaningful scale. Metrics should be based on a model similar to the Women in STEM ambassador's National STEM Evaluation Guide. ATSE's *Elevate: Boosting Women in STEM* program provides a blueprint for how such a program can be implemented, with accountability and assessment of its efficacy, and continuous improvement, built into its core.

In addition to our previous recommendations to the conversation starter and the let's talk solutions consultations, ATSE makes the following further recommendations to refine the Diversity in STEM Panel's interim recommendations:

Recommendation 1: Use the central Diversity in STEM office to provide oversight and accountability for diversity initiatives in industry as well as academia.

Recommendation 2: Limit government-funded research grants to organisations that have, or are demonstrably working towards, Athena Swan accreditation through SAGE.

Recommendation 3: Ensure the national strategic approach to diversity in STEM includes initiatives tailored to people retraining or returning to study to enter the STEM sector for the first time.

Recommendation 4: Simplify visa pathways and processes for recognising overseas qualifications to unlock Australia's underused skilled migrant workforce.

Recommendation 5: Provide long-term funding guarantees for an expansion of ATSE's *Elevate: Boosting Women in STEM* program, to support a greater number and diversity of people to qualify and attain employment in STEM.

Recommendation 6: Commit to scaling dedicated support programs for out-of-field STEM teachers through state and federal education departments.

Level 2, 28 National Circuit
Forrest ACT 2603
Australia

PO Box 4776
Kingston ACT 2604
Australia

+61 2 6185 3240
info@atse.org.au
atse.org.au

ABN 58 008 520 394
ACN 008 520 394

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Recommendation 7: Amend Draft Recommendation 4c to "All STEM-related sectors should actively include representations of diversity in research, publications, education materials and approaches from relevant diverse scientific knowledge systems".

Supporting diversity in industry

Most STEM qualified individuals work in the private sector – 90% of VET qualified workers and 79% of university graduates (Office of the Chief Scientist, 2020) – but the draft recommendations place a heavy focus on educational institutions and government funding programs. For any initiative to genuinely drive STEM diversity, programs and strategies must also include an industry focus. While the draft recommendations do link to industry (e.g., recommending flexible work), substantive actions fall well behind education and academia. Industry actions should be concrete, with measurable outcomes reinforced by robust systems for accountability and support. Industry leaders must champion diversity and ensure they are accountable for reducing barriers and increasing diversity. This responsibility should extend to all levels of leadership, including middle management, who are vital to the success of organisational diversity initiatives (Bourke & Dillon, 2018).

The proposed central office and independent council can play an important role in providing oversight and accountability for industry diversity initiatives, and ensuring that industry is responsible for continued growth in diversity. It will be necessary for this office to regularly evaluate progress towards, and the suitability of, the recommendations of the Diversity in STEM review, to ensure their effectiveness over the long-term. While industry actors will need to be flexible to implement the most effective strategies for their needs, a national office can support action by communicating best practice guidelines and intervene where action is ineffective. For example, ATSE' Diversity and Inclusion Toolkit was developed to help support STEM industry leaders in small-to-medium sized enterprises to promote diversity and inclusion. The national office could work to expand and promote this toolkit for the broader STEM sector.

Recommendation 1: Use the central Diversity in STEM office to provide oversight and accountability for diversity initiatives in industry, as well as academia.

Allocating government research funding to organisations promoting gender equity

Australian research funding should prioritise organisations that take demonstrable steps towards equity. The Science in Australia Gender Equity (SAGE) Initiative drives structural and cultural change, and promotes best practice for gender inclusion across the STEM sector. Athena Swan accreditation, managed through SAGE, provides assurance that organisations are taking proactive and demonstrable steps to support gender equity at all levels, benchmarked against international best practice. The program has widespread engagement from the sector with more than 40 universities and publicly funded research institutions involved. Given the widespread uptake of the program, any STEM research organisation not already on board is falling behind in terms of gender equity. As such, taxpayer-funded research investments should be reserved for those organisations that are members of SAGE and have, or are demonstrably working towards, Athena Swan accreditation. This will help to encourage stragglers to engage with the program and take a structured approach to improving gender equity.

