



Science & Technology AUSTRALIA

Women in STEM decadal plan

8 October 18

To the Australian Academy of Science,

Thank you for the opportunity to contribute to the development of the Women in STEM Decadal Plan.

Science & Technology Australia (STA) is the peak representative body for more than 70,000 scientists and technologists in Australia through our member organisations, including associations and societies, research institutes, and research strategy bodies such as councils of deans. Our mission is to connect science and technology with governments, business, and the community, to enhance the role, reputation and impact of science.

STA appreciates the opportunity to provide input to inform the development of a long-term plan to support gender equity in STEM, which is a key priority for our organisation and for our sector. We hope that this decadal plan will provide the opportunity to make swift and meaningful progress towards gender equity, by building on the existing momentum sparked by programs like Science in Australia Gender Equality (SAGE) and our own Superstars of STEM.

While STA has programs and policies in place to help address the issue of gender inequality in STEM, a long-term plan that brings together the entire sector is essential. Addressing the issue in a coordinated way, and as a whole and united sector, we are much more likely to achieve success.

In response to the discussion paper provided for this consultation, STA has focused on areas where a national long-term plan can be most effective by engaging with existing programs. It is important to acknowledge the diverse range of initiatives and programs already being implemented to increase women participation in STEM, and uniting these efforts, while finding new ways to enhance our progress towards equity.



Professor Emma Johnston
President
Science & Technology Australia



Kylie Walker
CEO
Science & Technology Australia

Introduction

Gender inequality remains a real and current problem for STEM, despite multiple attempts to address this issue.

Science & Technology Australia supports a national long-term plan to achieve gender equity in the STEM professions.

One of the major challenges to any national plan is ensuring the involvement of the entire sector. Equal participation of women at every level in the STEM sector must be tackled by the entire sector: we need to fix the system, not the women.

An effective national plan will also require buy-in from both federal and state governments, as well as a combination of public investment and funding from within the STEM sector.

Summary of Recommendations

STA recommends that the decadal plan include top-down guidance that can unify and support current programs.

To address the perception of scientists STA recommends:

- The proactive recruitment and training of qualified science and maths teachers, with professional development to include support and encouragement to use case studies featuring female role models in teaching these subjects
- Requiring gender balance in depictions of scientists and mathematicians in educational materials at all levels of schooling
- Ongoing support for programs such as Scientists in Schools and the Superstars of STEM which directly connect school students with inspiring real-world female science, maths and engineering role models
- Professional development for secondary school careers counsellors to assist them to identify and describe a range of rewarding STEM career options with a specific focus on encouraging girls to consider STEM degrees
- The Federal Government explore and implement initiatives for publicly owned broadcasters to increase the visibility of women in STEM roles across creative programming, news and current affairs.

To address the issue of retention and career progression of women in STEM STA recommends:

- Provision of seed funding from the Federal Government to develop a recruitment company with a specific focus to recruit and support women in STEM roles.
- Changing the focus of programs that provide mentorship to providing sponsorship of women in STEM roles
- Implementing gender application ratios and quotas for grant applications, senior roles and within societies/academies
- De-identifying applicants for research grants

- Requiring unconscious bias training of people on grant and promotion panels

To address gender equity in society broadly STA recommends:

- Legislation to address the gender pay gap using international examples such as Iceland as a template
- Working with the human rights commission and domestic violence groups to end domestic and gender-based violence
- Legislate for domestic violence leave in all workplaces using legislation from New Zealand as a template
- Work with the Diversity Council of Australia to provide information and campaign materials to educate the broader population on gender equity barriers and enablers.

Consultation Questions

1. What changes need to occur to enable more girls and women to participate in STEM education at any level?

Perception of scientists

The issue of falling participation of women in STEM is one that starts at a young age and only becomes worse as girls become more connected to their world. A decades long study in which children have been asked to draw a scientist underlines the societal and cultural forces working against girls and women in STEM. More children in recent years, both boys and girls, draw female scientists as compared to the drawings made in the 1960s. But stark differences remain between the gender assumptions made by girls and boys. The most recent report stated that 58% of girls drew a male scientist and 96% of boys drew a man¹.

As outlined in the section below there are ways in which the stereotypical scientist can be reshaped and made more diverse in mainstream media.

STEM education and training

There is no difference in the ability of girls and boys to excel in maths and science². When a girl grows up believing that science and mathematics are professions done by men, this internalised assumption serves as a significant barrier to entering these fields. This cultural stereotype is reinforced through the teaching of students at both school and university level with the majority of science and maths teachers being male³. From childhood, and through all levels of education, there is a lack of prominent and public female role models in science and technology, which directly effects the participation of girls in STEM⁴.

