Australian Chamber of Commerce and Industry

# Women in STEM Strategy

## Submission to the Department of Industry, Innovation and Science, July 2018

## Introduction

The Australian Chamber welcomes the opportunity to provide input to the Department of Industry, Innovation and Science regarding the Women in STEM Strategy to increase women's participation in Science, Technology, Engineering and Mathematics (STEM).

The Australian Chamber has maintained engagement with STEM initiatives across Departments, most recently with the Department of Education and Training's STEM Partnerships Forum as part of the National STEM School Education Strategy 2016-2026. This submission does not set out to provide detailed commentary on all of the questions posed in the discussion paper; rather it takes a high-level approach to cover issues most relevant to the Australian Chamber's members.

## Background

Attracting women to STEM study and work and retaining them in related careers is a challenge for many disciplines and occupations. Barriers are multi-faceted and range across a number of areas and therefore solutions need to be diverse as well. Over the years, a number of Departments have sought to address this issue and have launched initiatives. Going forward, there needs to be a coherent whole of Government approach to address the range of issues in STEM education generally, and specifically for encouraging and retaining women in STEM. Coordination or at the very least communication needs to span across the Commonwealth Departments, States and Territory governments. Likewise, a number of initiatives by industry have been trialled to attract and increase the number of women in STEM fields in particular industries. Lessons from their experience should inform any strategy that needs industry engagement.

## Issues for Consideration

### *1. Definition of STEM*

Strong consideration is needed to whether the focus of the strategy is limited to 'STEM' fields and careers rather than STEM skills more broadly. The perception of STEM relating to only Science, Technology, Mathematics and Engineering occupations is highly prevalent and as noted in the discussion paper, the diversity of STEM careers and workplaces will require contextualised solutions. STEM skills are highly valued and applicable across all careers and in life generally. For example, journalists need analytical skills in addition to maths and science when covering finance and

technology news. A semi-conductor stock analyst will need a background in technology or engineering although finance is usually not considered a STEM field. Rather, a focus on STEM skills will encompass all possible STEM related fields and careers as well as address the long-standing issue of gendered stereotypes about women's STEM capabilities whether it be in a STEM related field or career.

## 2. Education and Career Choice to be Labour Market Driven

The message is often a general push for students to undertake STEM study and move onto STEM careers. However, career choices need to be informed by the labour market, and evidence of employment success. Unfortunately, at present, not all higher education (university) graduates are successfully able to secure a job in their chosen STEM discipline, with some vocations being highly successful and others well below average. According to the 2017 QILT Graduates Outcome Survey Results, graduates in Science and Mathematics had graduate employment outcomes well below the average (71.8%) at 59%. This is in contrast to Medicine (95.9%), Pharmacy (95.2%), Dentistry (86.8%) and Veterinary Science (81.4%) study areas, which had some of the highest graduate employment outcomes[1]. However, longitudinal studies (of three years later) reflect some improvement for Science and Maths graduates, however results are still mixed since it is unclear whether employment was gained in the chosen STEM career or field. This illustrates the danger of lumping 'STEM' into a single unit, since the importance and experience of the disciplines are not equal, sometimes in part due to professional registration requirements.

Additionally, 21.4% of undergraduates reported as underemployed part-time workers because there were no suitable jobs in their area of expertise. Their skills are therefore not being fully utilised, at least early on. This highlights the important issue that career choices need to be informed by the labour market to ensure employment opportunities are in line with the skills being developed.

It is also important to note that not all STEM occupations are the same and not all employers look for the same combination of skills. The disconnect between skills shortage in the market versus the skills and degrees churned out by Universities needs to be examined and addressed. Study areas need to be translated into actual career options and this can be done through the involvement of industry. Part of the issue is for school students, especially women, to be aware of the opportunities and diversity of STEM related careers available to them. Another opportunity is to create better pathways between Higher Education (university) and the Vocational Education and Training (VET) sector enabling students to move across the two sectors with relative ease and recognition of skills.

## 3. Gender Expectations

### *Career and Occupation Choice:*

The pipeline of girls and women in STEM is severely limited due to society's expectations of the kind of career a girl will be good at and should pursue. Expectations and conditioning start from a young age at home with the girl's circle of influence constantly reinforcing gendered stereotypes. This is evident in the gender composition of the labour force in key occupations as reflected in Figure 1. Although industry has repeatedly made efforts to increase the number of women working in these occupations, they are traditionally male dominated and continue to remain so. For example, despite admirable efforts by industry groups such as the National Electrical and Communications Association

[1] Medicine, Pharmacy and Dentistry fields have some of the most gender-balanced workforces, so attracting women to these traditional health disciplines is not the issue. There are other issues such as lack of representation in top leadership roles and lack of mid-career opportunities post a break in a woman's career in these fields.

