# Towards Effective Technology Education in New Zealand

Maxwell S. Reid

## Introduction

New Zealand is a small former British colony in the South Pacific with a population of 3.9 million people. The small economy of the country is heavily dependent on overseas trade. Historically, a large proportion of New Zealand's exports, mainly agricultural products, went to the United Kingdom. In the past 20 years, however, New Zealand has had to adapt to a changing world, so that now our largest exports are to Australia, Japan, the United States, and China. New Zealand has, of necessity, moved away from its dependence on dairy, meat and wool exports, as the new industries of forestry, horticulture, fishing, manufacturing and tourism have become more significant (Department of Statistics, 1999). These changes, together with the huge advances in the associated technology, have created dramatic changes to our economy, and consequently, the fabric of New Zealand society.

There has been an increasing awareness of the delicate balance of our ecology, culture, economy and growth of a new independence. Major cultural changes, such as those that have resulted from our anti-nuclear stance, together with the re-emergence of a sense of identity within the indigenous Maori people, has resulted in the adoption of the Maori language an official language of the country. Along with this a unique New Zealand identity and culture has developed. The result is that New Zealand has of necessity grown away from the traditional colonial influence of England.

These words in the Anglican Book of Common Prayer (1928) are still true: "we are living in a new world…new knowledge and new ways of life bring with them new customs and forms of speech unknown before" (preface). Such changes have never been more explicit than in the field of technology, which has changed our ways, customs, and speech as no other aspect of daily life in New Zealand has.

This paper examines the historical concept of technical education in New Zealand as it developed from the British model. It examines how England and Wales designed and introduced a new technology curriculum, and how, of necessity, a New Zealand technology curriculum has been developed which is more suited to New Zealand's developing culture. The paper focuses on the

---

Maxwell S. Reid (maxwell.reid@aut.ac.nz) is on the Faculty of Science and Engineering, Auckland University of Technology, Auckland, New Zealand.

process of curriculum development. It illustrates some of the good features and some of the difficulties resulting from the introduction of technology as a subject in New Zealand schools in 1999. As an evaluation of technology education in New Zealand, this paper is preliminary, and an interim account of a change process that will continue well into the early part of the new century.

## The New Zealand Education System

The educational system of New Zealand, a former British colony, has understandably been influenced by the British school system. The public primary schooling system introduced in 1877 was made freely available to as many children as possible, and was "modeled on British and Australian counterparts" (McKenzie, 1992, p. 31). Until quite recently the New Zealand school system has been based on the three-term year, which was deliberately arranged around the New Zealand agricultural calendar, the breaks coinciding with:

- haymaking in January
- harvest/picking season in May
- lambing/calving in August

The late 19th century introduction of secondary schools to New Zealand was unashamedly academic. The secondary schools aligned themselves with the University of New Zealand by adopting the Matriculation Examination as an entrance requirement to University (Campbell, 1941). According to Lee, (1992) "English thinking dominated schooling policy and practice in the young colony…secondary schools were inaccessible to most youth, particularly working class children" (p. 103). In 1901 a *free place* system was introduced in which every child was to be offered a free place in a secondary school. The tendency that followed was for most pupils to remain at secondary school for a short period only, while following an academic course (Lee, 1992; McKenzie, 1992).

Curriculum reform was clearly desirable. The Minister of Lands in 1900 (cited in McKenzie, 1992) stated, "it was obviously the case in that children in the rural areas should be studying technical or agriculture subjects that would have a distinct bearing on the occupations in those localities" (p. 31).

As a result, by 1910 technical high schools had been established in the major centers throughout the country. This secondary school system now simulated the British tradition where middle class and academically strong went to a public or grammar school, and the working class went to a technical high school (McKenzie, 1992). (Although New Zealand society claims to be relatively classless by the British standards of family class structure, the division in any appearance of a New Zealand class structure is measured by an individual's wealth, rather than one's family connection). As a typical example of this division in the early secondary education, the city of Hamilton is a small inland New Zealand city at the center of one of the richest agricultural and pastoral areas in the world (Campbell & Campbell, 1999). Hamilton had two secondary schools until the late 1950's, and prospective students were required take an entrance exam as a requirement to gain entry to Hamilton High School (HHS). The remaining students went to the Hamilton Technical College (HTC) for a technical (or pre-vocational) education. The Hamilton historian Gibbons (1977) described HTC as offering practical instruction for quite specific skills and careers, "to teach practical knowledge to the artisans and labourers of the future" (p. 164).