¹ [“Children drawing more women in science”](#) BBC News, March 2018

² [“Study reveals patterns in STEM grades or girls versus boys”](#) UNSW, 2018

³ [“Who’s teaching Science? Meeting the demand for qualified science teachers in Australian secondary schools”](#) Australian Council of Deans of Science, 2005

⁴ [“You can’t be what you can’t see: making tech careers a reality for women”](#) The guardian 2017

At higher education levels there are some improvements in gender balance in some disciplines. A recent study from the University of Melbourne has shown women dominate men in 7 out of 10 disciplines studied at an undergraduate level⁵. However, engineering and information technology are still showing significant underrepresentation. This can again be at least partly attributed to a lack of role models and a perception among female students that there is no clear career path in STEM for them. A survey of engineering graduates, for example, has shown that the lack of women in professional engineering roles and the perception of a “boys club” directly effects the number of women participating in engineering at an undergraduate level⁶.

At all levels of education, it is resoundingly clear that the lack of women in STEM subjects is directly related to out-dated stereotypes and cultural norms, the lack of visible role-models in popular culture, the news media, in the classroom, and the dearth of information regarding clear career pathways for women in STEM.

STA believes it’s important to support science and maths teachers to create positive perceptions about the potential career paths for women in STEM, through a range of initiatives:

- Proactive recruitment and training of qualified science and maths teachers, with professional development to include support and encouragement to use case studies featuring female role models in teaching these subjects
- Requiring gender balance in depictions of scientists and mathematicians in educational materials at all levels of schooling
- Support for programs such as Scientists in Schools and the Superstars of STEM which directly connect school students with inspiring real-world female science, maths and engineering role models
- Professional development for secondary school careers counsellors to assist them to identify and describe a range of rewarding STEM career options with a specific focus on encouraging girls to consider STEM degrees

Proactive recruitment

The issue of the “leaky pipeline”⁷ within the STEM sector is yet to be effectively addressed. While recruitment agencies and initiatives such as Women on Boards⁸ specifically aim to facilitate the appointment of women to senior roles in a range of different types of organisations, these companies are not specific to STEM, and do not generally provide ongoing support for women once they secure these roles.

Seed funding from the government could be used to develop a recruitment company with a specific focus to recruit and support women in STEM roles.

⁵ [“Male students remain underrepresented in Australian universities. Should we be concerned?”](#) F. Larkins, 2008

⁶ [“Women deterred by engineering work culture: study”](#) The Australian, 2018

⁷ [“Stuck in the Pipeline: A critical review of STEM workforce Literature”](#) Heather Metcalf, 2010

⁸ [Women on Boards](#), accessed 2018

Organisations such as Pipeline Talent⁹ have shown how this can be done, by providing sponsorship and professional development alongside recruitment, and by working to support successful candidates for a term that extends well beyond recruitment.

Mentorship versus Sponsorship

Mentorship has long been used to encourage increased participation by minority groups, and to achieve better career progression – though the effects of mentorship have been shown to be limited compared to sponsorship¹⁰. The STA Superstars of STEM program excels within the sector, not just for the mentorship that it provides, but the sponsorship that results in an effective program. This is achieved by not only providing participants with a mentor but also providing specific career advancement opportunities as a result of this program.

Sponsorship involves supporting the Superstars to progress in their career, providing them with tangible opportunities to build their profile and network with influencers. Through sponsorship women in STEM can not only be encouraged to participate but also to hold lead roles necessary within the sector to achieve true parity¹¹.

2. What are the most effective things we can do to change inaccurate stereotypes about STEM professionals and the range of STEM careers?

Science & Technology Australia is already making strides in the areas of removing the “stale, pale & male” stereotype of STEM professionals through the Superstars of STEM program¹². The opportunity for women to be elevated in the media and to talk to children at schools about being a female scientist has been met with resounding support from the STEM community and beyond. It must be noted however, that participants in programs like these are expending time that would otherwise be spent directly on research and other duties and places a significant time burden on participants which is most commonly met by sacrificing personal time. Support from employer organisations for these extra communication activities has been mixed.

While programs like the Superstars of STEM are successful in supporting women to speak in the mainstream news media, there are still other sections of the media that fail to provide accurate or diverse depictions of STEM professionals. In entertainment and popular culture, scientists are more often than not depicted as exclusively male.