(NECA) to attract more women into their industry, female electricians make up only 2.1% of all electricians. For those that do make it, they are often top of their field. It is also interesting to note that with some STEM occupations although representation is low, allied occupations of a slightly different nature have a greater proportion of women in the workforce. For example, only 24% of the ICT Support and Test Engineers workforce is female but over 50% of ICT Trainers workforce is female. This, again, may be due to the nature of the job as opposed to the 'skills' required to do the job.

Ensuring there are girls in the pipeline to become future electricians and engineers requires a complete shift in the attitude and perception of the choices available to girls. This needs to start with the girl's circle of influence comprising of parents, peers, siblings, teachers, extended family and friends, accessible role models and popular role models. Any strategy aiming to increase the pipeline of girls entering STEM careers needs to target the circle of influence and aim to make STEM socially acceptable for girls.

| Job Profile | Women in the Workforce |
|---|---|
| Electronics Engineers | 0.7% |
| Mechanical Engineering Draftspersons, Technicians | 1.8% |
| Aircraft Maintenance Engineers | 1.9% |
| Electricians | 2.1% |
| Electrical Engineers | 4.9% |
| Industrial, Mechanical and Production Engineers | 4.9% |
| Architectural, Building & Surveying Technicians | 9.7% |
| Computer Network Professionals | 9.9% |
| Mining Engineers | 11.0% |
| Electronic Engineering Draftspersons, Technicians | 11.2% |
| Electrical Engineering Draftspersons, Technicians | 11.6% |
| Civil Engineering Professionals | 13.1% |
| Surveyors and Spatial Scientists | 14.0% |
| Software and Applications Programmers | 14.6% |

*Figure 1: Job Outlook (joboutlook.gov.au)*

### *Child Care:*

The burden of childcare disproportionately falls on women, which largely leads them to experience career breaks and being disproportionately represented in the part-time workforce. This has flow on effects of reducing their economic security including lower superannuation balances. Although this is applicable to all women, the impact of a career break or reduced hours on a scientist or researcher is profound due to missed opportunities to publish and present research. As reflected in Figure 2, 56.2% of science and mathematics graduates employed part-time were female[2] with 24% not seeking to work more hours. Flexible work hours as well as any flexibility in the workplace will help retain existing female workers who will then transition to full time employment when ready.

[2] The average across graduates of all study areas was 41.1% females employed part-time.

Table 5 **Part-time employment, by study area and gender, as a proportion of all employed graduates, 2017 (%)**

| | Total employed part-time* | | | Seeking more hours | | | Not seeking more hours | | |
|---|---|---|---|---|---|---|---|---|---|
| **Study area** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** |
| Science and mathematics | 50.4 | 56.2 | 53.9 | 24.3 | 26.9 | 25.8 | 19.8 | 24.0 | 22.3 |
| Computing and information systems | 22.4 | 20.3 | 22.0 | 13.3 | 12.0 | 13.0 | 5.3 | 6.0 | 5.4 |
| Engineering | 17.7 | 19.8 | 18.0 | 9.8 | 10.3 | 9.9 | 5.6 | 8.0 | 6.0 |
| Architecture and built environment | 25.8 | 36.0 | 30.5 | 12.2 | 18.7 | 15.2 | 9.8 | 12.6 | 11.0 |
| Agriculture and environmental studies | 28.0 | 41.9 | 36.2 | 16.8 | 24.6 | 21.4 | 7.2 | 12.1 | 10.1 |
| Health services and support | 43.6 | 44.6 | 44.3 | 25.3 | 24.5 | 24.8 | 15.1 | 16.3 | 16.0 |
| Medicine | 5.9 | 8.7 | 7.5 | 1.5 | 3.9 | 2.9 | 3.6 | 3.9 | 3.8 |
| Nursing | 31.2 | 45.0 | 43.5 | 18.4 | 15.3 | 15.6 | 9.2 | 25.0 | 23.4 |
| Pharmacy | 9.4 | 8.1 | 8.5 | 3.1 | 2.6 | 2.7 | 5.2 | 4.4 | 4.6 |
| Dentistry | 29.2 | 38.5 | 36.0 | 22.2 | 23.1 | 22.8 | 5.6 | 12.3 | 10.5 |
| Veterinary science | 27.8 | 29.5 | 29.2 | 11.1 | 13.4 | 13.1 | 16.7 | 14.3 | 14.6 |
| Rehabilitation | 18.9 | 21.7 | 21.0 | 7.7 | 12.7 | 11.5 | 9.4 | 7.4 | 7.9 |
| Teacher education | 24.1 | 31.0 | 29.9 | 14.7 | 16.6 | 16.3 | 7.5 | 10.6 | 10.1 |
| Business and management | 21.1 | 24.6 | 23.0 | 13.8 | 14.4 | 14.2 | 5.1 | 7.8 | 6.5 |
| Humanities, culture and social sciences | 47.0 | 51.2 | 49.9 | 24.6 | 26.5 | 25.9 | 16.7 | 19.7 | 18.8 |
| Social work | 32.2 | 35.1 | 34.7 | 21.9 | 18.9 | 19.3 | 6.8 | 13.1 | 12.3 |
| Psychology | 58.0 | 59.4 | 59.1 | 26.8 | 27.7 | 27.6 | 23.1 | 26.6 | 25.9 |
| Law and paralegal studies | 22.0 | 26.1 | 24.6 | 13.7 | 14.6 | 14.3 | 4.9 | 9.3 | 7.7 |
| Creative arts | 54.5 | 59.2 | 57.6 | 32.2 | 31.9 | 32.0 | 14.1 | 18.9 | 17.4 |
| Communications | 48.0 | 41.3 | 43.5 | 34.3 | 25.2 | 28.1 | 8.8 | 10.5 | 10.0 |
| Tourism, hospitality, personal services, sport and recreation | 52.2 | 43.6 | 47.6 | 37.8 | 16.8 | 26.7 | 11.1 | 17.8 | 14.7 |
| **All study areas**** | **32.2** | **41.1** | **37.9** | **18.2** | **20.5** | **19.7** | **10.1** | **16.3** | **14.2** |

