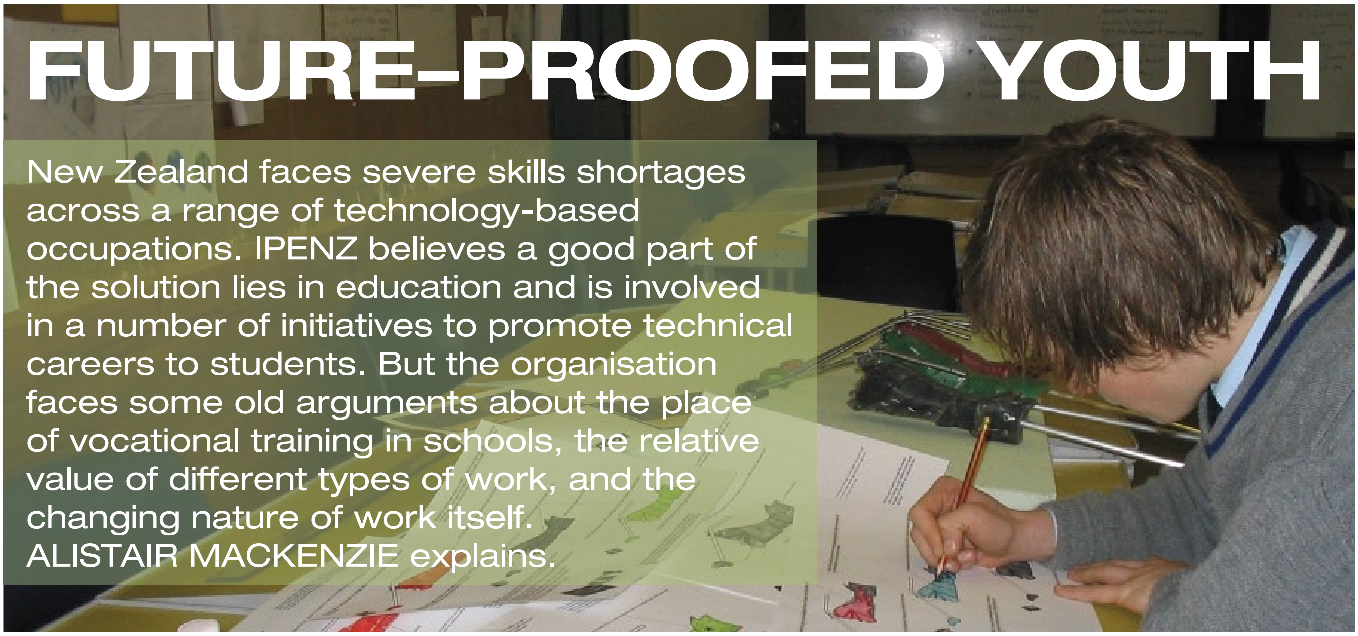
FUTURE-PROOFED YOUTH



New Zealand faces severe skills shortages across a range of technology-based occupations. IPENZ believes a good part of the solution lies in education and is involved in a number of initiatives to promote technical careers to students. But the organisation faces some old arguments about the place of vocational training in schools, the relative value of different types of work, and the changing nature of work itself. ALISTAIR MACKENZIE explains.

NEW ZEALAND'S GRADUATION RATES for engineering, manufacturing and construction degrees are lower than the rest of the OECD. While other OECD countries see about 13 per cent of their students graduating with degrees and postgraduate qualifications in engineering, manufacturing and construction, New Zealand's figure is less than half that – just 5.8 per cent. The picture is even worse at diploma and certificate level.

The solution is not as simple as building more engineering or trade schools or expanding existing ones. Even if the number of places increased, there wouldn't be enough suitably qualified students to fill them.

While tertiary providers may recruit senior high school students who've studied maths and physics, it's clear that subject decisions are made in earlier years. IPENZ advocates attracting students to technology-based careers when these decisions are being made, and has developed a number of programmes to ensure young people are aware of technology careers at an earlier age and make the right subject choices while at secondary school.

Programmes include the Transpower Neighbourhood Engineers Awards, which gets school students working alongside engineers; and Futureintech, which aims to raise the profile of engineering among students, parents, teachers and careers advisors. IPENZ Foundation scholarships encourage school leavers into tertiary engineering and technology education.

Complicated and ambitious

IPENZ has also thrown its weight behind the school technology curriculum through its Techlink project, a website that provides support for technology teachers. In doing so, the organisation bought into a scrap that has been dividing education for over a century.

The technology curriculum statement was published in 1995 and gazetted in 1997 for full implementation two years later. The new curriculum replaced the workshop craft syllabus – woodwork and metalwork. The other traditional subject absorbed, at least in part, by the technology curriculum was the home economics syllabus, with aspects incorporated into food technology and materials technology lessons.