In the cities, New Zealand's technical high schools typically offered boys pre-vocational streams of engineering, building, or an agricultural course to give them a practical skill preparing them for the non-professional workforce (Lee, 1992). Academically less able female students were offered a commerce stream with subjects like typing and bookkeeping to prepare them for commerce, where it was expected that they would work, or alternatively as Gibbons (1977) described, "needlework, cooking and domestic economy" (p. 164). The small populations of the rural districts could not sustain a two-school system, and these post-primary schools, of necessity, continued to be mixed or comprehensive. Such a system in these schools was now similar to the early British secondary school system on which ours was modeled (McKenzie, 1992). As described by Black (1994) "the major subject had hitherto been academic, with the vocational studies reserved for older students classed as less academically able" (p. 2). De Vries (1992) described a similar system in the Netherlands in which the courses were categorized as either "pre-vocational or pre-university" (p. 28).

The technical high school system, (or the technical streams in the comprehensive school), offered the students an education that they would otherwise perhaps not get. Gibbons (1977) pointed out that "in many ways Hamilton residents were much more enthusiastic about the technical school than the ordinary high school…most adult Hamiltonians up to the 1920's had received little or no secondary education" (p. 164).

The Technical high school system had the following drawbacks:

(a) Although a technical education was commonly thought to give the students who left school at the age of fifteen a useful start in industry, commerce, farming, or homemaking, it became increasingly so at the expense of a more rounded general and intellectual education. Within the British origin of a class system, this was never a concern in the British education system on which it was modeled (Black, 1994).

(b) Pre-vocational courses were generally perceived (by parents and students) as for less able students, giving the subjects a low status, even if this was never the intention of a particular school offering the subjects (de Vries, 1992). McKenzie (1992) observed "Inherited attitudes of the United Kingdom were an added handicap. In Britain, separate technical schools were typically associated in the public mind with second class knowledge which provided the limited skills and disciplined work habits of a docile working class" (p. 32). Similarly, the common fear of ambitious youth in New Zealand was that if they were directed into technical curricula, their vocational opportunities would be restricted (McKenzie, 1992).

(c) The system was sexist. The provision of a vocationally oriented education in reality, as O'Neil (1992) subtly put it, "meant the formalised entrenchment of gender differentiated (practical) vocational courses…male pupils took vocational courses for their future paid employment, some females took them for theirs, but many did so in the light of their expected future in unpaid domestic labour" (p. 88).

By the 1930s, there was a strong case to dispense with the two types of school, and thereby dispense with the associated class attitudes. In 1945 the Department of Education imposed a common core curriculum on all types of schools. This did not inhibit the ambitions of the academics or frustrate the aspirations of the ambitious, but it ensured a common range of studies, including craft subjects for the junior pupils (McKenzie, 1992). Students at post primary schools were able to take technical subjects, including workshop craft subjects (Ministry of Education, 1995). While this education system and its crafts may have been appropriate for earlier times, in more recent years it has generated the following problems:

- Frequently, the technology learned in schools did not help students in society because the equipment they used was often industrial or commercial cast-off and therefore likely to be obsolete and out-of-date. Johnson (1992) stated that "tremendous changes have occurred and will continue to occur in the workplace. Equipment and processes are becoming more sophisticated. This sophistication has resulted in fundamental changes to the skills needed by workers" (p. 1). As Black (1994) pointed out, "pupils are to be taught woodwork, metalwork and perhaps also about forming plastics. This prepares them for industries of the 19$^{th}$ and early 20$^{th}$ centuries" (p. 114). Unfortunately, if you were not academic, the skills being taught were no longer appropriate. Jones (1996) commented on early attempts at the inclusion of technology in the school programs: "technology as it has developed in past curricula encompassed a limited range of skills, processes and knowledge resulting from a narrow perspective" (p. 6).
- The school environment can be unrealistic and lack an examination of the social issues of technology. Zuga (1992) concluded in her research that, "…at best, schools are insulated from society and serve to preserve the status quo and schools are subject to the whims of fads and special interest groups" (p. 52).
- Medway (1992) commented, "There is nothing wrong with craft skills themselves as an element in education. The problem with traditional craft teaching—woodwork, for example—as an educational endeavour has rather been that the disciplines are learned within a context that limits their general applicability…to build a coffee table in school is to learn not a generalised competence capable of application anywhere but a competence for one context, school" (p. 20).
- The teaching of technical subjects requires skilled teaching staff. The separate technical and craft learning activities in New Zealand tended to be isolated from each other. The technological knowledge areas were not linked in a structured manner in which the knowledge could transfer from one situation to another. Raizen, Sellwood, Todd, & Vickers (1995) indicated the desirability of a socially structured link between the

