



IPENZ Informatory Note Three

The Role of Technology Education in New Zealand's Future Prosperity

July 2001

IPENZ

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TENZ

Technology Education New Zealand (TENZ) was established in 1996 to provide a framework to support and promote technology/hangarau education in New Zealand. The network encompasses close to 1000 primary, intermediate and secondary teachers, tertiary personnel, teacher educators and practising technologists.

Why Technology Education?

In late 1999, the Newseum, a journalism museum in Virginia conducted a survey of American historians and journalists to determine the top 100 news stories of the 20th century. Of the top 100 headlines in the 20th Century, an estimated 45% were directly related to technology. What the public reads, hears, and values reflects a growing emphasis on technological literacy.

For a society deeply dependent on technology, particularly in this knowledge age, we are largely ignorant about technological concepts and processes, and the factors that underpin technological development and innovation. In the past we have neglected technology education and this has led to a society that generally knows little about technology and engineering, and thus has little understanding of the potential of technology education in New Zealand schools. To compound this lack of understanding, there are those who equate technology education with the use of computers in schools. Computers are important tools for the enhancement of learning across all curriculum areas, but their use in itself is not technology education.

The need to increase technological literacy in New Zealand society is of national importance if we desire to be a knowledge economy. Therefore school programmes must include technology as an essential part of every student's education.

In the past, 'doing' (know how) has been undervalued in our technology education system and in many cases 'knowing' (know what and know why) has proven to be unhelpful. Technology education seeks to move beyond the divisions between theory and practice, and integrate these categories that have been historically separated in education. Such integration serves to enhance students', and ultimately society's, level of technological literacy and allows students to contribute to and critique these technological developments from an informed position.

Leading Features of the New Zealand Technology Curriculum
The technology industry is diverse: from textiles to high-tech electronics and computing software and hardware innovation, from traditionally New Zealand agriculture-based developments and marketing initiatives to the production of synthetic materials, and biotechnology. Technology education must reflect this diverse practice and offer students opportunities to develop understandings across a broad range of knowledge bases and cultural perspectives. The learning and teaching areas in the technology curriculum are particularly appropriate in the New Zealand context –

- materials technology
- information and communication technology (ICT)
- electronics and control technology
- biotechnology

- structures and mechanisms
- process and production technology
- food technology

Within these areas the curriculum seeks to develop technological knowledge and understanding, technological capability, and an understanding of the interrelationship between technology and society. Schools have flexibility as to how the curricula will be achieved and have the responsibility for making implementation decisions. A Maori technology curriculum (Hangarau) has also been developed to provide a thorough technology curriculum for teachers and students in bilingual and immersion classrooms and schools.

Technology is a learning area as demanding and worthwhile as traditional subjects such as science. It is one of the seven essential learning areas in the New Zealand Curriculum Framework and of equal status to the others.

International Comments on our Technology Curriculum

Most prosperous countries now have technology education programs, and the New Zealand technology curriculum is regarded as leading-edge. New Zealanders have made direct inputs into the development of curricula in USA, Hong Kong, South Africa, Finland, and Chile. Features of the New Zealand Technology curriculum which have drawn particular attention are:

- the broad concept of 'technological literacy'
- the coherent nature of the curriculum, which gives explicit recognition to technological knowledge and practice and to societal elements rather than focussing more narrowly on 'design and make' and technical skills
- the inclusion of technologies with particular relevance to the New Zealand economy, e.g. biotechnology.

Progress in Teacher Professional Development and Resource Material Development

Professional development for teachers is critical. Adoption of the new learning area in the New Zealand national curriculum has meant that many practicing teachers and teacher educators have needed to develop a sound understanding of technology education in order to fully incorporate it into their classrooms. Professional development has occurred over the last eight years in various forms at a cost of more than \$25 million. This has given most primary and intermediate-level teachers opportunities for participation in year-long programmes and allowed for the establishment of nationwide advisory and facilitator teams.

Because the curriculum is so leading edge there are few international resources. Many of the available resources have

come through small grants to voluntary organisations. Technology Education New Zealand (TENZ), the Institution of Professional Engineers New Zealand (IPENZ) and the Royal Society of New Zealand have collaborated to produce:

- *Delta case studies*: a series of case studies examining how schools are approaching the task of introducing technology education into their school curriculum
- *E.g. Example of technological practice*: stories of technological 'projects' in the wider community from outset to completion including setbacks and discoveries.
- *Matter of Principle*: fact sheets illustrating technological principles such as reliability, efficiency, user friendliness or optimisation, in an appropriate context.

