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Women in STEM Strategy

Response to the discussion paper

July 2018

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Introduction

About Engineers Australia

Engineers Australia is the peak body of the engineering profession. We are a professional association with about 100,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community. Engineers Australia represents the engineering team, comprising Professional Engineers, Engineering Technologists and Engineering Associates.

About this response

This response to the Women in STEM Strategy discussion paper provides some insight into the challenges faced in the engineering profession with regards to attracting and retaining women. It identifies some cohorts of female engineers who may be underutilised, and it explores issues important to increasing girls' participation in STEM (Science, Technology, Engineering and Mathematics) based study. Finally, it provides short responses to the six questions posed in the discussion paper.

Contact details

To discuss the issues raised in this response further please contact Justine Romanis, National Manager for Professional Diversity and STEM, on (02) 6270 6552 or JRomanis@engineersaustralia.org.au.

The importance of engineering in STEM

Throughout the world, analysts have argued that the way to achieving a technologically based economy is to develop the mathematical, technological and scientific skills of the future workforce. In launching the National Innovation and Science Agenda, the Prime Minister said he was ushering in 'the ideas boom'. New and innovative ideas are the beginning of technological advance, but it is engineers that translate new ideas into new products and services that are commercially attractive in domestic and overseas markets. Engineering and its continuous development over recent decades effectively uses knowledge of mathematics and science to solve real world problems. Australia's ideas boom depends on the skills of engineers to bridge the gap between idea and practical products and services that will drive productivity and economic growth.

Australians have a positive impression of engineers, but few in the community and few political decision makers understand what engineers do, how this contributes to community well-being and prosperity, and the critical role played by engineers in achieving technological progress.

Innovative environments do not just happen, they are outcomes of interaction between individual and corporate ideas, entrepreneurship, risk taking and investment and government policies to foster these factors and address barriers to innovation. Therefore, building Australia's engineering capability must be an indispensable element of the government's innovation strategy. Our contention is the role of engineers is pivotal and without sufficient, and the right type of, engineers, many good ideas will continue to be just that – good ideas that have gone nowhere.

No profession unleashes the spirit of innovation like engineering. From research to real world applications, engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward thinking ways. Few professions turn so many ideas into so many realities. Few have such direct and positive effect on people's everyday lives. We are counting on engineers and their imaginations to help us meet the needs of the 21st Century". In short, engineers make things happen.

The issue starts at school

The Women in STEM Strategy discussion paper addresses several issues facing gender equity within STEM career pathways. The equitable participation of women in STEM careers will ensure that Australia is drawing on all available STEM talent across the country and that all Australians are equipped for the jobs of the future.

As the paper mentions, the problem of gender equity in STEM careers is well known. The challenge starts at school, and from a young age. Primary school education, high school education, subject selection and career awareness are key to increasing the participation of women in STEM based careers. The challenge is educating our young women on the importance of foundation STEM skills in context of problem solving and future innovation. The message we deliver currently is to tell our students they need to study maths and science subjects, without helping them understand the 'why'. It is critical we put context around STEM skills as foundations for innovative thinking and real-world problem solving. Potentially this would present a challenge for a high percentage of teachers too, we need to invest to upskill our valuable teaching staff, so they are informed and confident in communicating the 'why'.

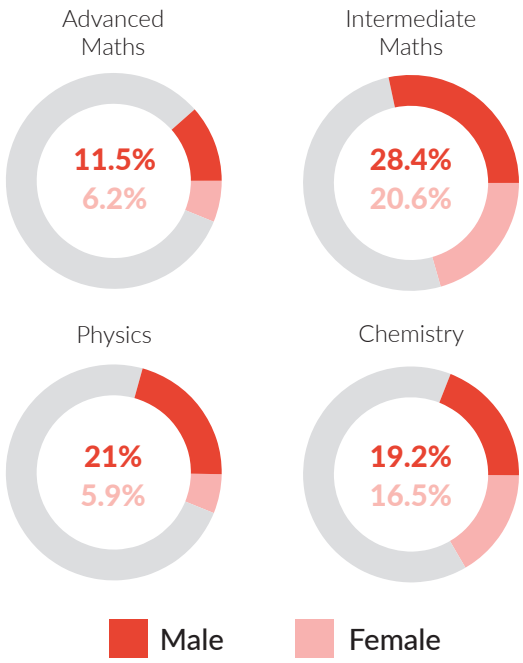
Engineers Australia launched a report 'Engineers Make Things Happen' in 2016 where it stated, 'the importance of science, maths and technology for our future development has received widespread attention, but high school participation in these subjects continues to fall.'

A key issue is that in the face of falling participation in science and maths subjects, increasing high school retention further has been stabilising the number of students in these subjects and creates a window of opportunity that policy makers can take advantage of to implement new policies to reverse falling STEM participation. That window is, however, closing.

Firm grounding in science and mathematics is important in a number of fields, but particularly so for engineering because science and maths are the tools used by engineers to solve problems. Participation in these subjects is typically far lower among young women than young men.

Participation by young women in critical foundation subjects for engineering such as advanced and intermediate maths, physics and chemistry is alarmingly low and is in stark contrast to their participation in higher education which is 30% higher than young men, an outcome that is not receiving the attention it deserves.

Student at year 12 in each subject (2015)



In effect, this low participation has created an environment in which engineering recruits most engineers from half the population, a situation that is unsustainable given our national agenda.