theory and the practical aspects of technology. Such programs can help students “begin to think differently about their school subjects as they put knowledge from several fields to work in an attempt to solve practical problems” (p. 53).

- The curriculum did not encourage team working. In today’s work environment it is likely that a professional will have to work in a group relationship to solve a problem or operate a system. “No longer can any one person be expected to master a body of knowledge” (Braukmann & Pedras, 1990, p. 3). Resnick (1991) offered the view that “groups are especially preferred when several kinds of knowledge and expertise are required, that call for the participation of several individuals whose work must be coordinated” (p. 14).
- The curriculum was not considered responsive to New Zealand’s particular needs, languages, and cultural differences. In particular said Jones (1996), “…not maximising learning for Maori, Pacific Island students and for girls” (p. 2).

Although New Zealand has this long history of technical education in the intermediate and secondary schools, the delivery of general secondary school education has not always related the students to a realistic social framework of knowledge which is applicable to an increasingly technological world. What is required is a technical education system for all students (Burns, 1992). However, unlike the traditional technology programs, which formerly taught only skill-based programs, the technology instruction in schools must change to meet the needs of a technologically advanced society. Johnson (1992) asked the question, “given the fact that the skills needed by the workforce are changing and the increased need for all citizens to have high level thinking skills, are the students being provided the opportunity to acquire those skills?” (p. 27).

New Zealand underwent major curriculum reforms in the 1990’s. The development of a national curriculum was part of this reform (Jones, 1996). This resulted from growing concerns with school curriculum (Jones, 1996). During the 1970s and 1980s, calls were made for a curriculum that was responsive to New Zealand’s needs for people highly skilled in science and technology, and with the language and cultural sensitivity needed to maintain international economic competitiveness (Levette & Lankspear, 1990). Technology subjects need to be accessible to all children, regardless of gender or social standing. Along this line, Black and Harrison (1985) proffered the general idea of technological capability with a *task-action-capability* (TAC) approach. They listed three interacting personal attributes required in the education of children to be of direct practical value in the real world:

- “*Resources* of knowledge, skill and experience which can be drawn upon, consciously or subconsciously, when involved in active tasks.
- *Capability* to perform, to originate, to get things done, to stand by decisions.
- *Awareness*, perception and understanding needed for making balanced and effective value judgements” (p. 54).

**Technology Education in England and Wales**

In 1990, the New Zealand Government, influenced by the changes taking place in England and Wales, embarked on a project to revise the school curriculum (Jones, 1996). In 1991 the New Zealand Minister of Education requested the development of a technology curriculum as part of a broad initiative at improving student achievement. The initial development phase included a scrutiny of technology education developments occurring in other countries (Ministry of Education, 1995). The introduction of a technology subject in schools was a worldwide trend this decade (Black, 1994; Mather, 1996).

Understandably, there were problems in the introduction of the technology curriculum in England and Wales. A study of that curriculum implementation process would no doubt be beneficial to curriculum designers who followed. Since the introduction of the technology curriculum in England and Wales had an influence on the revision of the New Zealand curriculum (Jones, 1996), the lessons learned there naturally become part of the development path of the New Zealand curriculum. It is therefore appropriate to review them.

