



Science & Technology AUSTRALIA

Status of the Teaching Profession

20 December 18

To the Standing Committees on Employment, Education and Training,

Thank you for the opportunity to provide feedback regarding the status of the teaching profession. 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.

In an increasingly technological world, the development of skills in science, technology, engineering, and mathematics (STEM) will be essential to assure the strength, competitiveness and capability of Australia's future workforce. The Australian education system must provide a solid foundation in mathematics, science, and technology to all students.

Educators make a valuable contribution to Australian society. It's important to ensure they have the best support, structures, and training in order that they can work towards the best outcomes for students.

To ensure that STEM education empowers all, STA recommends the following:

1. Establish a nation-wide plan to achieve an adequate number of suitably qualified maths and science teachers;
 - a. Provide opportunities for teachers to retrain and continually develop maths and science skills;
 - b. Develop a national strategy to address the issues of teacher retention;
 - c. Encourage teaching students to specialise in maths or science;
 - d. Encourage and incentivise maths and science undergraduate students to consider a career in teaching;
 - e. Increase enrolments of maths and science students at the tertiary level; and
 - f. Provide appropriate career guidance to students that outlines the benefits of both STEM and education training in tertiary institutes;
2. Provide support for professional development to equip existing teachers to upskill in the use of digital technologies.
3. Monitor and respond to digital trends and ensure future teachers are equipped to prepare students appropriately.
4. Registration and monitoring of:
 - a. Secondary subject education obtained by teachers throughout their degrees; and
 - b. Any re-training undertaken by teachers during their careers.
5. Apply a gender equity lens to the future STEM teaching workforce to:
 - a. Work towards a gender balance in education degrees; and
 - b. Work towards a gender balance in STEM degrees

Kind regards,



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President, STA



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Introduction

Between global competition, a digital based economy and mass automation of the labour workforce, today's students are going to require a vastly different skillset than those of their parents. In particular, it is expected that STEM skills are going to be most important: an estimated 75% of the fastest growing occupations will require STEM skills and knowledge¹. If Australia wants its workforce to be prepared for a prosperous future, and for the challenges that lie ahead for our society, we must invest now in providing a strong STEM education to all students.

Unfortunately, unlike some more innovative countries like Germany and Japan, Australia is falling behind in providing the education needed to underpin an effective and competitive future workforce. According to the latest international comparative data, Australia's performance in both maths and science has been in decline since 2009².

Instead of seeing an increase in participation in STEM to meet this growing need, students are taking easier maths subjects, and fewer are studying science in both secondary and tertiary education³.

A key component in preparing students for the needs of the future is a teaching workforce that is suitably qualified and provided with sufficient support.

A lack of qualified science and mathematics teachers

The dearth of mathematics- and science-qualified teachers in both primary and secondary education is of grave concern. There are a large number of people with no tertiary qualifications in maths or science teaching these subjects.

According to the Australian Council of Educational Research, up to 38% of Year 7-10 mathematics classes are taught by out-of-field teachers⁴. This leads to a decrease in student engagement, as the teachers feel less confident with the material that they're teaching⁵. This decreased engagement has been identified as a contributing factor to the decrease in students continuing with their STEM studies beyond secondary education⁶.

Unfortunately, the issue of out-of-field teaching has no quick and easy fix. According to recent modelling undertaken by the Australian Mathematical Sciences Institute, it could take up to 10 years to train enough maths-qualified

¹ ["Australia's STEM workforce: a survey of employers"](#) Office of the Chief Scientist, 2014

² ["The Programme for International Student Assessment key findings"](#) Australian Council for Education Research 2016

³ ["Discipline Profile of the Mathematical Science"](#) Australian Mathematical Sciences Institute, 2017

⁴ ["Out-of-field teaching in Australian Secondary School"](#) Australian Council for Educational Research, 2016

⁵ ["Action Now: Classroom Ready Teachers"](#) Department of Education and Training, 2014

⁶ ["Monitoring Australian Year 8 student achievement internationally: TIMSS 2011"](#) Australian Council for Education Researchers, 2012

teachers to meet demand in Australia⁷. This solution, while long-term, requires immediate collaborative action between the commonwealth and state governments, education unions and peak bodies, schools and training providers.

STA has identified six obstacles in the recruitment and training of more maths and science teachers.