Technology and the NCEA

Technology, like other senior secondary school subjects, will have achievement standards in the new National Certificate of Educational Achievement (NCEA). The Level 1 achievement standards are for a single integrated "general technology" subject. Even though there is sound education pedagogy for retaining an integrated approach at Levels 2 and 3 (Forms 6 and 7) lobby groups wish to splinter technology into highly specialised subjects, one for each of the seven technological areas. This flies in the face of the multi-disciplinary nature of technology, and the established need for all students to acquire broad-based technological literacy.

Challenges and Risks

General lack of understanding, and consequent undervaluing, of technology education:

There are many vocal critics of technology education's entry into the compulsory New Zealand curriculum, and most of these hold misconceptions about it. A commonly held view is that 'technical education' should be seen as a vocational rather than academic subject, or one entirely concerned with skills rather than knowledge. Other mistaken views are that technology is only ICT, and that use of computers as an educational tool is technology education. These views in the community, and among principals, result in barriers to successful implementation.

Implementation lull:

The Ministry of Education's focus has now moved to other curriculum areas as their new documents are released. Whilst the Ministry has attempted to continue to support implementation of technology education through various professional development opportunities, many schools have already shifted their focus to other issues, often to the neglect of technology.

The need for further professional development for teachers: With the development of senior school qualifications, the professional development needs of senior school teachers have been highlighted. These teachers often chose not to be involved in earlier professional development programmes in technology education and must now be supported as they make the transition from past practices to those more consistent with the curriculum. The extent of this change has in many cases resulted in teachers adopting a negative attitude, resisting the implementation of technology education in secondary schools.

Need to attract many more degree-qualified technology teachers: Technology has never before been taught in the senior school, and its introduction needs hundreds of teachers with higher-level technological knowledge and a broader technological literacy than were needed in the past. Powerful incentives for graduates leaving University to undertake teacher education and forgo careers in the private sector are needed. These incentives are totally lacking, in an area where the need is at least as great as those for science and mathematics teachers.

Lack of understanding of progression pathways to tertiary education and careers:

Achievement standards in technology provide comprehensive progression options for a wide range of students. From a solid grounding in technology education from Year 1, through programmes in technology to the completion of Year 11 (Form 5), students can exit school with NCEA qualifications (at Level 1 achievement standards) that are geared towards entry into apprenticeship schemes or 6-12 month polytechnic diploma courses. Level 2 achievement standards in technology open doors into longer-duration and higher-level polytechnic diploma courses. For those interested in more academic pathways, Level 3 achievement standards in technology and scholarship assessment (still to be developed) will assist in preparation for and meeting of entry requirements into university degree courses such as engineering, technology, architecture, and design.

The need for community partnerships:

Technology is a living and dynamic subject, which requires positive interaction between schools and their communities. Projects carried out in the local community provide win-win benefits for both schools and project sponsors. The willingness of technological professionals to participate is vital. Existing schemes are run by the voluntary efforts of a small number of enthusiasts, and are vulnerable to the loss of key individuals.

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Improved development of the school/community partnership in technology is needed, with the likelihood that this will spin off across other curriculum areas.

Closing Remarks - Contributing to New Zealand's Future Prosperity

The compulsory education system must equip every New Zealander with the skills and knowledge necessary to live a prosperous life with dignity in the technologically enhanced lifestyle of a Knowledge Society. To prosper they need to be innovative and entrepreneurial in outlook, and take responsibility for re-educating themselves to use the benefits of technology. The achievement of dignity involves an understanding of the inter-relationships of technology, society and the environment to promote harmony with others and avoid the development of underclasses in New Zealand society. The New Zealand Technology curriculum is vital and world-leading. Technological practice helps students develop skills of innovation and entrepreneurship for their future prosperity. Technological literacy helps them to live with dignity in a technological world

Other Informatory Notes:

- i. The Role of Engineers in Developing National Wealth***
- ii. Educational Policy for a Technically Literate Society***

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