Audit of Science, Engineering and Technology Skills

RMIT Response

1. Introduction

RMIT welcomes this opportunity to contribute to the discussion on the current and future supply of, and demand for science, engineering and technology (SET) skills in Australia. As a major provider of technical and professional SET skills, RMIT is acutely aware of the issues impacting on student demand for SET qualifications, and the critical shortage of skills in SET related industries. We therefore support the Department of Education, Science and Training (DEST) in its effort to clarify the scope of the problem and to work with education providers and industry to develop sustainable solutions.

As one of Australia’s leading technological universities, RMIT makes a significant contribution to Australia’s overall science, engineering and technology capacity. RMIT is a provider of vocational education and training, undergraduate and postgraduate education and has a significant SET research program, with strong industry links. RMIT is also involved in primary and secondary school education through teacher training programs and outreach programs such as peer tutoring in schools. As such, it is in good position to make a contribution to the national discussion on SET skills.

The key issues identified by RMIT include:

- The low level of public awareness of new career opportunities in science, engineering and technology arising from vocational education and training and higher education
- The importance of pathway opportunities and partnerships in skills development
- The changing nature of SET skill sets required by industry and community
- The need for high quality SET teachers
- The development of innovative SET teaching and learning

2. Awareness of SET – public perceptions, young Australians’ perceptions

Science, engineering and technology programs are no longer attracting the best prepared and most capable students, although first preferences for many SET programs remain high. If young people are to be attracted to SET it is essential that:

- The image of SET during primary and secondary school years and among parents must improve. Without strong “flagship” images for careers in science and engineering and opportunities available for those with SET skills, the trend away from SET careers will continue. The image of SET needs to change from being isolated and laboratory bound to highlight the reality of the exciting, rapidly changing and high technology world of science, engineering and technology today. An important component of this work is raising the profile of VET qualifications and the strong employment opportunities that arise from them, not only among young people but for older workers who may believe that they are `too old to learn’. (RMIT is currently conducting focus group work among older workers to ascertain their learning needs and how we can best promote learning opportunities within this group). This requires greater partnership between providers, Government and employers.
• Achievements in Australian science, engineering and technology need to be recognised and showcased. Australia has significant numbers of world-class scientists and engineers working in industry and research organizations. By raising their profiles in the community they can act as role models to inspire and motivate the next generation.

2. The importance of pathways and partnerships

In addition to promoting SET career opportunities to school leavers, governments in partnership with educational providers and industry must focus on up-skilling the existing workforce in order to address skills shortages. Improving workforce participation rates is now a key focus of government; however more opportunities need to be provided for non-school leavers and older workers to acquire the science and technology skills required for the economy. As the workforce ages, the provision of effective pathways between work and learning is essential if employees are to refresh and upgrade their skills.

Pathways development is a key priority for most educational institutions. RMIT, for instance, has established SET pathways across its VET and higher education sectors, including nested qualifications which provide multiple exit points for students. To facilitate student choice, RMIT provides career and academic advice for students to help them select appropriate pathways, and targeted orientation and transition support as students move between sectors throughout their working lives. We are responding to both Government and industry imperatives to make available pathways more transparent and accessible to students. However, as a dual sector provider we are also subject to contesting imperatives from different levels of Government around pathways provision. This is an area that urgently requires State and Federal collaboration around shared policy initiatives, in order to maximize the value offered by pathways in general and dual sector institutions in particular.

3. The changing nature of SET skill sets

SET skills sought by industry are changing in nature as many large, bulk commodity industries in developed economies have moved offshore to be replaced by smaller more specific enterprises. For instance, the polymer industry in Australia has changed from bulk commodity polymers to lower volume, higher value products and with it a shift in requirements, from traditional petrochemical engineers to engineers and scientists with a broader range of skills spanning both technical and commercial disciplines. At the same time, the SET labour force is increasingly global, with many Australians employed offshore in large multinational companies, and increasing numbers of skilled SET workers from overseas employed in Australian based companies. This requires workers in these fields to be sensitive to cultural and communication differences and adaptable to changing environments.