Technical/vocational education in English and Welsh schools by tradition had been centered on the crafts, and art and design. The craft education was really of two strands, trade craft, stemming from nineteenth century type manual training, and the village type craft. While both of these areas were responsible for teaching children manual skills, it became increasingly difficult later to represent modern industrial practice in schools. Craft work has serious limitations as a foundation for modern technological activity. It may give experience in designing and making, but it falls short of modern industrial activity, intellectual concepts, modern cultures, and realistic working environments (McCormick, 1992a, 1992b). As Medway (1992) observed, the craft areas of the curriculum actually had been moving substantially in the direction of intellectual stimulation for some years. “The craft processes of woodwork and metalworking had been supplemented and partially replaced first by design and then by elements of physics and engineering” (p. 4). The 1989 research of Layton, Medway & Yeomans (Cited in Medway, 1992), showed that two results were clearly apparent:

1. Technology had risen in status and was attracting more able students,
2. Children who had previously found enjoyment, success, and self-respect in the craft subjects, no longer found them in the written scientific demands of the reconstructed technology subject.

By the 1980’s, it was recognized in Britain that there was a clear need to raise the status, prominence, and effectiveness of technical education. McCulloch, Jenkins, and Layton (1985) talked of the need to raise its status to a prominence that it enjoyed in other countries such as West Germany. Similarly, Weiner’s 1981 examination of English culture, (cited in Black, 1994), expressed concern about the British lack of industrial competitiveness and enterprise. He referred to the depressing effect of the gentlemanly English culture, which despises industry and disdains practical activity (p. 33).

In 1988 the British Education Act published the decision to include technology as a compulsory national curriculum subject to be studied throughout

England and Wales. This new subject of technology was seen as meeting the needs for a discipline which would be "both intellectually stimulating and legitimate in the eyes of career-minded students and their parents" (Medway, 1992, p. 4). However, there were many problems defining the nature and scope of technology education, as a detailed specification of the National Curriculum was not complete (Harrison, 1992; Barnett, 1994) and both teachers and pupils were evidently confused about what counted as technology (Harrison, 1992; Barnett, 1994; Jones, 1996). As Taba had pointed out in 1962, the confusion surrounding curriculum development often stems from insufficient "analysis of what knowledge in any subject or discipline consists of" (p. 172).

Consequently, the *National Curriculum Order for Technology 1990* was issued to settle this confusion (Barnett, 1994). It was hoped that some of the conflicting issues, statements, and other confusion would be accommodated in this paper. This national effort brought the subject of technology into the curriculum, but not as a unified subject. It was identified as a *foundation subject* which could be construed as not as important as a *core subject* such as science (McCormick, 1992b).

The National Curriculum specified two distinct profile components, *design and technology* and *information technology*. McCormick (1992b) analyzed the curriculum and concluded that, "for all intents and purposes these are two separate elements, with information technology being cross-curricular" (p. 18). It appeared that all the previous craft subjects were to be coordinated into integrated design and technology activities. The main problems were:

1. Very little content was specified directly (Harrison, 1992; McCormick, 1992b). The guidelines were vague and open to interpretation. Assessment was even more difficult. McCormick further commented on the vague and abstract nature of the program (1992a), "… besides the level of complexity, one of the major problems was the difficulty in interpreting what some of the statements meant. They had been deliberately kept at a level of generality to try and avoid prescription" (p. 48).
2. The curriculum did not have a coherent knowledge base of its own. The initial 1990 design was a mix of the existing technology, art, and craft subjects, which were scattered among the various attainment targets, involving different levels of compromise for existing teachers (Paechter, 1992; Harrison, 1992; McCormick, 1992b).
3. There were five unrelated knowledge perspectives designed. Black (1994) observed that "each competing perspective differs from the others in its particular priority and aims, and also in justifying a particular group of teachers, and often threatening other groups" (p. 115).
4. Although the subject rose in status to recruit more able students, students who had previously found enjoyment, success, and self-respect in the crafts (and often nowhere else) ceased to find them in the written and scientific demands of the reconstructed and renamed subject technology (Medway, 1992; Harrison, 1992).

5. The requirement of the technology curriculum that, “Admissible activities must involve developing an explicit design proposal” was unusual because in a large proportion of industrial situations, those who develop and design don’t usually build, and those who build, don’t usually design (Medway, 1992, p. 16)! McCormick (1992a) commented, “Design, important though it is, is undertaken by only a fraction of those working in technology” (p. 47).
6. The subject was difficult to implement. McCormick (1992a) wrote, “…from a point of view of implementation, there was the idea that design and technology would be taught by existing teachers from subject areas of art and design, business studies, craft design and technology, home economics, and information technology. This implied the bringing together of teachers who had no real contact in the past and putting them under pressure to co-operate” (p. 48). There was debate and contestation between teachers of the various subcultures within the overall group (Paechter, 1992).