There is little that can be done to address this in international media, however Australian program creators, film-makers, writers and broadcasters can be supported to address this damaging stereotype. For example, grants and incentives could be created, or existing grants have quotas incorporated, with

⁹ [“About Pipeline”](#) Pipeline Talent, Accessed 2018

¹⁰ [“Women at work: Why mentoring is good but sponsorship is even better”](#) UNSW Business School, 2017

¹¹ [“Mentorship vs. Sponsorship, and how to maximise both”](#) Forbes Leadership Forum, 2015”

¹² [“Superstars of STEM”](#) Science & Technology Australia, 2018

the express purpose of increasing the visibility of women in STEM in Australian media content. This would be an effective mechanism to give young women and girls a clearer vision of how they could pursue a career in science and technology.

The Federal Government could work to create this change by exploring incentives for publicly owned broadcasters, such as the ABC and SBS, to increase the visibility of women in STEM roles across their creative programming, and their news and current affairs.

3. What measure should we be using to determine eligibility for career recognitions and progressions?

Regarding career recognition and progression, there are three immediate areas that may help to ensure gender parity. These initiatives can be applied to all areas of grant funding, promotions and awards.

Diversity quotas and gender application limits:

Diversity quotas can quickly and effectively address the issue of gender disparity where it exists. Grant bodies such as the ARC already monitors gender disparity among successful applications and it would be possible to address these concerns with a quota regarding each field of research. At a national level gender application limits can be used to increase collaboration with women in the sector and provide encouragement to elevate these women to chief investigators on grants and applications. For example, for every 2 applications received from an institution, 1 of those applications must have a female chief investigator. By having quotas at the granting body level and gender application ratios at the institutional level the issue of gender equity becomes a whole-of-sector concern rather than the responsibility of an individual body.

De-identifying applicants:

There is an argument that in small fields of research that true de-identification of applicants is not entirely possible. While this may be true to an extent there are still benefits to de-identifying applicants for initial evaluation in conjunction with quotas to ensure gender parity where full de-identification is not possible.

Unconscious bias training:

Despite the best efforts of some organisations and evaluators there is always a measure of unconscious bias involved with the evaluation of applications in every field. This unconscious bias extends beyond women in STEM to cultural and racial unconscious bias¹³. There is however, unconscious bias training that makes evaluators better aware of their own privileges and biases so that they may be addressed. In most cases this training is voluntary however STA recommends that every organisation that evaluates applications in any form require this unconscious bias training.

¹³ ["Unconscious bias and the bamboo ceiling"](#) The Australian Human Rights Commission, 2014

4. Australia has more than 330 different initiatives to foster and participation of girls and women in STEM. What type of initiatives are demonstrating the most impact in your area of interest?

STA strongly believes that the high number of initiatives targeting the issue of gender parity in the STEM sector are beneficial as an indicator of willingness, resources and passion for solving this problem. These could be further enhanced through coordination and – where appropriate – rationalisation, with a focus on measuring impact by both quantity and quality. While a national, whole-of-sector plan for addressing the issue of gender equity in STEM can provide big picture policy changes, there is an important role for grass-roots changes.

The presence of this volume of programs gives an indication of the complexity of the problem. Whether it is education, hostile working environments, or sourcing and supporting appropriate role models; it is obvious there is no quick fix to address the issue of gender inequity. While it is tempting to look for a single program that will solve it at a national level, much like the initial Close the Gap¹⁴ program, this approach is unlikely to succeed without supporting grass-roots efforts.

STA is measuring the impact of our Superstars of STEM program through multiple indicators and early results suggest very strong success. We are also creating templated resources and bespoke advice to our member organisations. The majority of these are scientific associations and societies, which have enormous power to affect career trajectories for individual scientists through conferences, journals, awards and strategic committee membership. We are building an evidence base for this work and will continue to measure its effectiveness over time.

STA believes it is vitally important for professional associations and societies leading the sector to strive towards parity. Through organisations such as STA and its members, women are often provided with the support, training and opportunities needed to become leaders in the field.

Rather than be distracted by the number of programs that are being run, it may be worth providing top-down guidance to unify their efforts. For example, with the Close the Gap campaign, there is top-down guidelines for any organisation to implement a reconciliation action plan¹⁵. Development of similar tools for organisations to better and more effectively address the issue of gender equity in STEM could be a way to better complement the numerous programs addressing multiple barriers throughout the STEM sector.

5. What societal and regulatory issues (i.e. not STEM specific) will have the greatest impact on women in STEM, and how should we address those barriers?

