

Engineering Leadership Forum

Submission on ‘Tomorrow’s Schools’

7 April 2019

The Engineering Leadership Forum comprises the CEOs of New Zealand’s professional engineering and technology associations, including Engineering New Zealand, the Association of Consulting Engineers New Zealand, Water New Zealand, Civil Contractors New Zealand, the Institute of Public Works Engineering Australasia New Zealand Division, the Electricity Engineers’ Association, Concrete NZ and the Institute of IT Professionals NZ. These organisations represent the interests of well over 50,000 NZ professional engineers, engineering technicians and IT specialists.

Introduction

1. The Engineering Leadership Forum (ELF) has invested significant time into making submissions on the potential reform of vocational education training. However the vocational training system cannot be considered in isolation from school learning outcomes. Anecdotal evidence amongst ELF members is that there are still systemic weaknesses in the delivery of basic science, technology, engineering and mathematics (STEM) education in schools which impact on the readiness of school leavers for employment and the effort required, often by employers, to ready employees for undertaking L3 and 4 qualifications in the engineering sector.
2. One of our member organisations, Engineering NZ, has had a long term commitment to lifting STEM awareness and outcomes in secondary and primary schools through the Futureintech ‘ambassador’ project and its successor the Wonder Project (see Wonderproject.nz).
3. The Tomorrow Schools proposals include the creation of a new network of hubs to provide support for school boards and principals. Our proposal is that the hubs should be established to also include capability to provide support for STEM education in both primary and secondary schools.

Background

4. The appointment in 2009 of Sir Peter Gluckman as the inaugural Chief Science Advisor to the Prime Minister heralded a significant increase in interest by government in the importance of science and innovation to New Zealand’s economic and social future. As Sir Peter subsequently noted ‘a forward-looking science education system is fundamental to our future success in an increasingly knowledge-based world’ and he spent some time looking at how science education system ‘.....could be strengthened to contribute to our development as a “smart”, innovative, knowledge-oriented country, capable of addressing the serious questions we will face in the future, and how we can “engage and enthuse” more young New Zealanders in science.’ The Royal Society’s ‘The Future of Science Education in New Zealand (2012) also reviewed the issues facing the schools system in delivering an improved STEM education outcome. The NZCER contributed a review in 2013 ‘Building a future-oriented science education system in New Zealand: How are we doing? (Jane Gilbert and Ally Bull). The report gives a snapshot of the data available on the topic which confirms broadly that we could and should be doing better.

5. However, we have found it difficult in the short time available to document the current state of STEM education in NZ. We have consulted with experts, who confirm that for some time there has been no significant new research nor any new initiatives by Government. Below we summarise some comments we have received:
- a) Science and maths are still perceived as hard subjects due to the level of abstraction involved. Additionally STEM is still seen by both learners and their influencers as a second choice in terms of academic achievement perceptions. Contributing to this is the declining quality of STEM teachers, as STEM teaching is one of the least attractive career opportunities for STEM graduates, and poor careers advice on engineering opportunities especially - for example that going to university was a better outcome than a L5 or L6 qualification from an ITP.
 - b) Learners do not want to do too much STEM. Doing all 3 sciences plus two maths in Y12 and Y13 leaves little room for other subjects and is seldom attractive – with the outcome that they drop some or all of sciences and maths often without knowing the consequences in terms of preparation for further study. Additionally, science in secondary schools is often highly siloed into physics, chemistry and biology – this acts to make it harder to do integrated project work. Maths is becoming even more siloed as algebra and calculus are separated from statistics.
 - c) The lack of qualified teaching and pressure on timetables mean that for many smaller schools it is not possible to do three sciences. One school a commentator was aware of had a timetable where it was not possible to do both physics and maths despite these be highly complementary.
 - d) Many specialist STEM teachers are close to the end of their teaching career and are resistant to change – for example often still teaching for preparation for university rather than for a wider vocational education perspective.
 - e) Many science and maths teachers are not specialists and take a ‘cookbook’ approach to problem-solving that does not develop deep and embedded understanding of key principles amongst learners.
 - f) Secondary education is still too much in silos whereas most employers demand cross-disciplinary skills, not helped by the structure of the NCEA.
 - g) There is little or no growth in school population and certainly little in students doing subjects needed for engineering style qualifications.
 - h) The lack of recognition that basic STEM in schools needs to be seen as a priority by both students (and their influencers) and the educators if we are to compete with Asian economies long-term.
6. For the ELF, the precise state of STEM education in schools is less an issue than looking for new opportunities to lift learner’s access to quality STEM education. It is well known how that without adequate numeracy and basic STEM education the transition from primary to secondary schooling can be fraught, and the prospects for future work opportunities significantly limited. Regionally located schools, especially primary schools, appear to suffer most from a lack of STEM education capability.

7. The Tomorrow's Schools Taskforce has suggested the establishment of 20 hubs to take responsibility for property, employment, advisory services, professional development, and allocating Government funding – leaving schools to focus on education. The hubs would be in charge of about 120 regionally-grouped schools. The hubs would be independent of the Ministry, although their boards would be appointed by the Minister.
8. ELF proposes that a group of experienced STEM teachers could be placed within each of the hubs. They would be tasked with monitoring STEM education processes and outcomes and provide schools support where and when it was needed – on a half day or day basis for example. By sharing this skill set across say the 125 schools in each hub better outcomes would be inevitable. It is well beyond the ELF's ability to take this idea to any level of detail, although we are aware that some decades ago the Ministry of Education had implemented schemes to provide specialist skills to schools in need, and that this concept is hardly a new one.
9. We would be pleased to meet with the Taskforce to discuss our views that a focus on improving STEM education across schools is long overdue, and that the proposed reorganisation could be used to leverage this outcome.

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