Medway (1992) expressed some of these frustrations in his analysis: “It is interesting and important, therefore, to ask how this new subject got itself invented and included, and what the implications are of the shape which has been given to it”. He claimed the process to be, “…on one hand educational idealism and well-founded theory and on the other, conceptual confusion, unrealistic aspirations and ideological loading, and to an outcome which is bizarrely radical and conservative by turns” (p. 1).

As a consequence of these early difficulties in the implementation, a major curriculum review began in May 1998 involving teachers and other interested groups to develop improvements to the entire school curriculum (Qualifications & Curriculum Authority, 1999). The review was published in May 1999. The entire revised national curriculum is available (Department for Education and Employment, 1999).

It is always easy to criticize, but these early efforts in the UK had made positive steps towards solving an international educational problem. Influenced by this early international research, New Zealand educators took a fresh approach to the development of New Zealand’s technology curriculum.

## The New Zealand Technology Curriculum

Following a decade of educational review (Department of Education, 1987), the Government of New Zealand undertook a revision of curriculum in 1990 under the banner of *The Achievement Initiative* (Ministry of Education, 1991). The object was to explore ideas influenced by the curriculum reforms that were taking place in England and Wales. A Ministerial Task Group Reviewing Science and Technology Education was set up in 1991 which made many recommendations, the most significant being that a technology curriculum be developed as an area in its own right. The report recommended a technological education for all students, to develop people who are creative, innovative, and resourceful—and who can combine enterprise, initiative, and imagination with knowledge and skills. The report went even further in its recommendations to include:

- the importance of teaching and assessing interpersonal, communication and broadly-based practical skills;
- a broad range of knowledge and skills recognized by assessment procedures;
- adequate teacher training and resourcing for technology education;
- Maori input and inclusion of the use of Maori language. (Ministry of Research, Science and Technology, 1992).

The University of Waikato was contracted to write a draft curriculum for New Zealand schools (Jones, 1996). Consequently, the current *Technology in the New Zealand Curriculum* was printed in 1995, and has subsequently been issued to schools (Jones, 1996). The achievement objectives of the curriculum are:

*Strand A: Technological Knowledge and Understanding*

Within a range of technological areas and contexts, students should develop and understanding of:

1. The use and operation of technologies;
2. Technological principles and systems;
3. The nature of technological practice;
4. Strategies for the communication, promotion, and evaluation of technological ideas and outcomes.

*Strand B: Technological Capability*

Within a range of technological areas and contexts, students should produce technological solutions. They will:

5. Identify needs and opportunities to provide information for possible technological practice;
6. With reference to identified needs and opportunities,
    (a) generate possible options and strategies, and select, develop and adapt appropriate solutions;
    (b) produce technological outcomes to agreed quality standards, managing time, using human and physical resources skillfully, safely and effectively;
    (c) present and promote ideas, strategies, and outcomes throughout technological practice;
    (d) evaluate designs, strategies, and outcomes throughout technological practice in relation to their own activities and those of others.

*Strand C: Technology and Society*

Within a range of technological areas and contexts, students should:

7. Develop awareness and understanding of the beliefs, values, and ethics of individuals and groups:
    (a) promote or constrain technological development;
    (b) influence attitudes towards technological development;
8. Develop awareness and understanding of the impacts of technology on society and the environment:

(a) in the past, present and possible future;
(b) in local, national and international settings.

The curriculum is a multi-layered structure. Each of these three strands has 8 levels of itemized achievement objectives, to serve the subject as the children progress through the school system over a period of 13 years (Technology in the New Zealand Curriculum, 1995).

The New Zealand technology curriculum is the result of a group of experienced curriculum writers, some of whom had had experience in re-writing the science and mathematics curriculums. The development policy was a result of the wider community input (Jones & Carr, 1993) and also a result of much international research into technical education, teaching, and learning (Jones, 1996). It should be noted that the New Zealand curriculum is not simply the copy of an overseas model with a few wording changes. It is a break from the British modeling of the past, with a new subject that is reflective of New Zealand conditions and culture, and with a knowledge base of its own which incorporates a balance of intellectual, social, and personal interactions with technology. The curriculum appears to be well balanced. It is not a fragmented assemblage that tries to cobble together a whole spectrum of existing subjects and crafts. The design may be varied to suit particular areas of the country and it is also versatile enough to reflect current technological practices.

