The Intended and Interpreted Technology Curriculum in Four New Zealand Secondary Schools:

Does this all mean the same?

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Abstract

In 1993 a new draft technology curriculum was introduced to New Zealand schools, followed by the publication of the final document in 1995. Its design and intentions required a shift in thinking within schools, in teaching and learning, and in the wider community. This had significant implications for the way schools managed curriculum implementation, for staffing in technology, and for resourcing. Professional development opportunities, funding support and support resource material were made available over a number of years as research in this area continued. Access to this support was not consistent for teachers and schools, and in some cases, not always sought. By the time the implementation of the technology curriculum became mandatory in 1999 for all students, Years 1 – 10, anecdotal evidence and some initial research showed that its interpretation and delivery in schools was varied, or no different from that of the previous workshop focussed syllabus.

This research sets out to discover how technology education has been implemented across a small selection of schools in the Wellington region and to consider the way school management and technology staff in each school have interpreted and implemented it. Student responses to this implementation are also examined.

The study draws from four secondary schools, and the focus is on senior technology as this was viewed by the researcher as a level where the interpretation and implementation of technology education could be most diverse. Changes in national assessment practices also highlighted this diversity. Each school was treated as a case study involving interviews with principals, teachers and senior students, in order to examine how technology is understood and practised. The ways in which teachers and students understood technology is examined within a framework of contemporary national and international research literature.

The findings need to be considered in view of the fact that only four sites were used, the research is interpretive in nature, and makes use of case study methodology. In other words, the results cannot be directly generalised; however, readers are able to identify from the descriptions the extent to which findings transfer to their own context.

The distinctive factors that emerged from this study highlight that the teachers concerned interpreted and implemented the technology curriculum with a strong consideration of their students' backgrounds, learning needs, abilities and aspirations. In addition, the teachers' own experience and qualifications, along with contextual factors associated with the school, such as its decile rating, appeared to be linked with the teachers' interpretation of the curriculum. Teachers identified a need for ongoing, robust professional development so that they could be confident in their practice, and have a common understanding of terminology presented in the curriculum and national assessment standards. Resourcing for schools in the form of facilities, materials and staffing was varied and also needed to be supported.

The study also identifies further research requirements to inform and support this curriculum area. These requirements ask for the extension of the present research to other schools, the evaluation of professional development programmes in technology, and the evaluation of the impact of school technology programmes on students' learning and students' future educational/work pathways.

Acknowledgements

There are too many people to name, to whom I am indebted for their input into the completion of this thesis. At different points over the last four years, friends and colleagues offered their support in that their faith and encouragement gave me the strength and resolve to see this work to an end. Above all I would like to make special mention of Professor Cedric Hall who willingly went over and above his already demanding work schedule to take on supervision of my thesis when another of my supervisors moved abroad. Cedric's professional knowledge and consistent support gave me the confidence and determination to take this study to its conclusion. I would also like to thank Professor Wayne Edwards for his supervisory support. Of course this thesis could not have been carried out without the generosity and willingness of interview participants. They were obliging and welcoming in allowing me to conduct interviews with them. I conclude this piece with a special thanks to my children who carried on independently while their mother spent many hours in her office taking this study to a conclusion.

Dedication

I dedicate this thesis to my parents. My father, Dr. Fritz Bondy, a learned man, whose consistently positive outlook on life enabled him to overcome hardship, prejudice and a physical disability. He was my inspiration. To my mother also, whose determination and drive, she gifted to me.

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CHAPTER 1

Introduction

1.1   General aim of the research

Technology education was introduced to schools in New Zealand in draft form in 1993. It was new in its approach and some observations suggest that schools', teachers' and students' responses to it have been varied. The New Zealand Labour Government in the late 1980s proposed the introduction of technology education, as one of seven essential learning areas, into a new national curriculum. *The New Zealand Curriculum Framework* (Ministry of Education, 1993) was followed by the publication of each of the seven essential learning areas over the next seven years. *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) was set out, similar to the others, in terms of intended outcomes. It did not offer detailed descriptions of what content to teach but required from teachers a shift in thinking in terms of approaches to teaching and learning. Instead of a "syllabus/prescription" form of curriculum, teachers were required to construct learning experiences for the students within the eight level curriculum framework; this involved the integration of areas of technology and relevant contexts for the study of technology with the achievement objectives specified in three curriculum strands: A. technological knowledge and understanding, B. technological capability and C. technology and society. Involvement and consultation in the development of this curriculum, according to the Ministry of Education, was widespread but actual teacher involvement was minimal (Fancy, 2004), and the development of the curriculum was tightly controlled by the government. In 1999, the technology curriculum was gazetted as a legal requirement to be taught in schools to all students, Years 1 – 10. It is not clear how many teachers have embraced the new curriculum and how many have resisted it and, although the evidence is anecdotal, it appears that a range of discussions occurred amongst technology teachers in relation to their understanding and implementation of the curriculum. The basis for this comment is the writer's contacts with schools as a technology teacher educator as well as perceptions obtained from professional development workshops, conferences and other meetings attended by the writer. Whilst a number of technology teachers left the profession in the early years following the curriculum publication, others remained and either slowly changed their approach or have continued teaching workshop skills and other

traditional subjects in the way they had always done prior to the publication of this new learning area in technology.

This study commenced in January 2005 – nine years following the publication of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) – and set out to determine whether a perceived division between what was intended with the new curriculum and what was interpreted and implemented actually exists, and if so, what is the nature of this division, why does it persist, and what can be done to re-align the different positions?

1.2   Contextual background and relevance of the research

The period of this investigation coincides with a major revision of the 1993 *New Zealand Curriculum Framework* (Ministry of Education). Potentially the review of the curriculum could deal with, and possibly settle, issues that are also the focus of this research. However, because of the timing of the review, this thesis cannot provide a detailed analysis of the resultant changes to the 1995 technology curriculum.

The technology curriculum has challenged educators to rethink what technology and technology education are. It also focuses on processes as opposed to content, and requires teachers to review their teaching practices and attitudes to teaching and learning. It promotes the idea of placing the teacher in the role of facilitator as well as learner alongside students and this is perhaps the first time that many teachers have been asked to work in this way. Along with a focus on the new approach and understanding of the new (1995) curriculum, and the associated ideologies, it is possible that this research might identify issues or hurdles that have impeded the realisation of the ideals of the new curriculum.

