
July 2017

Science Technicians Workforce

Summary for School Teachers

Royal Society Te Apārangi

- Help students find career opportunities in science.
- Match qualification level to science-rich roles.
- Find out what issues are important for career development.

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Opportunities in the science technician workforce

Do you have students interested in science who are not likely to go to university? The good news is they don't have to go to university to get the skills they need to get a rewarding job in a science field. In fact, our research on the science technician workforce shows that many BSc graduates enter the technician workforce without the practical skills they need to do the job. This is creating issues for employers who don't want to have to pay for the training they think science graduates should have received in tertiary study. They would preferably take on applicants with practical skills that can be gained through, for example, the New Zealand Diploma of Applied Science qualification. This is available through the Institutes of Technology and Polytechnics (ITPs).

We decided that this sort of mismatch of needs between employers and educational courses needed investigation. We also wanted to consider the opportunities and career pathways. So we brought together experts in these areas to consider the issues and look at potential solutions. This information is provided in our Science Technicians Workforce Report.

A summary of the report is available at the end of this document. The full report is available at <https://royalsociety.org.nz/what-we-do/our-expert-advice/all-expert-advice-papers/science-technicians-workforce-panel/>.

The Expert Panel, and a supporting Reference Group, were appointed by the Royal Society Te Apārangi. The Panel consulted widely, including with business, to ensure the findings of this report reflect today's science technician environment and that the recommendations are plausible and compelling.

What does the science technician workforce look like?

The number of science technicians in New Zealand is hard to quantify, but likely to be of the order of 10,000. There are some career technicians, but others move through the role. Nevertheless, it is probably there are several hundred new entrants to the role each year, most entering the role soon after leaving tertiary education. Notably:

- Some organisations are heavily reliant on a senior technician workforce nearing retirement
- Where roles involve the biological sciences or are part-time, science technician positions are more likely to be filled by females
- It is not uncommon for recent migrants with Masters Degrees and PhDs to seek

technician roles to gain a foothold in the New Zealand employment market.

Science technician roles encompass an ever-widening range of activities, and associated skills and experience, such as:

- Involvement in research projects and programmes
- Supporting the introduction of new innovative and leading-edge technologies
- A wide variety of roles in primary processing and manufacturing industries
- Various roles in health and biotechnology industries
- Quality control, monitoring and quality assurance testing, and verification, particularly in service provider organisations
- A variety of service work typically involving specialist analyses and measurements
- Planning and carrying out field and environmental work including monitoring, sample collection, preservation, and storage
- Managing and/or providing skilled contributions to the smooth, effective, and safe operation of a diverse range of teaching laboratories at secondary and tertiary institutions, and research laboratories
- The skilled operation and maintenance of scientific instrumentation with varying degrees of complexity, which can include experimental design and data analyses
- Roles in electronic and mechanical workshops concerned with the design, fabrication, and maintenance of mechanical, electrical, and electronic devices and equipment
- Health and safety compliance roles.

Our nation ranks amongst the highest of the OECD countries for qualification to job mismatch, where individuals are accepting jobs that are not well matched to their qualifications. Twenty-nine percent of the technician and trades workers surveyed believed they were over-qualified for their job.

New Zealand ranks third highest in the OECD for the proportion of adults that have attained a Bachelor's degree. In science, our nation produces more Bachelor's degree graduates than the average of the OECD countries. The information available to the Panel indicates that in order to find employment some of these graduates are embarking on science technician careers, just to get a start in the job market.

The number of students who graduated with a Bachelor's degree in natural and physical sciences between 2008 and 2015 was almost 9-fold higher than those who graduated with a Level 5-7 Diploma in the same field. New Zealand is well out of kilter with the OECD norm where the ratio is about 4 (see the table below).

Percentage of domestic and international graduates in 2013 by field. The OECD column is the average value.