## Problems Facing New Zealand Technology Teachers

It may be difficult for the technology curriculum to succeed until it has full status, equal to other subjects in the school curriculum (Jones, 1996). In the transition stage there are potential problems in the successful introduction:

(a) As McCormick (1992a) had observed with the prototype England and Wales technology curriculum, many of the original technical/craft subcultures do not naturally work together. The former areas of arts and crafts that were rather specialized are now merged into a new curriculum where technology teachers are no longer required to be expert in a very narrow field of technology. Most of the non-technical teachers will initially lack the appropriate technological expertise. Similarly, the former specialized subject teachers will now require more general knowledge and skills in technology and education. The recommendation of the Ministry of Research, Science, and Technology to provide for adequate training and resourcing must be taken very seriously.

(b) It follows from the above that the teachers will not always have the answers and must of necessity change their roles to mentors and facilitators. While the successful teaching of the subject will encourage talking, the exchange of ideas, questioning, and curiosity which is excellent for the development of group dynamics, some children's cultures do not encourage it. Moli (cited in Hodson, 1999) observed of the Polynesian immigrants into New Zealand that "…many have learned from parents that the teacher, like the priest or pastor, holds valuable knowledge and as such is to be respected, not questioned by mere students. Indeed, to ask a question can be a sign of lack of attention and disrespect. …to teach the children to be critical thinkers and to ask questions in an inquiry approach is certainly opposing the conforming aspects of the culture" (p. 216). It is not a problem just for one culture in our multicultural New Zealand schools and society. Hodson (1999) observed that "…girls brought up within the Islamic tradition may experience difficulty in challenging what they perceive as the proper authority of an adult male teacher" (p. 228).

(c) The standard New Zealand primary classrooms do not have facilities to out carry some of the curriculum projects.

(d) The development and implementation of the subject can easily be undermined by misinterpretation (Jones, 1996).

To solve these problems, and successfully implement the technology curriculum, the teaching of technology as we have known it in the past will change. Vincent and Vincent (1985) stated that "curriculum change may denote bringing about changes in methods of teaching and learning, as well as changes in the programmes or courses" (p. 27). The curriculum states that a timetable for the subject of technology "allows for teachers to work collaboratively in planning and delivery" (Technology in the New Zealand Curriculum, p. 29). Effective planning of the subject necessitates an increase in the number of meetings the teachers must attend which, in turn, has increased their workload (J. Moreland, personal communication, July 31, 1999). Recognition of this problem has resulted in a reduced requirement for teaching technology in the first year of the programme's implementation. A gradual phasing in of the subject resulted in a partial implementation of years 7-8 and 9-10 in 1999 (New Zealand Education Gazette, 1999).

## Conclusion

Technological knowledge is increasing at an exponential rate and the professionals of today work in environments where they can no longer be expected to learn in advance all the technological knowledge required to solve day-to-day problems. Knowledge must constantly be acquired in order to understand technology and solve the problems of the time. It is difficult to train a person for a professional situation where the demands of tasks may be to some extent unpredictable, and where the knowledge and skills needed are not usually defined by some prior instruction or coaching of the concept or process. McCormick (1997) stated: "Technological activity is by nature multi-dimensional, requiring understanding from a variety of points of view" (p. 144). In addition, most people working in a technological occupation must retrain in technology at least once in their working lifetime.

As this knowledge explosion continues, the balance between *what to learn* and *how to learn* must shift towards the latter. Given the impossibility of knowing everything about anything, the educational requirements for a job and those for higher education are converging. The Carnegie Task Force (cited in Malcolm, 1988) observed that "…the economic and social needs of our country will force us to provide for many the kind of education previously reserved for the elite few" (p. 224). Vincent and Vincent (1985) go even further and stated that “Oral and social skills, it is argued, are the skills most employers need from their employees” (p. 108).

