



Australian Academy of Science

# **SUBMISSION TO THE TEACHER EDUCATION MINISTERIAL ADVISORY GROUP**

**FROM THE AUSTRALIAN ACADEMY OF SCIENCE / JUNE 2014**



## Teacher Education Ministerial Advisory Group Consultation 2014 SUBMISSION

### NAME OF ORGANISATION OR INDIVIDUAL MAKING SUBMISSION

Australian Academy of Science

### AREAS FOR RESPONSE

**1. What characteristics should be fostered and developed in graduate teachers through their initial teacher education?**

How can those best suited to the teaching profession be identified?

What are the skills and personal characteristics of an effective beginning teacher? How can teacher education courses best develop these?

#### INTRODUCTION

In providing a submission to the Teacher Education Ministerial Advisory Group, the Australian Academy of Science (the Academy) wishes to comment specifically on the preparation and professional learning of teachers of science. Some of the Academy's comments will however have implications for teacher education generally. The Academy supports the well-accepted principle that teachers are the key to improving student learning. It is therefore of critical importance that we strive to have the best teacher education possible.

Since its foundation in 1954 the Academy has been at the forefront of promoting scientific excellence, science education, international collaboration, evidence-based advice and scientific endeavour in Australia. The Academy has always advocated the need for quality teachers of science to ensure that all students who pass through our education system emerge into the wider community with a high degree of science literacy. The Academy acknowledges that many of our top scientists have been significantly influenced by an inspiring teacher. Support for quality professional teacher learning is provided by the Academy through its innovative Primary Connections and Science by Doing programs.

The Academy is made up of around 450 Fellows, all of whom have been elected to the Academy by their peers on the basis of outstanding contributions to scientific knowledge. The Academy is an independent body and with no statutory obligation to government, enabling it to provide impartial advice on matters of science and science education.

#### CHARACTERISTICS OF TEACHERS OF SCIENCE

Graduate teachers of science should have a good understand of:

- the science that they teach
- the way the science can be presented to students for effective student learning
- the pedagogical skills required to ensure deep student learning

Initial teacher education should foster and enhance a teacher's ability to engage, enthuse and excite students in their learning with the aspiration that students will want to learn more about science and the world in which they live. For some students this will translate into a desire to pursue a science or science related career.

## 2. What teaching practices should be developed in graduate teachers through their initial teacher education?

How can the teaching practices that produce the best student outcomes be identified?

How can teacher education programmes encourage teachers to reflect on evidence to support their choice of teaching practice?

How does reflection on evidence translate into student outcomes?

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### PREPARATION OF TEACHERS OF SCIENCE

To be an effective teacher of science you need to understand the science that you teach. This is true for both primary and secondary teachers. In their teacher preparation courses it is important to ensure that this occurs. For secondary teachers the minimum expectation is that a science teacher will have a science degree with a major in one of the main science disciplines.

At present there is a potential requirement that teachers will have at least two years of a teacher education course. While this is an admirable goal the consequence is that science teachers will need to be educated for five years to become formally qualified science teacher. The Academy is concerned this will have a negative impact on attracting people into science teaching. There is a shortage of mathematics and science teachers at present especially in the junior secondary area. Such a requirement would potentially further exacerbate this concerning unsatisfactory state of affairs. Rather we should be exploring ways to attract more people into science and mathematics teaching.

The Academy would encourage the Advisory Group to review this requirement with a focus on quality teacher education.

### 3. What level of integration should there be between initial teacher education providers and schools?

What evidence is there that effective integration achieves good teaching practice? What are the most effective types of integrated experiences in preparing new teachers?

What are the cost implications of more integrated professional experience? Are there more effective ways in which professional experience might be funded?

What other methods, or combination of these methods, could achieve better outcomes than the current approach to professional experience?

How can partnerships between teacher education providers and schools be strengthened to make teacher education more effective?

How can teacher education providers and schools best work together to select and train mentor teachers to effectively support pre-service teachers on professional experience?

How can consistency of good practice and continuous improvement across teacher education providers and schools be assured?