1. Few opportunities for teachers to retrain and continually develop maths and science skills;
2. Current science and maths teachers leaving the profession;
3. Not enough education students are specialising in maths or science education;
4. Few incentives for maths and science undergraduate students to consider a career in teaching;
5. Decreasing maths and science enrolments at High School and tertiary level resulting in less maths and science qualified graduates entering teaching; and
6. A lack of adequate careers advice regarding the skills and opportunities provided by a STEM degree.

Current science and maths teachers leaving the profession

With a shortage of qualified maths and science teachers it is essential that Australia makes a special effort to retain the qualified teachers that we do have. The issue of teacher attrition is particularly problematic amongst early career teachers, 40% of whom leave the profession within the first five-years⁸.

Much of the research into teacher retention indicates teachers who feel valued are more likely to stay within the profession⁹. In Australia, research has shown that teachers are dissatisfied with their work, and this dissatisfaction is a driving force that is leading to attrition¹⁰.

To improve job satisfaction amongst teachers in Australia, a cultural shift must occur both within the education sector and more broadly. While online training can be as effective as face-to-face training, the latter has the added benefit of networking and fostering a collegial culture. A collaborative education culture can also increase collaborations between STEM educators and industry partners¹¹.

As well as keeping the current maths and science teachers in the profession there are not enough education students are specialising in maths or science education to meet the nation's future needs. Australia has had some past success in trying to combat this. In secondary education, teachers are required to

⁷ [“AMSI Occasional Paper 1 – Crunching the numbers on out-of-field teaching in maths”](#)

Australian Mathematical Sciences Institute, 2018

⁸ “Early career teacher attrition: intentions of teachers beginning” Teaching Education, 2015

⁹ “Teachers who feel appreciated are less likely to leave the profession” The Conversation, 2018

¹⁰ [“Teacher Attrition and Retention Research in Australia: Towards a New Theoretical Framework”](#) Australian Journal of Teacher Education, 2015

¹¹ [“Optimising STEM Industry-School Partnerships: Inspiring Australia’s next generation”](#) The Australian Council of Engineering Deans, 2018

specialise in a subject as part of their education¹² and this has been the primary pathway for many of Australia's current specialist mathematics and science teachers.

However, it is clear that the current system will not be sufficient to meet the growing demand for specialised teaching in maths and science as STEM skills become even more important for our workforce.

One approach to consider is the introduction of financial incentives to undertake maths and sciences as secondary subjects, in the model of the highly successful Secondary Subject Trainee Allowance in New Zealand. This program provided a \$10,000 scholarship to students undertaking training in subject areas where there were teaching shortages and was shown to increase the number of students in these areas by 51%¹³.

No incentive for maths and science undergraduate students to consider a career in teaching

All universities in Australia require students to undertake study in units that are outside their nominated field of interest. Science and mathematics students might be encouraged to go into teaching by proactively requesting that they undertake a broadening/elective unit in education during their studies.

Students are already required to take elective units, so by incentivising science and maths students to choose education (for example, by introducing a waiver to the course fee), more STEM graduates may find themselves exploring career options in education as a result¹⁴.

Decreasing maths and science enrolments at the tertiary level resulting in less maths and science qualified graduates entering teaching

Despite the value and relevance of STEM skills, the number of students enrolling in maths and science degrees at universities has been declining as a proportion of overall student enrolments¹⁵.

Therefore, it is important to recognise that any increase in maths and science teachers in Australia is predicated on increasing enrolments in STEM subjects in tertiary education. Incentives should be provided to universities to enrol, and support, more science and maths graduates in order to address this issue.

A lack of adequate careers advice regarding the skills and opportunities provided by a STEM degree

After consultation with the STEM sector, career advice provided to secondary students was raised as an issue that has a profound effect on the future recruitment of maths and science teachers.

¹² "[Secondary Teachers](#)" NSW Department of Education, Accessed December 2018

¹³ "[New plan to Address teacher shortage](#)" New Zealand Government, 2018

¹⁴ "[Universities can help recruit more science and maths teachers, but they can't do it alone](#)" The Conversation, 2018

¹⁵ "[Australia's National Science Statement 2017](#)" Department of Industry, Innovation and Science, 2017

Career advice provided to students in secondary education is highly focused on matching a degree to a career and advising students on possible paths for them to follow. While this methodology is effective in directing students along certain career trajectories, it can fail to translate the value of STEM degrees towards achieving a multitude of non-STEM-traditional career paths including teaching.