Anecdotal evidence and some literature, as will be discussed in Chapter 2, suggest that technology education is currently being implemented in secondary schools in an inconsistent way. Secondary schools' structures present a range of contexts and situations. School timetables, as well as physical and human resources, all play a part in how curricula are implemented in secondary schools. The wider school community socio-economic and ethnic make-up may also play a part in determining the nature of parents' and students' aspirations for student learning and achievement. A new

approach, such as that required of technology education, may not be seen by teachers and learners alike as supporting the learning to which they aspire. The anecdotal evidence suggests that some teachers are genuinely trying to implement the curriculum with the best intent but are expressing frustration over difficulties in marrying theory and practice. The experiences of these teachers and their students need to be made explicit.

The study examines the position and practice of technology education through conversations with principals, teachers and students in four Wellington secondary schools. The research problem investigates whether discrepancies, in fact, do exist between what is promoted in *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) and what actually happens in some secondary school technology classrooms. These discrepancies are highlighted in view of some of the historical and political contexts that have led to the curriculum change. The study explores school management, teacher and student experiences and responses with the intention of understanding how the technology curriculum is interpreted and practised in the selected secondary schools. This research is important because it will identify synergies and tensions in teaching and learning in technology education and subsequently offer information that can contribute to curriculum policy and practice. It is the writer's belief that technology teachers must feel confident and supported about their approaches to teaching the subject and they need to have a sense of belonging to a teaching community where understandings, experiences and issues in technology education can be openly discussed.

1.3   The research

A case study approach has been adopted for this research where each school is treated as a separate case. Within each school, information is gathered from the principal and some teachers. Their ideas and experiences are examined in terms of how they interpret, manage and use the New Zealand technology curriculum. Semi-structured interviews are used to enable participants to share their ideas and experiences which, in turn, are examined in the particular context of each school. In addition, focus group interviews have been conducted with a group of students in each school to identify their experiences of the curriculum. The purpose of these interviews was to gather

further information on how each school has interpreted the curriculum through analysis of the perceptions and reactions of students.

Qualitative methods are used to observe what is made of perceived tensions and differences between what the curriculum promotes and what is practised in classrooms. In light of the suggestion that technology education is being implemented in secondary schools in an inconsistent way, the theoretical frame identifies the curriculum as intended by the government and interpreted and implemented by teachers. This model of the intended and interpreted curriculum is based on that of Harland (1988).

1.4   Research aims and questions

The overall aim of this research, in a question form, is as follows:

> How is *Technology in the New Zealand Curriculum* (1995) interpreted and practised in a sample of secondary schools in the Wellington area, and what discrepancies exist between the intended and interpreted curriculum?

This aim and key question breaks down into the following research questions and acts as the umbrella for gathering interview data:

❖ How is senior secondary technology education interpreted and practised at senior level in a sample of Wellington schools?

The data gathering sets out to discover how the intended curriculum (to be discussed at length in Chapter 2) has been interpreted within the four case study locations and how each of these locations has managed and organised their senior technology curriculum programmes.

❖ What are the school senior management experiences of, and expectations for, technology education and its implementation?

Interviews with school principals will establish how they have understood the curriculum and what policies they have developed in response.

❖ What are teachers' expectations and experiences of technology education and technological literacy?

Teachers are closely connected to the learners. Their interpretations, expectations and subsequent implementation need to be made clear to inform this research.

❖ What are students' expectations and experiences of technology education with regards to their intended learning?

Student responses to how the technology programme is experienced provide further evidence for the interpretation of the curriculum (how it is implemented) as well as how it is received. However, the emphasis in this research is on using the students' data to gain further insights into the interpretation and implementation of the curriculum; a full analysis of how it is received ("learnt") goes well beyond what could be managed within the scope of this study, involving detailed analysis of students' learning.

1.5 Researcher position

The research has developed through the researcher's experiences as a teacher and teacher educator in technology education, her background and strong interest in Māori education, and of her own belief that the pedagogical approaches of technology have the potential to support inclusive pedagogy. However, the researcher's/writer's perspective on what is currently happening with senior secondary technology education in New Zealand schools has been formed from observations in schools, discussions with technology teachers and student teachers, discussions in professional development workshops and at conferences. Literature relating to the topic has also contributed to this perspective. These observations, discussions and subsequent reading have highlighted the idea that there may be some tensions and differences between what the curriculum promotes and what is practised in classrooms, so the research has been developed on the premise that technology education is currently being implemented in secondary schools in an inconsistent way. Evidence to support or challenge this premise is central to this research.

The researcher has a commitment to preparing competent beginning teachers for meaningful and rewarding teaching careers in the area of technology education. The differences and tensions that appear to have emerged between the intended

curriculum and its supporting literature (the theory) and what happens in secondary school classrooms (the practice) makes this difficult; thus, presenting the problem upon which this research is based. The research outcome is intended to inform her practice as a technology teacher educator and, on a broader scale, it is intended to inform technology teachers and decision makers in schools. Ultimately, if discrepancies and differences are indeed shown to exist, then it is the policy makers and designers who must be informed; their role is to identify further curriculum pathways to provide meaningful and relevant learning for all students.

1.6   Outline of the thesis

Following this introduction, the literature review that makes up Chapter 2 focuses on seven main aspects within the literature to support the argument from which the theoretical framework and research have developed. The first two sections provide background, firstly involving discussion on the meaning and nature of technology and subsequently on the nature of technology within the context of education. It is important to investigate early ideas on technology and analyse how technology has been viewed in relation to people and their environment. With this established, it is then equally important to investigate how technology has been introduced in school curricula. Section 3 examines The *New Zealand Curriculum Framework* (Ministry of Education, 1993) and Section 4 introduces *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) and discusses its development. The introduction of the technology curriculum marks a significant time in the New Zealand education system and so information on both of these publications is relevant. Section 5 briefly discusses the recent *Curriculum Stocktake Report to Minister of Education* (Ministry of Education, 2002), and Section 6 outlines key definitions in technology so as to give clarity to the terms referred to in this thesis. The final section develops diagrammatically the theoretical framework for the study. This chapter provides the context and foundation for the research questions which are articulated at the beginning of the next chapter.