Overall the change in industry has led to:

• Significant changes in industry skill sets required with small teams working across more diverse areas. RMIT has responded to this need by embedding in its SET curricula the development of generic skills such as communication, team-work, self-management, leadership, change management and entrepreneurial skills.
• A need for interdisciplinary SET skills, that is, skills at the interface of disciplines, rather than multidisciplinary or large teams of different disciplines. RMIT has recognised the importance of the interdisciplinary nature of the science, engineering and technology industry as well as the need to increase the depth understanding of the basic sciences. New programs in
biomedical engineering, polymers, nanotechnology, mechatronics, biosciences and double degrees such as civil engineering and international studies will address the staffing requirements of these new market niches.

- Strong engineering and science practitioners, with practical hands on skills, able to contribute more immediately and specifically to small to medium local enterprises. Large volume, homogeneous training programs which served industry in the past need to be modified to meet the new, differentiated market requirements.

Graduates with the new skill sets will have a sound discipline base in science, engineering and technology with good design and analysis skills that can be applied across a broad interdisciplinary environment. Broad based science and technology institutions such as RMIT have the capacity to leverage a range of specializations and develop interdisciplinary programs to meet industry needs. Educational institutions must continue to be supported by Commonwealth and State funding structures that meet these interdisciplinary imperatives.

However, there is a broader imperative for Government in framing an industry policy for Australia – that is, developing a focus on particular industries where Australia can be globally competitive and ensuring appropriate investment in infrastructure and people.

4. The need for high quality SET teachers

If Australia is to meet demand for appropriately qualified scientists and engineers in the future, it is essential that there are high quality teachers at all levels of the education system. To ensure this we need to:

- Attract able and motivated students into teaching and ensure that they have sufficient formal education in the basic sciences to make them competent and confident teachers. This is equally important for primary as well as secondary teaching. In particular, the ability of primary school teachers to engage children in science during their formative years is essential.
- Recognise and reward teachers (at all levels) who contribute to the quality of teaching and learning in SET through innovative teaching and assessment practices, design of curriculum resources, production of textbooks and online materials etc.
- Encourage more collaboration between schools, TAFE providers and universities in initial teacher training, ongoing professional development of teachers and interaction between school students and university students in mentoring, peer tutoring and similar programs.

5. The development of innovative SET teaching and learning

The curriculum at all levels should stimulate awareness of science, engineering and technology. Curriculum designers, schools and universities have the opportunity to:

- Design science curricula that are both rigorous and motivating. Rather than “dumbing down” science to make it more accessible, curricula should apply current understanding of effective thinking, problem solving and learning to provide challenging and engaging learning experiences for students. In particular, we need to ensure that students have opportunities to engage in projects and activities that address real life problems and involve applying scientific theory and research to achieve outcomes.
- Provide an appropriate depth of learning and more opportunities for high performing school students choosing SET disciplines. For example, RMIT science courses, including introductory courses, are taught by discipline experts - especially those who are active and
enthusiastic researchers. In addition, RMIT SET students are engaged in research as junior/apprentice members of research teams from the start of their study wherever possible, thereby developing their capability to think creatively about the value of inquiry and the application of knowledge.

- Foster a greater commitment from industry groups to work collaboratively with the formal education sector to support initial training and education and ongoing professional development in SET through industry/TAFE/university partnerships R&D, advice on program development, support for scholarships, and support for equipment.
- Think not only in terms of the domestic market and national needs, but also of the international contexts in which graduates will be both trained and employed. This requires attention to the cultural specificities in curriculum design, and to the development of educational technologies that facilitate cross-border teaching and learning provision.
- Invest in our education, training and research infrastructure, to ensure that it supports the quality of skills development that we need. Experience has shown that the private sector has limited capacity or will to invest in large-scale SET infrastructure. Government needs to protect and leverage its current investment in education and training infrastructure to ensure that it meets the emerging needs for increased skills development, through investment and through incentives for partnership and collaboration.