Level of Education	NZQF Level 5-6		NZQF Level 7 (Bachelor's or equiv.)		NZQF Level 9 (Master's or equiv.)	
	NZ	OECD	NZ	OECD	NZ	OECD
Life Science	1	0.5	4.5	2.6	7.1	2.8
Physical science	0.1	0.3	2.0	1.7	2.6	2.2
Total	1.1	0.8	6.5	4.3	9.7	5.0

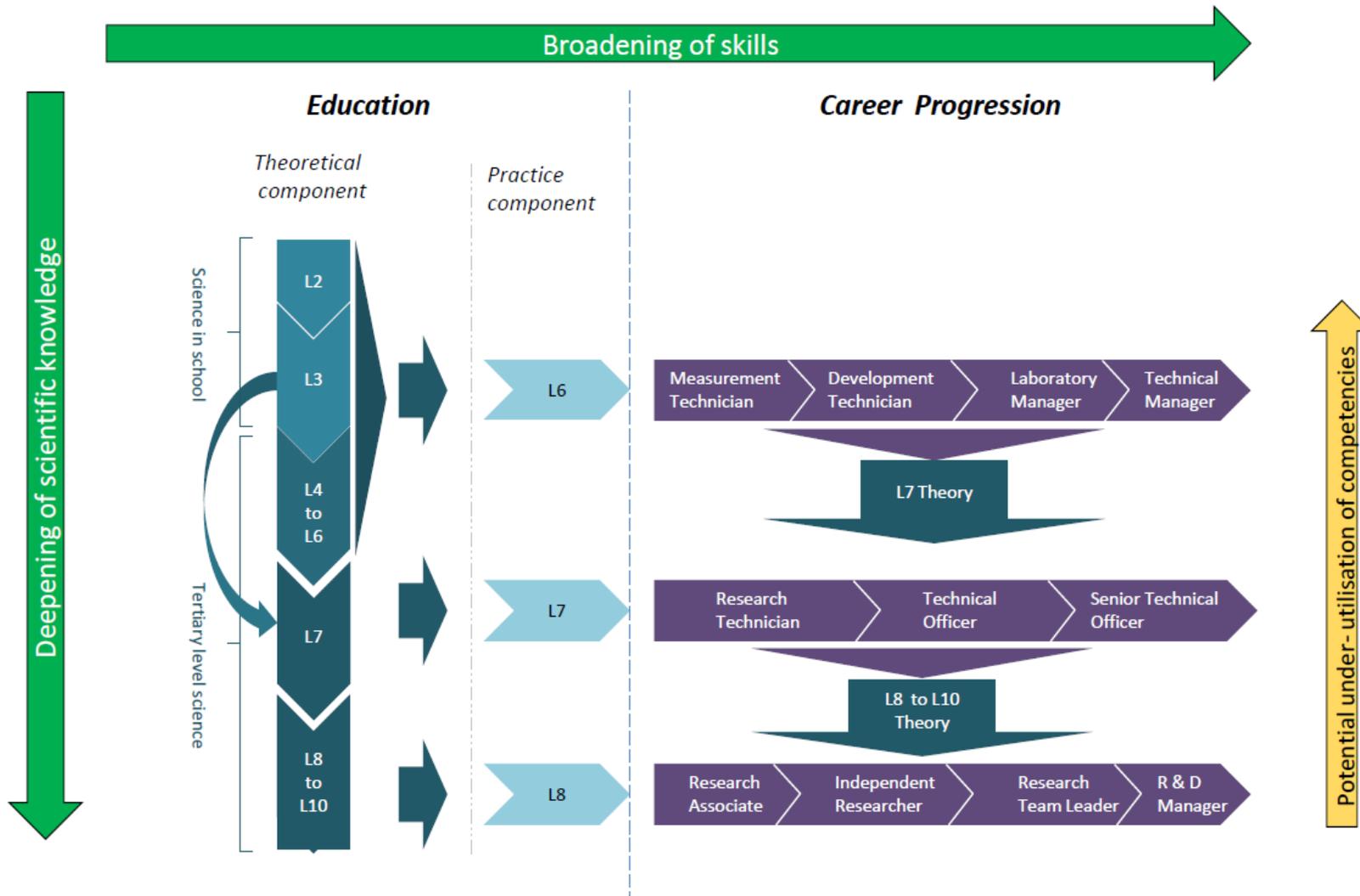
Recent data produced by Universities New Zealand indicate the net value (employment opportunity) of a Level 7 qualification in biological sciences (\$50,800) is lower than for a similar level qualification in physical sciences (\$59,900), and significantly lower than most engineering or ICT fields (\$55,600 - \$86,000). This suggests that there is an oversupply of graduates in the biological sciences areas.