Chapter 3 sets out the methodology for the study, starting in Section 1 with the research aims and questions. Section 2 includes a description and justification for the overall qualitative approach and, in Section 3, details of the case study methods are presented along with a description of the overall research design. Section 4

describes the data collection methods where the use of interviews with principals, teachers and students of senior technology classes are conducted in four secondary schools located in and around Wellington. The interviewees' ideas and experiences are examined in terms of how they interpret, manage and use the New Zealand technology curriculum. This section also outlines how the style of semi-structured interviews best enables these personnel to share their ideas and experiences which, in turn, are examined in the context of each school. Data analysis procedures are examined in Section 5 and the chapter leads into Section 6 with an examination of the validity and reliability of the study. Section 7 provides a discussion of the relevant ethical considerations.

The results from the data collection are organised and presented in Chapter 4 – Parts A, B, and C. Part A presents detailed results for Schools A and D; Part B presents a summary of the results for Schools B and C. Given the amount of detail in each school's analysis, the decision was made to report in full only two of the schools and provide summaries for the other schools (further details are given in Chapter 3). Part C draws together the results from the four schools and examines common themes and differences.

There are six sections in Chapter 5. Following the introduction, there is a brief overall summary of the results contained in Chapter 4. The third section links these results back to the supporting literature in Chapter 2 and identifies patterns and common themes that emerge. These are used to revisit the theoretical framework in Section 4, as earlier presented at the end of the literature chapter. A revision of the theoretical framework informs recommendations for further practice and research in technology education in Sections 5 and 6.

CHAPTER 2

Literature Review

The purpose of Chapter 2 is to establish, through a review of the literature, the context out of which the investigation has developed and to examine meanings within technology and technology education so as to adopt a theoretical lens and framework. Sections 2.1 and 2.2 discuss perspectives on meanings of technology as well as technology education. The chapter also examines the *New Zealand Curriculum Framework* (Ministry of Education, 1993) in Section 2.3 and *Technology in the New Zealand curriculum* (Ministry of Education, 1995) in Section 2.4, as it has been intended for interpretation. Section 2.5 discusses the *Curriculum Stocktake Report to the Minister of Education* (Ministry of Education, 2002), although it needs to be recognised that the timeframe for the Stocktake extends beyond the period of the data collection for this thesis. This discussion leads to the presentation of definitions that guide this research (Section 2.6). Section 2.7 draws upon the content of Sections 2.1 to 2.6 to guide conceptualisations of the intended and interpreted curriculum. This is presented via the theoretical framework for the formulation of the research. Section 2.8 summarises the chapter.

2.1   Perspectives on meanings of technology

A common view on the nature of technology is required so that teachers, along with their school managers, can make informed decisions about its relevance and position in the education system. It is of interest in this respect that *The Nature of Technology* has been included as one of the strands in *The New Zealand Curriculum Draft 2006-2007* (Ministry of Education, 2006b). The question of whether or not technology teachers have a consistent understanding of the nature of technology is obviously important as teacher viewpoints influence how the subject is interpreted and taught in schools. Technology, and what it means, is initially interpreted in this section in terms of its perceived relationship with science; subsequently, revisions of this interpretation are discussed. A contemporary interpretation is then examined.

Many ideas on the nature and meaning of technology have developed and evolved through its connection with human and social development. Technology has existed as long as people have and hence technology's role from the earliest known point of

humankind needs to be recognised. It has been a fundamental element in the development of civilisation. People have used technology to try to make life easier – whether related to survival components such as food and shelter, or the acquisition of knowledge and control. Technology for fundamental survival has been the earliest form (Burns, 1997), but as it has evolved over time it has been shaped by the society in which it has been positioned, and society has been shaped by it in turn. This is a reciprocal development to the point where recent focus on a narrowed relationship with economic growth has been questioned. Some will argue that this (the economic imperative) has been the reason for introducing it to schools (IPENZ[1], 2001; Jolley & O'Neill, 2001). However, in earlier times, technology developed from human experience, genuine needs and people's knowledge and ability to develop solutions in response to those needs. Technology has evolved as society has and so its nature has been interpreted in many ways, simultaneous to this evolution.

2.1.1   Technological determinism

Based on many early interpretations, there remains a belief that along with knowledge and ability, science informs technology – to the point that technology is really seen as applied science. Gardner (1994) describes this position as the deterministic view which has been used widely to discuss the relationships between technology and science, and technology and society. An extreme example of this view would be where society itself is seen as being determined by technology. This is in line with a traditional view where technological thinking is regarded as a practical application of scientific laws, or as identified in Bigelow's (1831) description of technology, "the arts of science" (cited in Gardner, 1994, p.134). A challenge to this idea is difficult "so long as technologies are mistaken as crafts and regarded as theory-free" (Bunge, 1966, cited in Gardner, 1994, p.141).

A quite different belief, which derives from an historical perspective, suggests that scientific theory is of little use to technology. While technology makes use of selected scientific knowledge, it does so only where and when such knowledge is needed. Other arguments against the "technology-as-applied-science" idea see technological capability as a predecessor of science: "...science and technology have different goals; whereas technology aims to intervene in the world and to change it, science aims to understand the world" (Burns, 1997, p.25).

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[1] IPENZ: Institute of Professional Engineers New Zealand

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In looking at the meanings of science and technology, Gardner (1994) describes views that may well match many teachers' interpretations today. Technology can be an object, a procedure, or more than a procedure. It also can include invention, design, innovation, dissemination, and improvement. Other views can refer to a technological system or to technology as a subject area or field of specialisation. Science is not usually viewed as disparately. There are diverse and long-standing discussions on the nature of technology which continue to this day and perhaps it is this very situation that has made the introduction of technology education into schools varied in approach, thus reinforcing the purpose of this study.

2.1.2   Social shaping of technology

The nature of technology can be seen in a broader context beyond its relationship with science. Pacey (1983) describes this context as life itself, of which technology is an integral part, not a separate compartment. The confusion around the word "technology" and the two adjectives "technical" and "technological", is highlighted where technological developments are not restricted to technical form. Technological practice includes the organisational aspect, technical aspect and cultural aspect, and Pacey's following diagram (Figure 2.1) shows how culture refers to values, ideas and creative activity.