New Zealand education has taken positive steps to define and establish technology education as an academic discipline to replace traditional school craft subjects. All students are expected to study technology following a structured progression of the curriculum from their first year in primary school to their senior secondary year 13. The success of the technology curriculum will depend upon its successful implementation in the schools, together with the development of an effective assessment program. Naturally it will take time to develop a culture of technology education in New Zealand schools, as “…technology education does not have a historical home in New Zealand” (Jones, 1996, p. 24). The exams that students sit in the 7$^{th}$ form (the final secondary school year required as a university entrance qualification) are the exams that possess social status. It can be expected that the subject of technology will gain an appropriate social status and break its current shackles as a pre-vocational course when it eventually becomes a 7$^{th}$ Form exam. The examination unit standards for the subject are currently being written and will be phased in gradually, starting in 2001. A panel of academic professionals is developing the achievement standards, professional development requirements, and resources for year eleven and will be introduced in 2000 (P. Petherbridge, Ministry of Education, personal communication, 19$^{th}$ November 1999). Unlike the old pre-vocation training in the technical schools, the new subject of technology will be of assistance in acquainting the New Zealand pupils with the aspects of technology that are important in the 21$^{st}$ century. It will provide students with the knowledge and skills that will be useful, regardless of the career path they choose, by increasing their options, horizons, and perspectives).

The process that resulted in *Technology in the New Zealand Curriculum* was designed to give the students an understanding of the culture, the values, and the social issues involved with technology. It is intended to bring the concept of technological literacy into the intellectual domain. Such an understanding and intellectual approach to technology is now deemed necessary for all students in order for them to function effectively in our modern technological society. The new subject will lay a good foundation for further technological learning in school as well as the inevitable learning that takes place outside the school in the home and at work.

Nickerson (1988) went even further in expressing the view that technology education will “…increase one’s appreciation of other cultures, viewpoints and lifestyles, and deepen one’s sensitivities to other people’s rights, feelings, preferences and hopes…it should heighten one’s curiosity and inquisitiveness; as a consequence of one’s education, the world should be a far more interesting place than it would otherwise be” (p. 4).

## References

Anglican Church. (1928). *Book of common prayer.* London: Collins Liturgical Publications.

Barnett, M. (1994). *Designing the future? Technology, values and choice.* International Journal of Technology and Design Education, *4,* 51–63.

Black, P. J. (1994). *Technology in the school curriculum.* Papers from the science, mathematics and technology (SMT) education in OECD countries.

Black, P., & Harrison, G. (1985). *Technological capability.* In place of confusion. (Open University Pamphlet). R. McCormick, P. Murphy, & M. Harrison (Eds.). London: Addison-Wesley.

Braukmann, J. R., & Pedras, M. J. (1990). *Preparing Students for living in a technological society: A problem solving approach to teaching.* Journal of Technology Education, *1*(2).

Burns, J. (1992). *Technology - What is it, and what do our students think of it?* The New Zealand Principal, *6*(3), 22-25.

Campbell, A. E. (1941). *Educating New Zealand.* Wellington, NZ. Department of Internal Affairs.

Campbell, L. A., & Campbell, H. A. (1999). *Hamilton – heart of the mighty Waikato.* (On-Line). Available: http://www.chemistry.co.nz/waikato.htm.

de Vries, M. J. (1992). *Technology education in the Netherlands.* Teaching and Learning in Technology. R. McCormick, P. Murphy, & M. Harrison (Eds.), England: Open University. Addison-Wesley.

Department for Education & Employment. (1999). *National curriculum.* (On-Line). Available: http://www.dfee.gov.uk/natcurr.htm.

Department of Education. (1987). *The curriculum review. Report of the committee to review the curriculum for schools.* Wellington, NZ: Government Printer.

Department of Statistics. (1999). *Census 96 – statistical information.* (On-Line). Available: http://www.stats.govt.nz/statsweb.nsf

Gibbons, P. J. (1977). *Astride the river, A history of Hamilton.* Christchurch, NZ: Whitcoulls.

Harrison, M. E. (1992). *Halfway there: Reflections on introducing design and technology into the secondary phase.* Teaching and Learning in Technology. R. McCormick, P. Murphy, & M. Harrison (Eds.), England: Open University. Addison-Wesley.

Hodson, D. (1999). *Critical multiculturalism in science and technology education.* Critical Multiculturalism: Rethinking Multicultural and Antiracist Education. S. May, (Ed.). London: Falmer.