* Includes graduates employed part-time where preference for additional hours is unknown
**Where a graduate completes combined degrees across two study areas, their outcomes are included in both study areas. 'All study areas' figures count each graduate once only.

*Figure 2: QILT Graduate Outcome Survey 2017*

## 4. ATAR Scores

Students, especially in high school see better rewards by avoiding 'hard' subjects to not adversely affect their ATAR scores. Although the choice of subjects pursued in school should not be about the score at the end, in reality most school students who seek to do higher education are calculating the pros and cons of each subject based on their potential ATAR score. The strategy needs to tackle this issue if aiming to address negative perceptions through ensuring university entrance criteria not solely based on ATAR scores. Weighting needs to be given to students completing subjects considered 'difficult' at the year 12 level, such as higher level maths and more challenging science subjects.

# Proposed Solutions for Consideration

## 1. Counter Perception

The Australian Chamber proposes an elective subject at years 9 and 10 that allow students to undertake a subject that applies the knowledge of science, maths and digital to 'real world' problems and projects. This subject should aim to make learning fun and interesting.

## 2. Industry Engagement

Engagement with business/industry and schools can take many forms – anything from supporting the school trivia night, to community support for fundraising or careers activities, to working in an ongoing way with the VET program within schools or supporting specific science projects.

The most common interaction between schools and business is when the schools reach out for sponsorship – this business model within schools and their P&Cs is well established. Schools are less well set up to reach out to business for ongoing relationships, and indeed often the greater success is achieved with the more specific reach out (eg VET experience – including ASBAs – and Science projects) as this enables the business to get its head around it. In almost all cases, a local connection is critical as is recognised in the issues paper. Although increasingly businesses are conscious of their CSR (whether they use that language, or in the case of small business, the willingness to give back into their community), their overwhelming focus is on running a sustainable and in some cases growing business, so activities with schools need to be manageable and beneficial to their continued business success. Given this reflection, it is fair to say that unless there is a personal connection (the business is run by a parent or relative), it is unrealistic to expect that in most cases businesses will reach out to schools. Of course, it does happen but efforts should be directed towards inspiring the school community to better understand the benefit of seeking business relationships for the relevant activities in the school that would highly benefit from industry involvement, such as career education, work experience, improved understanding of real world application of STEM concepts and enhanced project outcomes.

## 3. Mentoring/ Role Models

Industry engagement can also take the form of a mentorship program for girls in schools and universities studying STEM skills. This will serve as the all-important connection between the classroom and the workplace, encouraging and providing guidance to girls to continue in the field and understand the diversity of options available to them. A Commonwealth funded mentorship program involving industries and businesses collaborating with schools and universities to pair students with female mentors at all levels will address the issue of lack of guidance and information and change perceptions of parents. The process needs to be made easier with a pipeline of mentors ready and available who have cleared necessary background and police checks. This requires considerable planning and coordination across the commonwealth, states and industry.

## 4. Focus more on STEM skills rather than only STEM careers

STEM skills will be required across all or most occupations. Not all STEM jobs will experience growth, particularly with the impact of technology on routine and computational tasks. Students and their support network such as teachers and parents need to be well informed by up to date advice and labour market information that helps them make good decisions about their career and study options.

## 5. Discrimination at the Workplace

There may be issues of work place discrimination in traditionally male-dominated areas for career progression (from promotions to senior leadership). This could once again stem from the perception of the capabilities and suitability of girls in STEM careers. Industry leadership is aware of these issues and is working hard with individual businesses to overcome them.

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## About the Australian Chamber

The Australian Chamber of Commerce and Industry speaks on behalf of Australian Businesses at home and abroad.

We represent more than 300,000 businesses of all sizes, across all industries and all parts of the country, making us Australia's most representative business organisation.

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