By setting a long-term plan for addressing the issues highlighted above, we can ensure that future students are provided with specialised mathematics and science teachers in all classes across the country. This will increase student outcomes, provide the workforce with sufficient STEM skills, and lead Australia towards a more prosperous future,

STA recommends:

1. Establish a nation-wide plan to achieve an adequate number of suitably qualified maths and science teachers;
 - g. Provide opportunities for teachers to retrain and continually develop maths and science skills;
 - h. Develop a national strategy to address the issues of teacher retention;
 - i. Encourage teaching students to specialise in maths or science;
 - j. Encourage and incentivise maths and science undergraduate students to consider a career in teaching;
 - k. Increase enrolments of maths and science students at the tertiary level; and
 - l. Provide appropriate career guidance to students that outlines the benefits of both STEM and education training in tertiary institutes;

Ensuring a coding-qualified teaching workforce

The economy of the future is going to be digital. It is important, therefore, to ensure that young Australians are equipped with the understanding, skills and confidence to participate in the new digital economy.

One of the most effective methods to empower students in new technologies is by teaching them to code¹⁶.

However, Australia's approach to teaching coding skills lags behind the rest of the world. Where highly digital and innovative economies, such as Estonia, have embraced coding as a core subject for all students¹⁷, Australia has only now begun to adopt these subjects in to our curriculum. As of 2019, a digital technologies curriculum developed by the Australian Computing Academy will be required teaching in all schools¹⁸¹⁹.

¹⁶ ["Coding In Education: Why It's Important & How It's Being Implemented"](#) Open Colleges, 2017

¹⁷ ["An education for the 21st century means teaching coding in schools"](#) The Conversation, 2015

¹⁸ ["Are schools preparing students for the jobs of the future?"](#) SBS News, 2018

¹⁹ ["What is the digital economies curriculum"](#) Australian Computing Academy, Accessed December 2018

While this is a welcome step, providing a new curriculum is only half the battle. The teaching workforce needs to be provided with the opportunity to undertake professional development in these areas too. Without enough support and incentives, digital technology education risks falling victim to the out-of-field teaching dilemma which already exists in mathematics and science.

It's also important to build flexibility and foresight into the system, so that we can respond to future trends and developments. Coding is a great skill to focus on at the moment, but it is important that we keep looking for and remain open to integrating new skills into curricula and teacher training, to give Australia a competitive edge.

STA recommends:

2. Provide support for professional development to equip existing teachers to upskill in the use of digital technologies;
3. Monitor and respond to digital trends and ensure future teachers are equipped to prepare students appropriately.

Increased detail in teacher qualification monitoring

According to the Australian Professional Standards for Teachers, the only required qualification for teaching is a degree from a recognised institution²⁰. There is no requirement to have or register a formal qualification in fields of education like maths or the sciences for those who are teaching in the areas of maths and science.

As well as addressing the other issues raised in this submission, it will also be important to continue to monitor the problem of out-of-field teaching. Currently, our education system is unable to identify or address a lack of confidence or skills among the teaching workforce, which is letting down students and teachers alike.

It is important to note, however, that at no point should such a register of skills be used to disqualify current teachers, it should instead be used to empower teaching professions and encourage them to undertake retraining where it can benefit the system and their students.

STA recommends:

4. Registration and monitoring of:
 - c. Secondary subject education obtained by teachers throughout their degrees; and
 - d. Any re-training undertaken by teachers during their careers.

²⁰ "[Australian Professional Standards for Teachers](#)" Australian Institute for Teaching and School Leadership, 2011

Monitor and address diversity within the profession

Gender inequality in teaching and in science, technology, engineering and mathematics continues to be an issue in Australia, however there is no national, coherent approach to address them²¹.

The ideal would be a STEM-qualified teaching workforce that is gender balanced. Over the past 50-years the number of male teachers in both primary and secondary education has been in decline²². To improve the number of specialist science and maths teachers, it is important to address the gender imbalance that exists in STEM graduates and in education graduates.

A specific effort is required to increase tertiary enrolments in STEM subjects to in turn increase the number of potential science and maths teachers. Any initiative that seeks to increase the number of overall STEM enrolments for the purpose of encouraging more graduates to take up teaching must take genuine steps to ensuring gender balance among this cohort.

STA recommends:

5. Apply a gender equity lens to the future STEM teaching workforce to:
 - a. Work towards a gender balance in education degrees; and
 - b. Work towards a gender balance in STEM degrees

²¹ “The teacher workforce in Australia: Supply, demand and data issues” Australian Council for Educational Research, 2015

²² “[Are male teachers headed of extinction? The 50-year decline of male teachers in Australia](#)” Economics of Education Review, 2017