Surprisingly, New Zealand is low in graduates in applied biological sciences like agricultural and horticultural science.

Overall, holding a Bachelor's degree qualification has become increasingly common for people in science technician roles in spite of those graduates lacking the general technical aptitude and transferable practical skills of graduates from a Level 5 or 6 technician qualification. Such qualification mismatch carries with it potential negative consequences for remuneration, employee job satisfaction and staff retention. Bachelors graduates are better matched to technician roles in research organisations than to technician roles in industry and service organisations.

There are worthwhile career pathways for technicians at different levels as illustrated diagrammatically overleaf. Nevertheless some technicians will progress their careers by moving away from roles set out in this model.

The Royal Society Te Apārangi science technicians' career model.



Implications for Guiding Students

There are very worthwhile career opportunities in science that can be accessed from a level 6 qualification - there are students whose aptitude is more practical and less theoretical and such students could well have great careers from studying at level 6, even if they do obtain University Entrance. It may be unwise to push those students towards University study.

Those who choose a qualification targeted to a specific area of applied science, health science, engineering or technology are likely to enjoy better remuneration and access to satisfying work in the early part of their career than those who take a general science qualification in disciplines in which there is a high supply of graduates.

There is a need to be realistic about the career prospects for different types and levels of science-based qualifications. Becoming a technician is a realistic early career expectation for those science students whose tertiary qualification is at Level 7 (Bachelors) qualification, especially if it is in the biological sciences.

As the career model shows, deepening of technical knowledge may prove much less important than soft skill development for future career advancement, so studying more science may prove less valuable than wider skill development in the long run.

Related Information

Vocational Pathways

<http://www.youthguarantee.net.nz/vocational-pathways/>

Qualification Overview New Zealand Diploma in Applied Science (Level 5)

<http://www.nzqa.govt.nz/nzqf/search/viewQualification.do?qual=2552>

Employability Framework <http://www.youthguarantee.net.nz/news-container/new-resource-to-support-development-of-employability-skills/>

Science Technicians Workforce Report summary

Science technicians bring a wealth of practical skills to the business and science sectors, and make essential contributions to New Zealand's economy. The variety of roles and opportunities available to science technicians has increased markedly in recent years due to the use of increasingly sophisticated equipment and procedures, automation, data processing, and computational methods. There has also been a greater emphasis on oral and written communication skills, and on regulatory and compliance requirements. The use of newly introduced innovative and leading-edge technology requires skilled technicians. A strong and resilient technician workforce is vital for a growing and increasingly technologically sophisticated economy.

It is desirable to maintain good alignment between the knowledge and skills of science graduates and those required by employers. A science technician needs a definitive understanding of scientific principles and methodologies, plus technical aptitude and transferable practical skills. Ideally these are gained through tertiary education funded by a combination of government and student self-funding. Training provided by the employer then properly adds the industry-specific requirements.

Even though science technician roles are very diverse, the Panel concluded there is an overarching requirement for the following attributes:

- strong technical aptitude
- transferable practical skills (plus the generic skills such as literacy and numeracy) that are directly work-relevant and of immediate use to a range of employers, allowing those employers to focus their in-house training on specific requirements
- adaptability, in order to respond to changing technologies and roles
- strong written and oral communication skills
- computational and data-handling skills
- workplace health and safety knowledge
- clear and worthwhile career pathways, from junior to supervisory and advanced roles.