**Diagrammatic definitions of "technology"
and "technology practice"**

CULTURAL ASPECT
Goals, values and ethical codes,
belief in progress, awareness and
creativity

ORGANISATIONAL ASPECT
Economic and industrial activity,
professional activity, users and
consumers, trade unions

Technology
Practice

general meaning
of "technology"

TECHNICAL ASPECT
Knowledge, skill and technique; tools,
machines, chemicals, liveware;
resources, products and wastes

Restricted meaning of
"technology"

Figure 2.1.   Diagrammatic definitions of "technology" and "technology practice" (from Pacey, 1983, p.6)

Pacey provides two examples of technological practice where the cultural aspect of technology was concealed by the more apparent practical issues. The two examples

refer to the use of snowmobiles in North America and hand-pumps in India (Pacey, 1983); these highlight the development of practical solutions from a single worldview perspective where cultural and environmental variations were not considered. Pacey's reference to the snowmobile case describes how standardised machines designed for use in an industrialised country neglected further specific needs of intended users such as Eskimos and Lapps. Similarly, he describes the case of simple hand pumps installed by village wells in India, where organisational considerations were disregarded and within a short period many pumps had broken down. These examples are important in demonstrating what may happen when the cultural or societal considerations in technology are not acknowledged; this will be important in later discussions of technology education, including workshop technology subjects where, until recently, technical aspects have been the main focus in our New Zealand classrooms.

Further to this, Pacey (1999) has extended his model to include a "personal" dimension. He poses the question as to what technology might look like if it had consistently developed with a "people-centred" approach where the love and care for others was paramount.
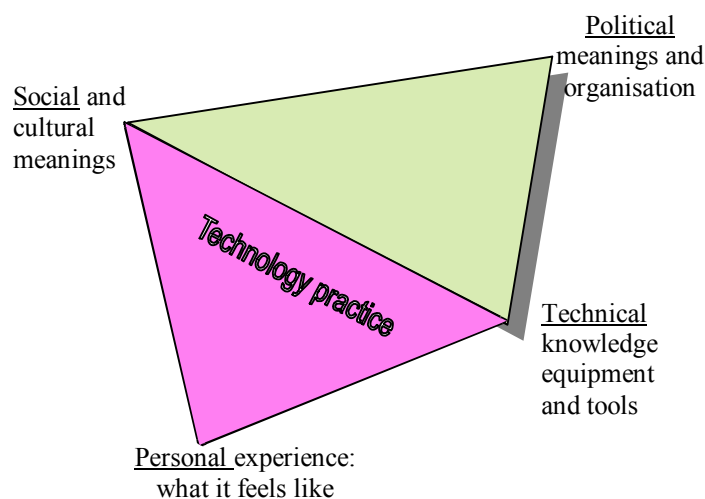
Figure 2.2: Dimensions of technology practice and experience
(from Pacey, 1999, p.8)

According to Pacey, these are different dimensions of technology practice and experience that coexist and interact as different and complementary levels of knowledge. An example of a people-centred approach, referred to as "appropriate

technology" (p.202) is given in the case of an agricultural engineer being sent to a drought-prone African region to initiate improvements in soil and water conservation. Quite opposite to the snowmobile and water-pump instances noted earlier in this section, a solution was developed out of friendship and dialogue between community and engineer. The engineer took time to learn the local language and form genuine friendships, thus enabling him to develop an understanding of local values and prior knowledge regarding conservation of soil and water. A successful technological solution was developed collaboratively. This approach is, in fact, one identified as important in ensuring sustainability for aid projects in general (e.g., Crowl & Hall, 2005).

Pacey also describes social meanings in technology where it was often widely believed that an inventor would define the social meaning of his or her creation, innovation or design. He suggests that consideration needs to be given to the idea that meanings of technology may well be discovered by the users.

Pacey's belief that technological processes are socially contextualised can be compared to the view of Staudenmaier (1985) who uses the idea of design-ambience. The design-ambient model stresses negotiation between the environment and the technological developments taking place. This moves closer to indigenous people's views about interaction with their environment (Durie, 1997). Although Western approaches to technology have perhaps been somewhat tardy in considering environmental issues in relation to technological developments, these considerations have emerged.

2.1.3 Ecological priorities

Beck (1992) argues that wealth and class do not count when the threat of global pollution is apparent. He describes the "risk society" where the industrialised world has perhaps woken up to adopt a "reflexive" modernization model, where a "wealth production" focus has eventually brought about a need for a "risk production" view. Rather than the limited view of making nature useful, the problems caused by techno-economic development are themselves a cause for concern. Beck describes those risks as environmental and ecological; they far outweigh wealth concerns.

Support for this approach is reinforced by Midgely's (1996) idea of "moral pluralism" where her view of human nature is optimistic. She proposes that people are social beings who hold a range of values, which include a high concern for all life. Further to this is the idea of ecocentric technology (Capra, 1997) where people are only one part of their natural environment and rather than people being the only focus, nature itself needs to be a participant. In other words, humans need to adapt their ways of living in order to fit in with nature as opposed to the idea that people use technology to manipulate nature to meet their needs. People-centred technology suggests that people are at the centre of its development; an ecocentric approach has the environment as a central aspect within which the technology is developed. Capra's and Midgely's ideas find a middle ground where ideals connect with reality by offering the paradigm of "deep ecology", a contextual approach, as opposed to "shallow ecology" where nature is exploited. People have an ethical responsibility for reflective practice in technology. Technologists can be well informed by indigenous societies that have developed their own technologies largely with this holistic, ecocentric, participatory perspective.

There is a need at this point to consider technology's place in education. The development of technology education beyond New Zealand, particularly in England and Wales, will be briefly considered in the first instance so as to place its development in New Zealand within a broader educational, economic and political context.

2.2 Technology in education

As a former British colony, New Zealand's schooling system was initially strongly influenced by the British educational system. This section includes an outline of how technology education was viewed and developed in Britain and then how the New Zealand education system mirrored a lot of this process.