#### PROFESSIONAL EXPERIENCES FOR PRE-SERVICE TEACHERS

The professional experience is a very important component of any teacher education program. The partnership between universities and schools is also important in providing this component. But the responsibility for enhancing this professional component rests with the universities. The main responsibility of a school is to educate its students.

Universities therefore need to prepare pre service teachers to a level by which they can make a meaningful contribution in a classroom with students. Through the school experience pre-service teachers can refine and adapt their skills to the demands of the classroom.

The Academy would encourage universities to use technology to assist pre-service teachers develop their initial teaching skills. This seems a more effective and efficient way of developing these skills. The use of film clips of exemplary teachers and computer simulation activities would enhance teacher skill development. Some of the Academy's professional learning modules provide examples of how this can be achieved.

#### 4. What balance is needed between understanding what is taught and how it is taught?

What is the desirable interaction between content knowledge and teaching practice for developing teachers?

What is the difference for primary and secondary teaching? Why is there a difference?

Should there be explicit training in how to teach literacy and numeracy in all teaching courses?

How can the balance between the need for subject specialisation and a generalist approach in primary teaching qualifications be addressed?

What, if any, changes need to be made to the structure of teacher education courses? Should content be studied before pedagogy (i.e. should 'what' to teach be studied before the 'how' to teach)?

What barriers are there to restructuring teacher education courses to ensure they address these concerns, and how may they be overcome?

Why does Australia face a shortage of maths, science and language teachers?

What can be done to encourage teaching students to develop a specialisation in these areas?

##### SCIENCE TEACHING PRACTICES

Science is a discipline in which the content knowledge of the discipline is increasing very rapidly. It is therefore important for students to be able to develop ways of applying their basic science ideas to new situations. In this way students will become scientific literate.

For this reason teachers of science need a broad range of teaching skills from teacher explanation and student discussion skills to sequencing student experiences by which the essence of science inquiry can be developed.

The Academy supports the science teaching practices as outlined in the Australian Curriculum: Science. Through an extensive consultative process the following statement was supported by the teaching profession:

"The science curriculum emphasises inquiry-based teaching and learning. A balanced and engaging approach to teaching will typically involve context, exploration, explanation and application. This requires a context or point of relevance through which students can make sense of the ideas they are learning. Opportunities for student-led open inquiry should also be provided." (Australian Curriculum: Science)"

The Academy through its programs has produced a variety of resources that assist both pre service and practising teachers improve their pedagogical skills. Both Primary Connections and Science by Doing have curriculum resources that embed effective and well-researched pedagogical skills into science lessons to help teachers. Science by Doing has also developed a series of award winning professional learning modules that use digital innovation in creative and engaging ways. These modules demonstrate how educational technology can be used to more effectively enhance teaching skills.

## 5. Other

Any other comments in response to the Issues Paper may be provided here.

### FUNDING OF TEACHER EDUCATION

During the past decades there have been numerous reviews of teacher education at both the national and state level. These reviews have repeatedly raised concerns of inadequate funding for the preparation of teachers. Funding problems have resulted in a range of practices that have evolved during the decades. Some of the consequences include:

- the increased enrolment in certain teacher areas that has resulted in an oversupply, for example primary teachers and physical education teachers
- the increase of lecturing and didactic practices and the increase in the size of tutorial classes at universities
- the decrease of contact hours for pre-service teachers (for example 25 hours per week in the early nineties to 10/12 hours per week at present) for many universities
- the growth of offshore programs in different countries augmenting local education faculty budgets
- the growth of pre service teachers from other countries engaged in practice experience in Australian schools
- the decrease of academic staff involved in pre-service teacher practice experiences and the increased use of casual staff especially retired teachers and principals.

The overall impact of some of these practices is to distract education faculties from their core purpose of providing quality teacher education for Australian schools. If we accept that teachers are the most important factor in improving education we need to ensure that the funding input is at a level to ensure good quality teacher education.

### CONCLUSION

The Australian Academy of Science reaffirms its support for quality teacher education. Substantial investment is required to provide quality teacher education but such an investment will result in the significant development of Australia's intellectual and human capital.

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