

## **INQUIRY INTO REVIEW OF THE NEW SOUTH WALES SCHOOL CURRICULUM**

**Organisation:** Engineers Australia

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## **Submission to the Legislative Council Education Committee on the NSW Curriculum Review**

### **Key Points**

Engineers Australia broadly supports the findings and recommendations of the Masters Review of the NSW Curriculum, and strongly urges that:

1. Engineering is made an explicit theme within the revised F-10 curriculum and is strengthened in the senior secondary curriculum.
2. Subjects and topics in the revised school curriculum are consolidated to support student pathways more strongly towards vocational and higher education in engineering and related technologies.

To these ends:

3. Engineers Australia is willing to work with NSW Education Standards Authority (NESA) and the NSW Department of Education.

### **Preamble**

Engineers Australia (EA) is Australia's principal engineering association, serving and representing 100,000 professional engineers, engineering technologists and engineering associates (senior technicians) across all fields of engineering practice. The declared purpose of Engineers Australia is to advance the science and practice of engineering for the benefit of the community.

In November 2018, EA representatives discussed the NSW Curriculum Review and concerns of the engineering profession with the Review Lead, Professor Geoff Masters. EA subsequently submitted a response to the Review.

We now wish to see that the implementation of the revised NSW school curriculum ensures that the State will strengthen its capacity to educate more schoolchildren to contribute subsequently through Engineering, to the State's prosperity, security, health and well-being. Of all the STEM fields, (science, technology, engineering and mathematics), Engineering is the largest employer of both university and VET qualified people.

COVID-19 has intensified the need to strengthen the domestic production of engineers in a wide range of occupations. The State has needs and ambitions for new infrastructure, technologically-centred communities (e.g. in the Aerotropolis), and a cyber-secure, low-carbon economy based more strongly on high-value manufacturing, software products and systems and state-of-the-art agriculture. These areas offer large potential for employment.

For several decades, the majority of the country's new engineers each year have been immigrants. The State will need larger numbers of professional engineers, and engineering technologists, technicians, and tradespeople than have previously been delivered through the school system via tertiary education. The revised NSW curriculum must play its part in developing children's knowledge, mindsets, experience and motivations towards these ends.

### **Responses to specific Terms of Reference that are relevant to these concerns**

#### **1. *The extent to which the Masters Review addresses its terms of reference.***

- (a) Curriculum: we welcome the organising principles of the revised curriculum, particularly the enhanced emphasis on building skills in applying knowledge. This is carried through into the proposed implementation (Chapter 8) and the new framework for learning in the senior years of the school, as summarised in Fig 15. Importantly the nine areas of the framework are both curriculum areas and occupational groupings.

The framework areas should provide senior students with stronger motivation towards post-school outcomes. Having 'Engineering, Construction and Manufacturing', explicit as a group for the first time is an excellent step forward. This must be underpinned from primary school. Engineering offers good opportunities for active, student-centred learning and student project work in senior secondary, as well as cross-disciplinary study.

- (b) Quality: the Review is comprehensive and high-quality work. It clearly reflects the very wide range of input received in consultations and submissions, as well as school educational research literature and knowledge of best practice.
- (d) Relationship with the national school curriculum: there is broad consistency with the national curriculum key learning areas (KLAs) and cross-curriculum themes. The Masters Review develops the framework for the senior school curriculum much further than the national curriculum has been authorised to do.

We are confident that the current review of the national curriculum will be informed and be enriched by the Masters Review via contributions from NESAs and others, and in the spirit of continuous quality improvement. Engineers Australia's representatives on the implementation reference group for the Technologies KLA are advocating strongly for Engineering in its own right and as the driver and exemplar of 'integrated STEM'.

## **2. Government policy objectives**

- (b) Literacy and numeracy and key subjects: Engineers Australia strongly supports English literacy and numeracy plus science (as the inquiry and evidence-based methodology for explaining the natural and physical world), as fundamental subjects that must be developed in the school curriculum. But school education is not complete without adequate foundation knowledge and skills in information technology, expressive arts, history and citizenship, personal health and life skills.

## **3. Other Matters**

- (a) Cross-curriculum priorities: the profession and occupations of engineering produce infrastructure, products and systems with predictable performance in terms of cost, manufacturability, aesthetics/human-factors/usability, reliability, safety, environmental impact, life-cycle management, etc., by using materials, models and methods that are underpinned by mathematics, science, computing and design principles. Engineering is thus highly inter-disciplinary and intrinsically innovative.

Engineering concepts can be explored and developed at all levels of the school curriculum without deep mathematics and science, and through using everyday materials and the relationships between people and their natural and built environments. Teamwork and communications can be encouraged. This is the integrative power of Engineering within STEM that the implementation of the Review should exploit. The biggest challenge of implementation will be rectifying the extreme shortage of Technologies teachers<sup>1</sup>.

(f) Vocational education syllabuses: a stronger engineering theme within a revised design and technologies curriculum should, over time, improve the orientation of more school students towards engineering and construction subjects, and the take-up of related VET in school subjects. To be worthwhile, these must be made updated to reflect contemporary manufacturing and construction practices. In manufacturing, additive (3-D) manufacturing and other techniques associated with Industry 4.0 must be embraced.

Engineers Australia's representatives will be pleased to give verbal evidence in support of this submission.

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<sup>1</sup> The national Design and Technology Teachers Association reported in 2019 that 96% of Australian schools have difficulty in finding qualified Technologies teachers and 68% believe the quality of their Technologies Education programs have been compromised as a result. <http://www.dattaaustralia.com/sites/default/files/TECHNOLOGY%20TEACHER%20SHORTAGE%20SURVEY%20REPORT%202019%20DATA%20AUSTRALIA.pdf>