2.2.1 Technology in education in Britain

Technical education in England and Wales was initially linked to vocational education which was based on a range of overlapping or interconnected concerns (Layton, 1993). These included economic considerations and political concerns relating to employment. Post-war economic decline in the United Kingdom brought

about the relegation of workshop skills to secondary schools, not so much with specific trades in mind but more for the development of skills essential for the workforce in general. Gender differentiation in subjects was also in the equation with woodwork, building, horticulture and metalwork for boys, and cooking and sewing for girls. Craft education traditionally encompassed manual training on the one hand and village-type craft on the other, but these approaches, although teaching children manual skills, were unable to keep up with modern industrial activities and working environments, contemporary culture, and intellectual concepts (McCormick, 1994). The added layer was the class system, where it was those students born into a working class environment who were mainly channelled into taking this type of subject as preparation for future vocations within the working classes. An increasing element of design was gradually integrated into the handicraft area, and in the late 1960s craft and design began to include elements of physics and engineering to the point that, by 1981, the then Department of Education and Science used the title, *Craft, Design and Technology* (or CDT) to describe the subject. The industrial and vocational theme was further developed within this subject as modular technology examination courses focused on electronics, pneumatics, and structures. These elements have been seen as components of applied science with an industrial and vocational flavour. Students were no longer taught only craft skills. They were encouraged to design what they made, and in the lower secondary schools students of all abilities were encouraged to participate in these courses (Atkinson, 1990), which tended to be organised as rotational modules. Boys and girls had access to all subjects with the intention that the gender bias might fade when it came to selecting further study.

There were basically two different responses to these courses amongst educationists. There were those who saw creative designing as a necessary way forward and those who believed that technology needed a sound knowledge base. These two groups could not, however, see the amalgamation of these approaches into one (Atkinson, 1990). During the 1970s and early 1980s prominent educationists continued to prevent CDT from securing a major role within the academic core of the school curriculum. Furthermore, responses from teaching staff of CDT, art, technology and design, exacerbated this situation as they protected their individual subject territory.

At a later point, Science, Technology and Society (STS) was introduced as a subject, taking strong account of citizenship education. It was a response from science educators keen to teach science in context. STS introduced a "values" perspective for technology, using approaches similar to social studies. It also used a problem-solving approach which supported decision-making relating to genuine contexts.

The Education Reform Act of Britain and Wales in 1988 introduced a national curriculum consisting of ten subjects for all children aged 5-16, the purpose being to ensure that all students study essential subjects. Technology was included as one of these subjects. With it now being a foundation core subject in the school curriculum, a design and technology working group was set up to define the components of study. Technology as an activity included a design phase as well as supply and production phases. The design and technology group produced their final report in the form of proposals to the Secretary of State in 1989. Four attainment targets were proposed for this design and technology subject, corresponding to: identifying needs and opportunities; generating a design proposal; planning and making; and appraising the design. A significant aspect of the proposals was that design and technology would be taught by teachers from subject areas such as: art and design; business studies; craft, design and technology; home economics; and information technology. Design and technology as a component of technology was launched into schools in 1990. It was strong on process and not so strong on content. It viewed the process as a holistic design-based activity; it recognised value issues, and it asked for a diverse group of teachers to work together to offer this subject in a coherent way (McCormick, 1994).

Medway (1992) offered a range of possibilities as to why a new approach to technology was introduced, including the idea that industries were wanting technical education to be raised in status, or that there were economic and cultural concerns regarding a perceived British lack of competitiveness and enterprise that needed correcting. He also described a trend for a new "academic specialism" (p. 66) at senior school level in the form of computing, accounting, economics, and legal skills. In summary, the major developments in technology education in Britain began with the introduction of workshop skills to secondary schools after the war to develop skills for the workforce. These courses were designed as gender specific. Fast developing working environments saw design gradually being integrated into these

subjects and by the late 1960s, craft and design also began to integrate physics and engineering. By 1981 the subject became known as craft, design and technology. Further to this, electronics, pneumatics and structures were integrated as part of the vocational theme into modular technology examination courses. At this point boys and girls were given access to all courses. Educationalists responded to these developments in two diverse ways where one group believed that creative design was necessary, whilst the other group saw the need for developing a sound knowledge base for technology. In this way, craft, design and technology was initially prevented from developing as part of the academic core of the school curriculum. The Education Reform Act (1988) introduced the national curriculum where technology was included as one of the essential subjects. From this point, in 1990, design and technology was introduced into schools, where an academic focus was offered at senior level.

2.2.2   Technology in education in New Zealand

Technology education developed in New Zealand out of similar trends. At the beginning of the twentieth century a number of technical high schools were introduced (Jones, 2006; McLintock, 1966), and academic students were channelled into academic subjects whilst non-academic students were channelled into commercial and trades subjects in preparation for the workforce. Gender stereotypes were reinforced in that girls dominated the domestic and commercial subjects, whilst the boys dominated the 'technical subjects' of engineering, woodwork and agriculture. These technical high schools remained until the mid-1960s, preserving the idea of vocational technical education for lower ability students (Burns, 1993). Meanwhile, following the post-primary curriculum of 1942 (Thomas, cited in Mawson, 1998b), common core subjects of metalwork, woodwork, sewing and cooking were introduced into secondary schools for 13 – 15 year old students, now regarded as Year 9 and Year 10 students. Following *The Currie Report* (Department of Education, 1962) the Department of Education implemented the workshop craft syllabus in 1975 with a new focus on design and the use of a range of materials. From the late 1970s, technical teachers became interested in the expansion of their technologically oriented workshop subjects to include an element of design and craft to the preliminary stages of making products (Davies, 1998). The use of materials also extended beyond wood and metal to include ceramics and plastics. Home economics echoed this too in the form of "design for living" or a similar label. However, student uptake increase was minimal as was a reduction in gender divisions.

During the 1980s government calls for the development of a curriculum that was responsive to New Zealand's needs and its economic relationship with the rest of the world were made, and in 1990 the newly elected National Government followed the Labour Government's education review with a project to revise the curriculum in primary and secondary schools. The major outcome of this review was the introduction of the *New Zealand Curriculum Framework* (Ministry of Education, 1993) or NZCF. Three key features of this framework were:

1. Identification of seven learning areas (these are listed in the next section) and eight essential generic skills covering, for example, communications skills, problem-solving skills and social and co-operative skills.