Recommendation 2: Limit government-funded research grants to organisations that have, or are demonstrably working towards, Athena Swan accreditation through SAGE.

Immediate actions to increase diversity in STEM

Immediate progress on diversity can be made by supporting underrepresented individuals to join the STEM sector. Improving the participation in tertiary STEM education of underrepresented people who are school leavers will help to improve workforce diversity over the long-term. However, more immediate progress can be made by encouraging and supporting underrepresented individuals who are not school leavers, and who are working outside the STEM sector, to retrain and reskill to join the STEM workforce, including those

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returning after taking time away from the paid workforce for caring responsibilities. Bringing in people from outside STEM with diverse experiences can help to promote creativity and new ways of tackling problems. Similarly, upskilling will be central to helping promote workers from underrepresented groups to leadership roles, where they can have a greater influence on organisational culture. ATSE's *Elevate: Boosting women in STEM* program provides support for women to attain additional education – including business degrees – in STEM areas of national importance. Expanding *Elevate*'s Leadership Scholarships would help support greater diversity in this key, mid-career, demographic. Furthermore, the wraparound supports underpinning the *Elevate* program (including professional development, networking and peer support, and mentoring) ensure that in addition to building more diverse workforces, scholars are better prepared to transition into the STEM sector and/or positions of leadership. However, no single program can or should constitute the nation's entire approach to addressing this issue. A high-level strategic approach is needed to align multiple programs and initiatives. This will need to be aligned with appropriately resourced retention support, to ensure that this does not simply create a revolving door where new people entering the sector only replace those leaving. The proposed national strategic approach to diversity in STEM must ensure that individuals retraining, upskilling or returning to study are fully incorporated into the strategy.

Migrant STEM professionals provide another immediate source of increased diversity. Almost half (49%) of all skilled migrants are not using the skills and experience they gained before coming to Australia - for women, this rises to 58% (Deloitte Access Economics, 2018). Around 20% of these are in engineering and IT -sectors with critical workforce shortages. The primary reasons for this include employer perceptions of skills and cultural differences, concerns about people leaving, visa and work rights problems, and issues with recognising qualifications and skills (Engineers Australia, 2021). Given the diverse backgrounds of migrants – and the fact that STEM-qualified migrants who cannot currently get STEM-related work are predominantly women – better supporting migrants to integrate into the Australian STEM workforce would provide an immediate boost to diversity and better support inclusion. Initial steps towards this can be improving processes to recognise skills and qualifications attained overseas and simplifying the visa system (including for STEM-qualified people who arrive on spousal and family visas). The national Diversity in STEM office can then work with employers to address their concerns and support workplace integration.

Recommendation 3: Ensure the national strategic approach to diversity in STEM includes initiatives tailored to people retraining or returning to study to enter the STEM sector for the first time.

Recommendation 4: Simplify visa pathways and processes for recognising overseas qualifications to unlock Australia's underused skilled migrant workforce.

Expanding and strengthening the Elevate Program

The ACIL Allen Women in STEM Evaluation Report, released alongside the draft recommendations, produced two recommendations relevant to ATSE's *Elevate: Boosting Women in STEM* Program. ATSE welcomes these recommendations as steps to supporting the long-term viability and growing the potential future impact of the program. As the Women in STEM Evaluation Report demonstrates, ATSE's *Elevate* Program represents a gold standard in diversity in STEM program design. The report highlights that many diversity programs do not target mid-career women, fail to consider intersectionality or are aimed at high performing women – excluding women who have not yet had opportunities to succeed. The *Elevate* Program addresses these concerns, having been built with intersectionality at its core, including providing Leadership Scholarships for mid-career women and not basing scholarships on prior academic performance. The report's recommendations for the program go to increasing the scope and long-term viability of the program, highlighting the initial positive data to support the program's continuation. ATSE supports these recommendations and is keen to work with the Department of Industry, Science and Resources to expand the scope of *Elevate*. As the national strategic approach to Women in STEM is developed, the Government is urged to work with ATSE to expand the Elevate program and guarantee long-term funding support.