To ensure gender parity in the workplace there needs to be a reformation in cultural perceptions of gender roles. Any plan to achieve gender parity in the

¹⁴ “[Closing the Gap](#)” Department of the Prime Minister and Cabinet, 2018

¹⁵ “[Reconciliation Action Plans](#)” Reconciliation Australia, 2018

STEM sector must consider the broader societal context. We therefore recommend both deep consultation with the Diversity Council of Australia, and several immediate improvements specific to the STEM sector to support women and men who have a caring role as well as a job in STEM.

The role of the carer

In Australian society the role of the carer, whether it is for children or others in need of care, is traditionally allocated to women. Even in cases where a man may be the primary care giver in a family unit issues, of illness and care for children are allocated to women by default. This societal attitude not only adds pressure on women to sacrifice their careers for caring responsibilities but discourages men from undertaking the role of carer within the family unit. Many of the issues facing women in STEM professionals such as a gender pay gap, lower superannuation, and hampered career progression can be traced back to the expectation of a carer role that has been assigned to women in society.

Gender pay gap

The issue of a gender pay gap is one that exists in all areas of society including the STEM sector. With women earning a lower wage (by 14.6 %¹⁶) there is less incentive to remain in the workforce compared to their male counterparts. There is also an economic benefit to ensuring pay parity among genders that needs to be considered¹⁷. Some countries are already making meaningful strides in the issue of gender pay disparity which started with the publication of wages within organisations and eventually legislation preventing this pay discrimination.

Gender based violence

In 2017 the level of sexual assault and sexual harassment at Australian universities was released by the human rights commission¹⁸. These results indicated that there was a higher level of gender-based violence at universities than previously reported. As a result, Universities Australia and other peak bodies released recommendations for universities to implement to counter this issue. But gender-based violence is not only unique to higher education. Currently 1 woman per week dies as a result of domestic violence and 1 in 6 have experienced violence or sexual violence by the age of 15¹⁹. This violence is an issue that affects the whole of society but has consequences in the participation of women in STEM.

Until women feel safe from violence both in public and in the home then equality in any workplace is impossible. One potential mitigation strategy is domestic violence leave.

¹⁶ [“What is the gender pay gap?”](#) Workplace Gender Equality Agency, 2018

¹⁷ [“Understanding the Economic Implications of the Gender Pay Gap in Australia”](#) Diversity Council of Australia, 2009

¹⁸ [“Change the Course: National Report on Sexual Assault and Sexual Harassment at Australian Universities”](#) Australian Human Rights Commission, 2017

¹⁹ [“Family, domestic and sexual violence in Australia”](#) Australian Institute of Health and Welfare, 2018

Domestic violence leave

According to the Family, domestic and sexual violence in Australia Report, from the age of 15, one in six women have experienced physical or sexual violence by a current or previous partner²⁰.

In New Zealand, legislation has been passed to provide their workforce with 10 days of domestic violence leave additional to regular leave provisions²¹, allowing survivors of domestic violence to find alternative accommodation, access support, and prioritise their safety.

Domestic violence is an issue that affects the entire Australian community, and as it impacts a disproportionately larger number of women than men, it needs to be considered as part of any Strategy aiming to promote gender equality.

6. Progress towards gender equity in STEM will require changes. How do we address the challenge of backlash and resistance to these changes?

Progress towards equity of any group in an established institution will always encounter resistance, and the STEM sector appears to be no different. Recently in Italy, a CERN professor was suspended for claims that women were being provided with advantages that prevented people from being awarded promotions or career progression through merit²².

One of the most successful initiatives to address the issues of resistance is the incorporation of accountable male champions within the sector. This program encourages men to ensure that their organisation is targeting the issue of gender equity within the organisation and holds their targets and promises to public account. Having these champions involved helps to reduce some of the potential backlash by presenting a different aspect of the issue.

The STEM sector is structured around the collection of evidence: in this sector, perhaps more than any other, building evidence-based approaches and education is the best way to limit the potential backlash. The benefits to the sector and to society of gender parity can be demonstrated to far outweigh the potential backlash from initiatives such as quotas. The Diversity Council of Australia has provided leadership in gathering and communicating compelling evidence to support diversity and inclusion initiatives.

7. If Australia is to take a strategic approach to improving the participation of girls and women in STEM, where would the effort be best placed?

²⁰ "[Family, domestic and sexual violence in Australia](#)" Australian Institute of Health and Welfare, 2018

²¹ "[A huge win: New Zealand brings in paid domestic violence leave](#)" Eleanor Ainge Roy, The Guardian, 2018

²² "[CERN suspends physicist who claimed physics was 'invented by men', and the 'somebody had to speak'](#)" ABC, 2018

While the development of a decadal plan is important, there are also initiatives that can be undertaken in the short term to address some of the more immediate pressure points for gender inequity.