2. The structuring of curricula around eight levels instead of yearly progressions.

3. The replacement of syllabus prescriptions by lists of achievement objectives for each level of each essential learning area. These placed a premium on "outcomes" of learning rather than subject content.

This represented a major change in the way curriculum was conceptualised and specified (details of this are given in Section 2.3 shortly), but the resulting *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) was intended to advance technology education in a way that shared, or drew upon, the thinking underpinning British developments. For example, the curriculum covered three strands covering technological knowledge and understanding, technological capability, and technology's relationship with society. The first and second of these compare in many ways to the thinking behind the British developments; they cover knowledge and understanding of how things work, and how to make. The third is somewhat different in that it gives much greater emphasis to the environment and context in which the technological activity takes place. These features are developed more fully in Section 2.4.

2.2.3   Challenges to teachers

One contextual similarity between the development of the subject in Britain and New Zealand, worthy of mention, is that developments within the two countries could be seen as mirroring similar perceptions of economic and industrial trends. The reforms in each country took place against a background of claims that global competitiveness would be dependent on the development of technological literacy

and that the school curriculum needed to reflect this. Another trend, that seems to have also filtered into the New Zealand system is that described by Kimbell, Stables and Green's (1996) suggestion that design and technology in the school curriculum in Britain had grown from a background of practice as opposed to one of theory, and this perhaps also explains a number of difficulties encountered by some teachers in New Zealand in relation to the implementation of technology education (Davies, 1998; Jones, 1998; Mawson, 1998b).

Developments appear to have come from a background where teachers have eagerly tried things out rather than being informed by an intellectual analysis of a field of knowledge. Many have been successful, possibly due to their enthusiasm and imagination. However, the difficulty comes when the subject is transmitted into a written curriculum for all teachers. It cannot be defined in a body of knowledge and skills; there has been a scarcity of research for this to happen. The knowledge base required of a beginning technology teacher, with its emphasis now on a process (design) approach rather than the traditional materials approach, highlighted the shift in the philosophical basis underpinning the teaching of, and about, technology (Barlow, 2002). It required "new" knowledge and the development of appropriate pedagogical approaches.

It is perhaps worth noting that a parallel appears to have existed in Australia where Ginns, McRobbie and Stein (2000) questioned the readiness of many teachers in Queensland to grapple with problems associated with implementing the new curriculum area of technology, along with their readiness to recognise its meaning and intent. Ginns, McRobbie and Stein's study has similarities to the intentions of the current research in that it takes the insights of pre-service teachers, experienced teachers and school students to elaborate on a discussion of technology's implementation. However, a major difference lies in the focus of the Queensland study which is on the primary school sector, whereas this study looks at secondary level education. Also, this study does not examine the views of pre-service teachers. The present research will shed light on difficulties New Zealand teachers may have encountered in interpreting and implementing the curriculum.

2.3   The New Zealand Curriculum Framework

This section gives further background information for the reader on the NZCF. It is not intended that this section, indeed, this thesis, will provide an in-depth coverage of curriculum theory. For reasons of scope, the focus is more about the way schools interpret the curriculum. Nevertheless, it is important that the 1995 document be introduced to set the scene for the New Zealand context. In order to develop an understanding of what is intended with this curriculum and how it has been interpreted, it is useful to examine the curriculum in general, with some examination of its historical and political context. Prior to the release of *Technology in the New Zealand curriculum* (1995) there was not a wide technology education research base available that was set in a New Zealand context (Compton, 2004). Consequently, the New Zealand literature base that I have drawn from in this *chapter* refers mainly to the limited range of recent research and writing that has occurred since the implementation of the curriculum. Most of this is in the form of refereed conference proceedings and journal articles from New Zealand, Australia and the United Kingdom. New Zealand Ministry of Education research findings are also used here. International research has been identified in places as a means of comparison.

The introduction of learning and teaching in technology was proposed by the Labour Government in the late 1980s in the context of a generic national curriculum which had not existed in New Zealand prior to the *New Zealand Curriculum Framework* (Ministry of Education, 1993). Although the curriculum reform of the 1990s was viewed by the Ministry of Education as having employed widespread consultation that had occurred during the late 1980s, and included consideration of what students needed to learn by way of knowledge, skills and attitudes, it was very tightly controlled politically. There was limited teacher involvement in its development (Fancy, 2004). Policies emphasised the raising of standards, attainment levels, and the notion of progression. The curriculum was set out in terms of expected learning outcomes as opposed to including descriptions of what to teach; this represented a major shift in thinking. Howard Fancy has outlined the framework as follows:

Table 2.1: The Framework for the New Zealand National Curriculum (Fancy, 2004)

	Principles The set of fundamental principles which underpin the national curriculum	
Essential Learning Areas The essential knowledge and understanding to be experience by all learners	***National Curriculum Objectives*** The clear learning outcomes to be achieved by all learners in the basic and other subjects	***Essential Generic Skills*** The essential skills and qualities to be developed by all learners
	Assessment Classroom and national assessment procedures arising from the national curriculum	

The following extract from the *Zealand Curriculum Framework* (Ministry of Education, 1993) is of particular relevance to this study:

> *The term "curriculum" has several meanings, depending on the context in which it is used. This document makes particular reference to the New Zealand Curriculum and to the school curriculum.*
>
> ***The New Zealand Curriculum*** *comprises a set of national curriculum statements which define the learning principles and achievement aims and objectives which all New Zealand schools are required to follow*
>
> ***The school curriculum*** *consists of the ways in which a school puts into practice the policy set out in the national curriculum statements. It takes account of local needs, priorities, and resources, and is designed in consultation with the school's community. (p.4)*

The set of principles, as shown in Table 2.1 give direction to the curriculum in New Zealand schools, the idea being that they reflect and support New Zealand's identity (Ministry of Education, 1993). There are eight principles in all and their headings are as follows:

- *The New Zealand Curriculum establishes direction for learning and assessment in New Zealand schools.*

- *The New Zealand Curriculum fosters achievement and success for all students. At each level, it clearly defines the achievement objectives against which students' progress can be measured.*

- *The New Zealand Curriculum provides for flexibility, enabling schools and teachers to design programmes which are appropriate to the learning needs of their students.*

- *The New Zealand Curriculum ensures that learning progresses coherently throughout schooling.*

- *The New Zealand Curriculum provides all students with equal educational opportunities.*

- *The New Zealand Curriculum recognises the significance of the Treaty of Waitangi.*

- *The New Zealand Curriculum reflects the multicultural nature of New Zealand society.*

- *The New Zealand Curriculum relates learning to the wider world.*
  (pp.6-7)

Of particular interest and in line with the definition of s*chool curriculum* is the third bullet point, which gives teachers and schools the professional freedom to design their programmes according to how they may best serve their students' learning needs.