The Panel found that over the last two decades there has been a growing and now significant mismatch between the knowledge and skills acquired through tertiary education to those needed in employment. The technical aptitude and transferable practical skills that employers are looking for in job applicants are now seriously lacking. The extent and breadth of the practical component of many qualifications from which graduates progress to a science technician role have been significantly reduced. This has shifted the responsibility for the transferable practical education from education providers to employers, many of whom are ill equipped to respond as trainers.

The Panel found that New Zealand Diploma of Applied Science qualification delivered through the Institutes of Technology and Polytechnics (ITPs) is fit-for-purpose, incorporating an adequate amount of transferable practical skill and technical aptitude development. However, numbers of graduates with this qualification nationwide are low. In discussions with employers of science technicians, the Panel was advised that most science technician job applicants hold a Bachelor of

Science or a higher qualification, but this does not necessarily reflect a better fit for the role over other candidates.

Current statistics indicate that the portion of individuals attaining a Bachelor of Science degree in New Zealand is significantly higher than the average in OECD countries. A substantial number of these graduates apply for and gain science technician roles. It is not clear whether these individuals believe this higher qualification to be a prerequisite for such roles, or whether they are failing to secure work in the science sector at a higher level or in a different vocation. Such degree holders too often need further extensive training to be effective science technicians and then leave the role after a relatively short period of employment. Whatever the reason, the majority of present entrants to science technician roles do not hold the core attributes listed above.

In summary, the New Zealand Diploma of Applied Science is effective, but other qualifications are not adequately developing technical aptitude and transferable practical laboratory skills for science technician roles. This has negative implications for employers who bear the cost of extended training and, in many situations, poor staff retention. This failing must be addressed.

The Panel suggests a two-fold approach for the future:

- The ITP sector should establish a national network of provision for educating and training science technicians focusing on the Level 6 Diploma in Applied Science qualification, this pathway being most suitable for technicians who will enter employment in industry and service roles. To address any demand for additional laboratory skills and experience from existing technicians, a Graduate Certificate in Laboratory Practice and short block courses run in conjunction with the national network of ITP providers or perhaps through private training establishments would be appropriate.
- Additionally, the degree-based pathway encompassing the Bachelor of Science qualification should be improved as a route to technician employment, especially for those seeking careers in research organisations. A suitable approach would include a core (compulsory) paper of 15 credits (points) on the basics of laboratory practice, and/or the introduction of a 40-60 credits (points) minor in laboratory practice within the degree programme. This would partly address the widespread concern employers have that students with Bachelor degrees often do not possess sufficient technical aptitude and transferable practical skills required for the science technician role.

The Panel suggests that a practice whereby employers provide practical work experience for students during their undergraduate training should be re-established. The benefit to employers is that such contribution would lessen the on-the-job training they otherwise have to provide to overcome the deficit of transferable practical skills of new employees.

The deficit of graduates with appropriate Diploma qualifications currently presenting to employers is serious and must be addressed by increasing enrolments to study Diploma qualifications. There

is a shortfall in career guidance. Clear, realistic and unbiased information on both routes for becoming a science technician needs to be made available through all parts of the careers advice system. A good example is provided by the Engineering Education-to-Employment (E2E) programme. Such a programme would likely attract a larger number of suitably qualified students to meet the demand for science technicians and in turn would create a more visible career option, provide direct routes to employment and a professional identity for science technicians.

The Panel examined registration schemes for technicians as used in other countries but decided their approaches were not suited to New Zealand. Rather, consideration should be given to include an assessment of the qualifications and skills of the science technician workforce in the accreditation system for specialist testing and service laboratories, as well as assessment of the particular processes and procedures being carried out.

The full report is available at <https://royalsociety.org.nz/what-we-do/our-expert-advice/all-expert-advice-papers/science-technicians-workforce-panel/>.