Johnson, S. D. (1992). *A framework for technology education curricula which emphasises intellectual processes.* Journal of Technology Education, *3*(2), 26-40.

Jones, A. (1996). *Technology education in the New Zealand curriculum: from policy to practice.* Centre for Science and Mathematics Education Research. Hamilton, NZ: University of Waikato.

Jones, A. T., & Carr, M. D. (1993). *Towards technology education. Volume 1.* Working papers of the Learning in Technology Education Project, Center for Science and Mathematics Education Research. Hamilton, NZ: University of Waikato.

Lee, G. (1992). Origins of the common core curriculum. In D. McCulloch (Ed.), *The school curriculum in New Zealand: History, theory, policy & practice* (pp. 102-122). Palmerston North, NZ: Dunmore.

Levette, A., & Lankspear, C. (1990). *Going for gold.* Wellington, NZ: Brassall.
Mather, V. (1996). The implementation of technology in New Zealand schools. In Burns (Ed.), *Technology in the New Zealand curriculum: Perspectives on practice*. Palmerston North, NZ: Dunmore.
Ministry of Education. (1995). *Technology in the New Zealand curriculum.* Wellington, NZ: Learning Media.
Ministry of Education. (1991*). N Z Education Gazette.* (7), Wellington, NZ: Ministry of Education.
Ministry of Education. (1999*). N Z Education Gazette.* (16), Wellington, NZ: Ministry of Education.
Ministry of Research, Science and Technology. (1992). *Charting the course: the report of the Ministerial task group into science and technology education.* Wellington, NZ: Government Printer.
Malcolm, S. M. (1988). *Technology in 2020: Educating a diverse population.* Technology in Education: Looking Toward 2020. New Jersey: Lawrence Erlbaum.
McCormick, R. (1992a). The coming of technology education in England and Wales. In Banks (Ed.), *Teaching technology*. London: Routledge.
McCormick, R. (1992b). Technology education in the United Kingdom. In R. McCormick, P. Murphy, & M. Harrison (Eds.), *Teaching and Learning in Technology* (pp. 15-27). England: Addison-Wesley.
McCormick, R. (1997). *Conceptual and procedural knowledge.* International Journal of Technology & Design Education, *7*, 141-159.
McCulloch, G. J., Jenkins, E. W., & Layton, D. (1985). *Technological revolution? The politics of schools science and technology in England and Wales since 1945.* London: Lewes Farmer.
McKenzie, D. (1992). The technical curriculum: Second class knowledge? In G. McCulloch (Ed.), *The school curriculum in New Zealand: History, theory, policy & practice*. (pp. 29-39). Palmerston North, NZ: Dunmore.
Medway, P. (1992). Constructions of technology: reflections on a new subject. In J. Beynon, & H. MacKay (Eds.), *Technological Literacy and the Curriculum*. Leeds: Falmer.
Nickerson, R. S. (1988). *Technology in education: Looking towards 2020.* Hillsdale, NJ: Lawrence Erlbaum.
O'Neil, A. (1992). The gendered curriculum: Home-makers & breadwinners. In D. McCulloch (Ed.), *The school curriculum in New Zealand: History, theory, policy & practice*. (pp. 74-101). Palmerston North, NZ: Dunmore.
Paechter, P. F. (1992). Subject subcultures and the negotiation of open work: Conflict and cooperation in cross curricular coursework. In R. McCormick, P. Murphy, & M. Harrison (Eds.), *Teaching and Learning in Technology* (pp. 15-27). England: Addison-Wesley.
Qualifications & Curriculum Authority. (1999). *National curriculum review consultation.* Education, *3*(16). (On-Line). Available: http://www.qca.org.uk/ncr/recommendations.
Raizen, S. A., Sellwood, P., Todd, R. D., & Vickers, M. (1995). *Technology education in the classroom: Understanding the designed world.* San Francisco: Jossey-Bass.

Resnick, L. B. (1991). Shared cognition: Thinking as social practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition.* Washington: American Psychological Association.
Taba, H. (1962). *Curriculum development theory and practice.* New York: Harcourt, Brace, & Jovanovich.
Vincent, B., & Vincent, T. (1985). *Information technology & further education.* London: Kogan Page.
Zuga, K. (1992). *Social reconstruction curriculum and technology education.* Journal of Technology Education, *3*(2), 48-58.