The NZCF[2] requires all schools to provide seven essential learning areas. These are: language and languages; mathematics; science; technology; social sciences; the arts; and health and physical well-being (up to and including Year 10). These became the new curriculum statements, with technology being quite different and extending beyond the workshop, textiles and food areas it replaced (see Section 2.4). Each curriculum area was also made available in the Māori language.

Further to this, the NZCF specifies eight groupings of essential skills to be the focus of student learning throughout their years at school. These skill groupings are communication skills, numeracy skills, information skills, problem-solving skills,

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[2] *New Zealand Curriculum Framework* (Ministry of Education, 1993)

self-management and competitive skills, social and co-operative skills, physical skills and work and study skills.

> *The curriculum will challenge all students to succeed to the best of their ability. Individual students will develop the essential skills to different degrees and at different rates.* *(p.17)*

Details of these skills groupings can be found on pages 17-20 of the NZCF.

The framework includes *attitudes* and *values* as an integral part of the New Zealand Curriculum. In this context the attitudes are referred to as the feelings or dispositions towards things, ideas or people, and the intention is to foster positive attitudes to learning. Values are referred to as internalised sets of beliefs or principles of behaviour and it is intended that the curriculum will reinforce commonly held values of individual and collective responsibility which underpin New Zealand democratic society (p.21).

The following figure shows the structure of the above descriptions and how they are positioned in relation to each other.
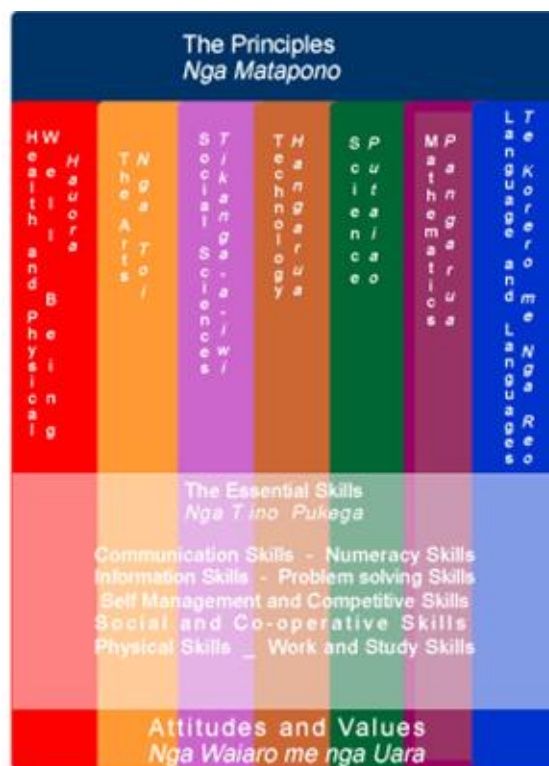
National curriculum statements specify
clear learning outcomes against which
students' achievement can be assessed.

Figure 2.3:   The New Zealand Curriculum Framework
(Ministry of Education, 1993. p.5)

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2.4   Technology in the New Zealand Curriculum

In 1993 the New Zealand Ministry of Education released the proposals for the new curriculum on the grounds of pedagogic, motivational, cultural, environmental, economic and personal development (Jones, 1998). The implementation of a new curriculum was not intended as vocational training but as a vehicle to engage all students in an intellectual and practical way, with a status equal to other subjects in the school curriculum. At this time there was very little published work on students' learning of technological concepts and processes. However, it was acknowledged (Burns, 1992; Jones, 1998) that students' and teachers' concepts of technological knowledge and processes would impact on the way that technological practice was undertaken. For example, if a teacher had a concept of technology as a "craft" then learning may be seen in terms of a progression of isolated skills. If students had narrow concepts of technology, their technological practice would be constrained. Similarly if there was an emphasis mainly on the process of technology, as opposed to an equal emphasis on technological knowledge and its place in society as well, student performance in technology would be limited.

It had also been seen necessary for New Zealand to grow away from the traditional colonial influence of Britain, and so a technology curriculum was developed which is more in line with the New Zealand cultural context. A ministerial task group set up in 1991 by the Ministry of Education to review science and technology education recommended that resourcing and teacher training for technology education be adequate, and that the technology curriculum be developed in New Zealand with an inclusiveness approach which includes Māori input and the use of Māori language (Ministry of Research, Science and Technology, 1992).

The Ministry of Education contracted the Centre for Science, Mathematics and Technology Education Research at the University of Waikato to develop a policy framework for technology education in New Zealand. The contract required that:

> *...there be wide consultation; best practice be taken into account, nationally and internationally; it be consistent with other government policies in education; it take account of teacher resources, teacher change, teacher development and qualifications frameworks.* (Jones, 2003, p.87)

Technology education was introduced in draft form in 1993 and sent to all schools and community organisations. In 1995 a revised form was approved and introduced to New Zealand schools as a new essential learning area to accompany the other more established learning areas. According to the Ministry of Education it was a response to fears for the national economy and the idea that a skilled workforce was needed (Fancy, 2004). It was the first new curriculum area to emerge in this country since the introduction of the technicraft subjects such as workshop craft and home economics, which had been introduced in the 1980s. Technology was "new" in that it presented new ideas about learning and it was a recent addition to the *New Zealand Curriculum Framework* (Ministry of Education, 1993). Its introduction was part of the global move towards a model of technology education that prepares students to succeed in a rapidly changing society. The then Secretary for Education, Maris O'Rourke, included this idea in the Foreword for the *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) statement:

> *The Minister of Education requested the development of the technology curriculum in 1991, as part of a broad initiative aimed at improving student achievement. The development process initially involved a policy development phase which included scrutiny of technology education developments occurring in many other countries. This was followed, in 1993, by the development of a draft statement which was circulated to schools and interested groups for comment and discussion. This final version takes into account the many responses that were received to the draft statement, as well as experience from school trials and pilot teacher development programmes.* (Ministry of Education, 1995, p.5)

2.4.1   Technology in the New Zealand curriculum – What is it?

The new emphasis in technology proposes that the "know-how" (capability/skills) is developed to include "know what" (knowledge about technology) and "know why" (an examination of the relationship between society and technology). These three aspects, when integrated into learning activities, provide for technological practice, which it is claimed in the *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) document, will lead to technological literacy.