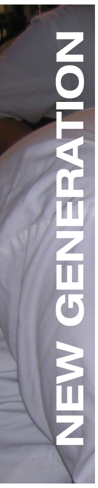
The curriculum is complicated and ambitious. Seven technological areas are covered: biotechnology, electronics and control technology, food technology, information and communications technology, materials technology, process and production technology, and structures and mechanisms.

The whole curriculum is made up of three "strands" – technological practice, nature of technology, and technological knowledge. These strands require students to undertake technological practice of their own and examine the practice of others. In identifying issues and planning their solutions, students have to consider the ethics, legal requirements, protocols and codes of practice involved, and consider the needs of the project's stakeholders. Through their technology classes, students are meant to gain an understanding of the philosophy underlying technology, learn about historical and contemporary issues surrounding technology, and consider likely future scenarios.

Opponents and proponents

Implementation of the curriculum has been a fraught affair. It was delayed several times for a variety of reasons, including secondary teacher industrial action. While it may have been a painful birth, to say technology has failed to thrive is not completely fair. The subject gained university equivalence in 2006, which means technology students can enter university on the basis of their marks in the subject. But it is fair to say the subject still attracts savage and frequent criticism.

The greatest criticism of the curriculum is directed at its perceived lack of practical focus and over-emphasis on the academic. Critics say the curriculum promotes principle over practice, process not product, knowledge not skill, and planning not doing. They argue the curriculum lacks a practical, vocational focus and short-changes the non-academic students who, under the old regime, learned skills that provided a foundation for future success in the trades.



Havelock North High School students at the Wattie's factory (left) and Wellington High School students at work on a project (right).

Proponents of the new curriculum say it is actually better focused on employment or vocation than the old syllabi. They argue its focus on literacy and numeracy, and process and problem-solving is better suited to meet the needs of today's employers and future employment than the old craft syllabus with its concentration on a narrow set of manual skills.

One of the stated purposes of the technology curriculum is to "develop competencies for the entrepreneurial market economy". Absolute rubbish, say its opponents: the focus should be on preparing students for real jobs not the promise of some post-industrial knowledge economy where everyone deals only in abstractions. The country's manufacturing base may have gone west, or rather east, but the trades are here to stay. (For their part, employers say all they want is kids who can read, write, add, subtract, multiply, divide and show up for work.)

Supporters of the curriculum suggest their opponents' low expectations are a soft form of bigotry. Channelling students into the trades before they complete a general education to at least NCEA Level 1 (School Certificate) is criminal, they say. Create robust trade training courses at polytechnics and ensure that there are apprenticeships linked directly to jobs available for students by making it worthwhile for industry to take on apprentices.

Committed technology teachers say let us get on with helping students realise their full potential and participate in life with dignity and prosperity. The aim of the technology curriculum, beside the purely vocational, is to increase the "technological literacy" of students so they can participate in an informed way in a society that has become technologically super-saturated. Technology teachers see part of their brief as informing their students about material goods in a critical way, which hopefully will give them some independence from the all-pervasive consumer ethic.

Get real, the curriculum's critics say. Forget the idealism. National Party leader John Key recently made a speech to the Employers and Manufacturers Association and gave the technology curriculum a thorough hammering. According to his figures, more and more young New Zealanders are opting to leave school early: around 4,000 pupils each year leave before the official leaving age. One in five has left by age 16 and two in five have left by age 17. More than one in 10 has no formal achievement record for their time at school, and 53 per cent of Māori boys leave school without obtaining NCEA Level 1. The answer, Mr Key says, is to engage these students in courses that truly interest them – practical trades courses, such as farming, building and horticulture.

While teachers may bridle at this sort of talk, they can at least take comfort in the fact that it's an old argument, dating back to at least 1903 when the passage of the Secondary Schools Act saw a big increase in the number of children going on to secondary education. It soon became apparent the increased intake was not being retained because the secondary schools had not adapted their curriculum to accommodate the different social and class experiences of the new students.

Besides its perceived lack of vocational focus, one of the other underlying problems of the curriculum is that it appears to have been developed without "traditional" levels of teacher consultation. Instead, critics say, the curriculum was developed by a cabal of bureaucrats and academics and its language reflects this. In his speech John Key noted that one needed a PhD in linguistics to understand the latest draft of the technology curriculum.

Couching the curriculum in the language of the market doesn't help either. Expressions like "preparing students to participate in the innovative market economy" are likely to raise hackles, particularly in places like South Auckland where the innovative market economy has seen power prices reformed out of reach. Given the curriculum's intention to foster curiosity, reflectiveness, inventiveness, and consideration for the needs of others, such linguistic hurdles are unfortunate.

