

World leading STEM teachers for Australia

In order for our secondary school STEM teachers to inspire students, they must have deep discipline expertise that gives them self-confidence in the classroom.

The challenge

The majority of the fastest growing occupations require significant science, technology, engineering and mathematics (STEM) skills and knowledge. Price Waterhouse Coopers (PwC) estimates that 75 per cent of all replacement jobs in the next 15 years will require some degree of STEM skills.

Reports by the Australian Chief Scientist and others have drawn attention to the falling participation rates by senior secondary school students in science and advanced mathematics. There are major implications for Australia's future economic prosperity – and human and environmental health – if the numbers of students undertaking STEM-based degrees at university are not increased. These include students who will ultimately take up careers in teaching.

Many factors can be seen to influence the decision by secondary school students not to choose these subjects at the level required for studying STEM disciplines at university, including the reduction or elimination of prerequisites for university entrance. Other factors include the large number of upper secondary subject choices and the perceived status of STEM careers and their earning potential.

There is good evidence to demonstrate that a highly significant factor is the influence of inspirational teachers. Many students choosing STEM studies at university will tell of an especially good teacher who influenced their decision. Further, a report from the Australian Council of Learned Academies has found that countries that lead on STEM education and workforce skills have inspirational teachers who are well trained in a STEM discipline and in pedagogy.

Australia needs to ensure all its STEM teachers aspire to be inspirational teachers and have the training to succeed.

The way forward

The Academy has further explored the factors that underpin inspirational STEM teaching at secondary school by convening a Workshop in November 2015, which has informed this Action Statement. The Workshop tested the hypothesis that inspirational teachers are self-confident in their chosen speciality, and that self-confidence comes from being fully educated in their speciality STEM subject as part of their teacher education.

Several key factors need to be addressed for Australia to have the inspirational STEM teachers it needs. All require urgent attention in order to enhance the quality of STEM teachers and teaching, and thus to improve the participation rates of senior secondary school students in STEM subjects.

The Academy maintains that the more rigorous the STEM-based education elements of a teacher's education and training program, the more confident the teacher will be and the more inspiring the teacher will be for their students.

Focusing on secondary STEM teachers, the hypothesis is that the best initial teacher training is through undertaking a bachelor's degree with an appropriate major, supplemented by post-graduation teacher training qualifications. It is recognised that other acceptable options may be available – the test for the “quality” of the discipline strength of trained teachers is their eligibility to be accepted into the relevant professional science institutes, such as the Royal Australian Chemical Institute or the Australian Institute of Physics.

Recommended actions

Initial teacher education and training for STEM teachers should require a bachelor's degree with appropriate major, along with either undergraduate or postgraduate qualifications in teaching.

- » Inspirational teaching rests on self-confidence. This, in turn, is based on the depth of discipline knowledge and experience in the teacher's STEM major, to the extent that they could be members of an appropriate professional institute in the relevant science discipline.

An independent national professional body for teachers, similar to those for other professions, should be established. The creation of an independent national professional body for teachers should be established to accredit and certify standards of education and training for courses and teachers respectively.

- » Other professions benefit from independent national professional bodies, including engineers through Engineers Australia and medical practitioners through their respective Colleges. Teachers would also benefit from such arrangements, as noted by the Australian Council of Educational Research and the Australian Science Teachers Association.

- » A national professional body such as the College of Teaching would be membership-based, would set standards, promote continuing professional development, and take responsibility for course regulation and teacher accreditation and certification.
- » The current structure and process for regulating and accrediting initial teacher education and training programs, and for certifying teachers, should be replaced by the professional body proposed here.

All out-of-field teaching in STEM disciplines needs to be eliminated as soon as practicable.

- » Having discipline-qualified teachers is fundamental to any national STEM education strategy. The Academy supports enhanced professional development and training for teachers to progressively remove current out-of-field teaching, as well as encouragement and incentives for more STEM students to take up teaching qualifications and careers.