Potential pool of female engineers

Engineering is not known as a gender-diverse profession, and indeed the percentage of women in the engineering profession is low. Just 13.6% of the engineering labour force is female, and it's even lower at 11.2% when only those who are employed in engineering roles are counted. However, the numbers involved are nonetheless significant, at almost 45,000 in the labour force.

There are two issues regarding female engineers, retention of female engineers, and workplace participation of overseas born engineers.

The rates of decline in terms of retention of women employed in engineering roles with age suggest well embedded structural issues that need to be addressed. Figures show a decline in Australian-born female engineers in engineering occupations from 69% at 20-24 years down to 14% at 65-69 years (compared to Australian-born male engineers going from 74% at 20-24 years down to 59% at 65-69years). The decline in overseas-born female engineers in engineering occupations is from 42% at 20-24 years, down to 20% at 65-69 years. Australia cannot fully capitalise on its engineering capability by recruiting most engineers from one gender.

The unemployment and workforce participation rates for Australian-born women are comparable with Australian-born men. The situation for overseas-born women is very different. For example, in 2016 they are much less likely to be in the labour force: 81.1% participation for the Australian-born women, compared with 70.8% for the overseas born. Of those women who are in the workforce, they are much more likely to be unemployed: 3.8% for Australian-born women, and 11.3% for overseas-born women.

The causes for this are not known, but it identifies a cohort of engineers who are currently underutilised, and they could form a large pool of potential talent.

The opportunity

There are three key areas of opportunity to increase female participation in STEM study and careers.

BUILD – The need to build capability and availability of STEM based female talent through primary and high school participation. We need to ensure that numbers of women in critical STEM subjects are increased, using the context of 'why' (humanitarian, problem solving) and increasing young women's awareness of STEM based careers with the use of female role models.

ATTRACT – The need to attract more women into STEM based careers, increasing public awareness of the variety of STEM careers and debunking the gender stereotypes, providing women with clear career vision using mentors and role models, by providing workplaces that encourage and promote diversity, and environments that are flexible and inclusive.

RETAIN – The need to retain the female STEM talent as they age, providing more flexibility around different life stages in the workplace and incorporate structured and positive career planning for female STEM professionals into senior leadership roles, using sponsors and mentors to engage and enable career advancement.

Responses to questions posed in the discussion paper

1. **Do you think the identified issues affecting women and girls in STEM education and careers are correct? Are there other key issues that have not been identified?**

Engineers Australia agrees that the issues identified in the discussion paper contribute to the STEM gender gap in Australia. We suggest additional issues to be addressed include:

- Systemic and individual biases, both conscious and unconscious
    - Community gendered stereotypes of STEM based careers/roles
- Alarmingly low participation rate of high school girls in maths and sciences and a downward trend.
- Perceptions among students, parents and educators regarding range, nature and suitability in all STEM careers, not just science.
- Lack of awareness of the broad range of STEM based careers.
- Retention of STEM based career females, notably low retention in engineering. Workplace flexibility within the profession has not kept up with current market opportunities, and therefore may not be as attractive to women.
- Lack of representation of women in leadership roles in industry, government and academia, and lack of visibility of those that are in leadership.
- Need to ensure the focus is on all STEM based careers and learning, not just science. While this discussion paper has a science focus, the Women in STEM Strategy must address the breadth of STEM based career and learning issues.

2. **What role can Government best play in addressing the issues of gender inequity in STEM fields?**

- Raising awareness through educators of the range and nature of STEM based careers
- Supporting development of contemporary STEM curricula
- Promoting women role models in STEM, including the selection of women for senior leadership roles on Government Boards and Committees.
- Upskilling teachers to understand current STEM based learning in context.

3. **What role should the science and research community, along with industry, play in addressing these issues?**

- Develop and implement specific gender equity plans for their workforce
- Actively promote their support for gender equality
- Support STEM initiatives that promote role models and put forward their best, brightest and most valuable talent to mentor young women
- Collaborate with other sectors to identify and resolve barriers to gender equality.

4. **Are current initiatives focusing on the right areas? What existing initiatives do you think are particularly effective at encouraging greater participation of women and girls STEM education and careers (including those managed or funded by government, and those led by the science, education and industry sectors)?**

- Male Champions of Change.
- Science in Australia Gender Equity.
- The pilot 'Engineering is Elementary' run through Questacon is an extremely promising potential national primary school program.
- Superstars of Science is a good program, however has the science focus, not all disciplines.

5. **What gaps exist in current efforts that the Government could address?**

- There is no consolidated, national approach to increasing girls in STEM through primary and high schools. The messaging is different with every program. There needs to be a consistent message in context for young women to want to follow STEM based careers. Currently some great programs, but ad-hoc approach.
- Reposition STEM education as problem solving and humanitarian. Research has shown this focus will resonate more with young women.
- A review of early childhood education and the elimination of gender bias.

- Raising public awareness of the diversity of careers in STEM.

6. Is there anything else the department should consider in developing the Strategy?

The discussion paper is high level and has a very clear science and research focus. In developing the Women in STEM Strategy, the department would benefit from a more in-depth analysis of gender equity issues in Australia, and from a broader focus across all STEM disciplines. The department would also benefit from the inclusion of stakeholders that represent the breadth of STEM careers and learning in the development of the strategy. Engineers Australia would welcome the opportunity to work with the department in the development of this body of work.

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