Recommendation 5: Provide long-term funding guarantees for an expansion of ATSE's Elevate: Boosting Women in STEM program.

Level 2, 28 National Circuit
Forrest ACT 2603
Australia

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ACN 008 520 394

Australian Academy of Technological Sciences & Engineering

Supporting out-of-field teachers to improve confidence in teaching STEM

The goal of draft objective 5 – to empower schools and educators – is critical in ensuring long-term improvements in diversity across the STEM sector. The National Teacher Workforce Action Plan will help to boost teacher numbers over the long term. However, this will take time. Meanwhile immediate action is needed to support teachers who are teaching out-of-field subjects. In mathematics – foundational for many STEM tertiary courses and careers – 38% of mathematics teachers nationally are out-of-field (Weldon, 2016), and 45% of secondary school principals report that maths and science classes at their school are being taught by out-of-field teachers (Australian Mathematical Sciences Institute, 2020). We risk a lost generation of diverse students while the National Teacher Workforce Action Plan takes effect. Rapid intervention is crucial to bolster the confidence of these educators and establish accessible support avenues. Initiative like ATSE's STELR program and Grok Academy have worked to help build communities of practice and a peer support network for STEM teachers. STELR operates in more than 900 Australian secondary schools and its new community of practice network has a particular focus on out-of-field teachers. However, these programs are not supported as part of a coordinated national approach. ATSE recommends specific measures to support out-of-field STEM teachers, through scaling existing proven initiatives. ATSE's *Our STEM Skilled Future* report provides a starting point for developing coordinated action to reinvigorate STEM education and better support out-of-field teachers.

Recommendation 6: Commit to scaling dedicated support programs for out-of-field STEM teachers through state and federal education departments.

Refining the inclusion of diverse knowledges

Draft recommendation 4c in the interim report argues diverse knowledges and representations of diversity should be actively included in all STEM related sectors. Traditional Knowledges of science and engineering should be incorporated into STEM practices wherever possible. ATSE supports the intent of this recommendation, however the use of the phrase "diverse knowledges" could have negative unintended consequences. The recommendation already highlights a diversity of scientific approaches. The use of the phrase "diverse knowledges" raises the possibility that this framing could inadvertently sanction "alternative facts", unscientific or pseudo-scientific perspectives. While diverse knowledge systems can be core to, and support, many scientific fields, not all knowledge systems are applicable to all scientific fields. A blanket recommendation to include diverse knowledges may be impractical in some fields (e.g., quantum computing). ATSE proposes amending this recommendation to focus on relevant and diverse scientific knowledge systems. This will allow the intent of the recommendation to be maintained while avoiding potential misinterpretations or inappropriate applications.

Recommendation 7: Amend Recommendation 4c to "All STEM-related sectors should actively include representations of diversity in research, publications, education materials and approaches from relevant diverse scientific knowledge systems".

ATSE thanks the Department of Industry, Science and Resources for the opportunity to respond to the Diversity in STEM review. For further information, please contact academypolicyteam@atse.org.au.

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References

Australian Mathematical Sciences Institute. (2020). *The state of mathematical sciences 2020*. https://amsi.org.au/wp-content/uploads/2020/05/amsi-discipline-profile-2020.pdf

Bourke, J., & Dillon, B. (2018). *The diversity and inclusion revolution Eight powerful truths*. www.deloittereview.com

Deloitte Access Economics. (2018). *Seizing the opportunity: Making the most of the skills and experience of migrants and refugees A research report for Multicultural Affairs Queensland November 2018*. https://www.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-making-most-skills-experience-migrants-refugees-011118.pdf

Engineers Australia. (2021). *Barriers to employment for migrant engineers Barriers to Employment for Migrant Engineers; Research Report*. www.engineersaustralia.org.au.

Office of the Chief Scientist. (2020). *Australia's STEM Workforce*. https://www.chiefscientist.gov.au/news-and-media/2020-australias-stem-workforce-report

Weldon, P. R. (2016). *Out of Field Teaching in Australian Secondary Schools*. https://research.acer.edu.au/cgi/viewcontent.cgi?article=1005&context=policyinsights