Quotas in research grants, promotions and on boards of professional societies can all increase participation of women in STEM fields. In a recent review of the research funding system in Australia, STA suggested a new model for the application and assessment of research grants²³.

STA recommended that the method of grant assessment provide for blind assessment of applications without consideration of the researchers involved. This methodology would prevent any unconscious bias, based on gender for example, from impacting the final assessment.

STA also recommended that institutions be required to address gender equity in their internal application process. To encourage gender parity the ARC and NHMRC would only accept applications from an institution at a 1 in 2 rate, i.e. for every two applications received one would be required to have a female chief investigator.

This is one example in which quotas could be used to address the issues of gender parity at both the national level and at the institutional level. Other organisations within the sector should also be encouraged to pursue quotas where gender disparity is evident including professional societies and academies.

The idea of quotas is considered controversial by some in the STEM sector because they incorrectly believe that the current system is based on merit. Close examination of STEM grades for both boys and girls show that this is an incorrect assumption because girls and boys are equally talented in STEM fields²⁴. Whether it is an unconscious bias or deliberate misconception, the quickest solution is the implementation of quotas.

STA recommends that any long-term strategy for the sector begin with quotas to address the immediate issues of parity while having a long-term focus to increase STEM participation of women at all levels.

8. Is there anything else you have not yet covered in your response which could improve gender equity in STEM?

The STEM sector faces some particular obstacles that are acute for female professionals. Examples of these and potential means to alleviate them are outlined below:

²³ ["Inquiry into funding Australia's Research"](#) Science & Technology Australia, 2018

²⁴ ["Study reveals patterns in STEM grades or girls versus boys"](#) UNSW, 2018

Conference Travel Availability:

There is a concern that STEM professionals with caring responsibilities are disincentivised from attending international conferences. Additionally, they are also not encouraged to take part in international sabbaticals or secondments to different organisations.

The current system also disincentivises institutions from sending parents with carer roles to conferences as the funding of a child's travel attracts the fringe benefits tax²⁵. To encourage institutions to fund the cost of childcare and child travel to conferences, STA recommends that a ruling be sought from the Australian Taxation Office to exempt STEM employers from liability for the Fringe Benefits Tax for these cases. Specifically, on direct or indirect support for children or care recipients to travel with employees on professional activities, and where this could not occur without this support.

Women are still overwhelmingly the primary parental care givers in many family units, which makes these barriers particularly stark for female STEM professionals.

These opportunities should be extended equally to all employees, regardless of gender or caring responsibilities. As such, it is important for employers to recognise that the provision of child-care or child travel is an essential component to consider.

Flexible Working arrangements and leave:

Leave provisions and workplace flexibility have improved over the past decade, however there is still much that can be done to ensure caring responsibilities do not disadvantage women in STEM.

The hurdles that prevent flexibility in time and place of work have been significantly reduced – but many STEM organisations have failed to capitalise on this.

Leave under Federal Research Grants

The Australian Research Council (ARC) has a gender equity action plan currently in place²⁶, and this plan:

- Provides parental leave for all scholarships;
- requires centres for excellence to implement centre specific-equity plans; and
- requires administering organisations, where relevant, to acknowledge and comply with their obligations under the Workplace Gender Equality Act 2012²⁷

The ARC has also announced a review of the provisions, requirements and management of maternity leave and parental/partner leave under the National

²⁵ [“Fringe Benefits Tax \(FBT\)”](#) Department of Industry, Innovation and Science, 2018

²⁶ [“ARC Gender Equality Action Plan 2018”](#) Australian Research Council, 2018

²⁷ [“Workplace Gender Equality Act 2012”](#) Federal Register of Legislation, 2016

Commonwealth Grants Program²⁸. This review will include the National Health and Medical Research Council (NHMRC) provisions as a body under the National Commonwealth Grants Program.

Leave under the Research Training Program

The legislation under the Research Training Program (RTP) is one way in which leave provisions can be corrected for the broader STEM sector. Updated recently, it is possible for research institutions and universities to allow for increased parental leave due to the increased flexibility these changes allow.

These changes give higher education providers more flexibility in the provision of scholarship funding and allow for scholarships to be extended beyond the standard 3.5 years to four. Some institutions are using this as an opportunity to extend stipends for students with a disability or those that undertake professional development during their study. It is possible that this extension could be used to allow for extended parental leave for both primary and secondary caregivers.

²⁸ [“Promoting and improving gender equality in research—a work in progress”](#) Australian Research Council, 2018