Opportunity to explore

But despite all the issues around interpretation of the curriculum, its terminology and resourcing, teachers have got on with it and moulded the curriculum to meet the needs of their students. One of the claimed strengths of the curriculum is that it caters for a diversity of learning styles, as it encourages exploration and experimentation. A survey conducted by the Post Primary Teachers' Association (PPTA) found most teachers said the curriculum catered well for the diversity of students in their schools.

Schools were told that, unlike other curricula, they could deliver the technology curriculum as a separate subject or integrated with other subjects. For example, biotechnology or electronics and control could be taught in science. Respondents to the PPTA survey said they valued this flexibility. Besides fostering cross-curricula links, the inherent flexibility of the curriculum supported teaching across a wide range of abilities and interests. Teachers reported they enjoyed the range of opportunities the curriculum offered students: the chance to experiment and take risks, to explore problems and discover diverse solutions.

In some ways teachers have become the whipping boys for the ideologically-driven disassembly of the apprenticeship scheme and the shortcomings of the NCEA assessment system. They have real cause for complaint, particularly over the degree equivalence issue. In 2003, the Alternative Disputes Resolution panel abolished degree equivalence and left more than 2,000 teachers – many of them in technology – facing a salary disadvantage of around $3,000 per year because their qualifications no longer allowed them to reach the top step of the salary scale. The subject continues to suffer teacher retention issues.

But for all that it's clear that very good results are being achieved. The Techlink website www.techlink.org.nz recently posted several case studies of successful interactions between industry and technology students (see page 48 for examples).

Politics aside, the real force underlying the whole debate is the changing nature of work.

Technology and societal changes have changed the old rules. Not all products are made from bricks and mortar, wood and steel. Not everyone gets to be an entrepreneur or an innovator. Most of those working in the "knowledge economy" will be disseminators of ideas, not originators. In this context, the new technology curriculum must be seen as brave attempt to anticipate the results of change and prepare the country's young people for the future.

Alistair Mackenzie *is Techlink Writer at IPENZ.*
The Techlink website www.techlink.org.nz is an IPENZ initiative supported by the Ministry of Education. Techlink publishes examples of contemporary teaching and learning in technology and provides encouragement and support for teachers in their ongoing planning and implementation of classroom programmes. Techlink also produces information for parents and works toward lifting the profile of technology education within schools and the wider community.

Future engineers James Steel (left) and Tim Wrinch (right).

Design magnet

James Steel, Year 13, Wellington College

James's co-workers at his part-time supermarket job asked him to design and build a customised air hockey table for their staffroom. He interviewed the staff and investigated the market thoroughly. After exploring concepts using sketches, computer-aided drawings and models, he considered and trialled alternative materials and processes.

James's finished project uses magnets to change the path of the puck and has interchangeable table-top shapes. The table required strong, accurate joints to ensure it retained its shape and strength.

"It works really well and both my client and I are really pleased with the way it has turned out. However, I am already thinking of ways of improving it, and making modifications to the project," says James.

Teacher Matthew Lane says the whole process is a particularly good example of how to rationalise each stage to guarantee an excellent technological solution. "James planned each stage of the construction process carefully, with one idea leading to another. Previous technology classes gave him the knowledge to choose the most appropriate materials and understand how each choice would have an effect on the final product."

James is now studying engineering at the University of Canterbury.

From print to power

Tim Wrinch, Year 12, Tauranga Boys' College

Given an open brief, Tim decided to design and develop a boat-mounted wind generator. "Wind generators usually spin on a horizontal axis and have to turn into the wind – they're noisy and spin so fast they can be dangerous," says Tim.

He decided to design one that spun on a vertical axis. These can take the wind from any direction and use a blade system that can only ever go as fast as the wind – making it a lot quieter and safer. His client also wanted it to be removable, so that it wouldn't get in the way while sailing.

Tim showed three ideas to his stakeholder group, and used a component from each to develop a new concept. He then got the advice of outside experts – an electrical technician for decisions on the alternator and an engineer on a system of bearings. "This was really useful. My electrical mentor suggested a stepping motor instead of an alternator, which could create a current at a lower rpm. That was a real saving."

Tim received a New Zealand Scholarship award in 2006 for his work on the project – an excellent achievement for a Year 12 student.

Teacher Steve Ronowicz says Tim's wind generator would be a challenge for any student. "The key to Tim's success was his ability to find and use the knowledge and skills of outside exerts to supplement his own. It is so rewarding to see a student push the boundaries and succeed at that level. Tim modified an electric motor from an office printer into a power generation unit. Now that's innovative!"

Currently in Year 13, Tim is developing and prototyping a new type of water-powered generator as part of his technology studies. Next year he plans to study engineering at Auckland University of Technology.