In order to develop an idea of how the technology curriculum was presented to teachers, it is perhaps helpful to view the comparison between the 1995 document and the workshop craft (1986) syllabus, which was included in a book published for teachers to use as a support for their implementation of the technology curriculum.

Table 2.2: Characteristics of technicraft and technology (Ministry of Education, 1998, p.8)

Technicraft	Technology
✍ Teaching and learning based on the syllabus *Workshop Craft: Forms 1 – 4 (1986)*	✍ Teaching and learning based on the achievement objectives of *Technology in the New Zealand Curriculum (1995)*
✍ Teacher provides students with a brief for making a product	✍ Students and teacher negotiate the design brief in response to an authentic need or opportunity
✍ Students usually work on the same project, developing individual solutions to design problems	✍ Students work on a range of projects and often develop design solutions in groups or teams
✍ Teacher often predetermines the materials required	✍ Students and teacher work out the materials required
✍ Teacher has the necessary technical skills and expertise	✍ Input and expertise can be sought from within and outside the school
✍ A practical design-and-make emphasis	✍ A focus on both intellectual and practical skills
✍ Classroom activity usually teacher-directed	✍ Classroom activity mostly student-centred
✍ Teaching and learning often product focussed	✍ Teaching and learning focused on the processes involved. Problem solving and planned solutions determine quality of finish required
✍ Assessment based on the syllabus, objectives of design, craftsmanship, related studies, and attitudes	✍ Assessment based on the achievement objectives of the technology curriculum

A comparison such as this must be viewed with caution, as it represents a polarised form of argument (see Hall, 2005, p.257, for a discussion of the danger in this form of argument).   The Ministry of Education, on behalf of the New Zealand Government, invested time and resources in the curriculum review and the associated curriculum developments so it was important, therefore, for them to ensure that teachers embrace the new curriculum and implement it in the way it was intended. The comparison given in Table 2.2, while giving a simple, clear message, treats as

polar opposites features that are often overlapping. The language is persuasive, and the structure of the comparisons resembles techniques sometimes used in advertising and propaganda. In reality, classroom implementation of any syllabus or curriculum does not yield such clear-cut opposites.

Although there was an aim to make this curriculum area unique to the New Zealand context, Jones (1997b) acknowledged that technology as a new essential learning area was written from policy guidelines developed by a team of people who were informed by international trends. Its theoretical framework was based on research and evidence gathered from other countries in terms of their experiences in implementing technology education. This is reflected in the following description of the technology curriculum given by Fancy (2004):

> *The technology curriculum, for example, emphasised the need to develop an understanding about how technology both shapes and is shaped by society. It links to areas that are critical in a modern economy such as information and communication, electronics, bio-technology, materials technology, design and graphics. It represented a substantial lift in academic content from the much more practically orientated technical subjects previously taught. (Fancy, 2004)*

In order to clarify the nature of the curriculum as a focus of this study an outline of the structure of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) is presented at this point. The curriculum is made up of three strands as shown in Figure 2.3. Each strand contains important achievement objectives relating to the curriculum. The purpose of these strands is to have the students experience, and become proficient in, technological practice, thus leading to their technological literacy. Technological practice was therefore conceived as being achieved when aspects of the three strands are integrated into a unit or activity. These units or activities are designed to sit within one or more of the seven technological areas of the curriculum, and these in turn sit within relevant contexts. The seven areas cover:

➢ Biotechnology

➢ Electronics and control technology

➢ Food technology

➢ Information and communication technology

- ➤ Materials technology

- ➤ Production and process technology

- ➤ Structures and mechanisms

Appendix 1 shows this in detail.

The curriculum also contains suggested learning and assessment examples.
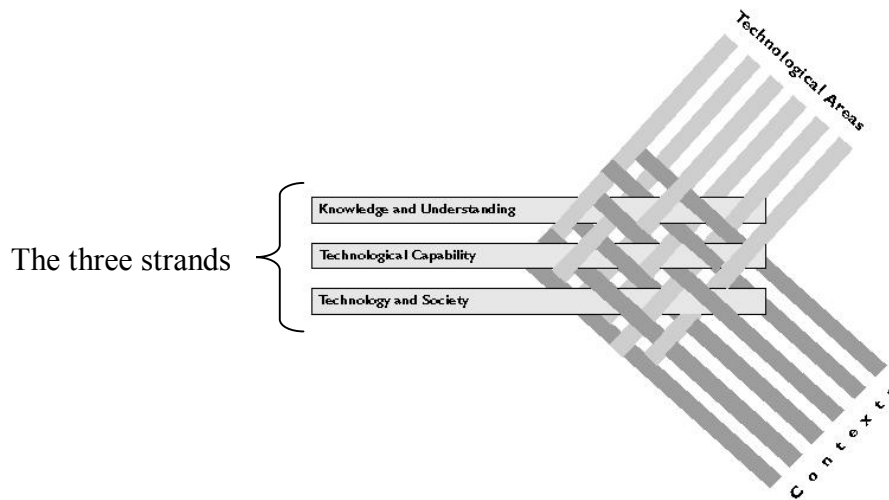
Figure 2.4: The intended integration between strands, areas and contexts
(Ministry of Education, 1995, p.13)

2.4.2 How schools implement the curriculum

Many secondary schools have applied labels related to technological areas in the new curriculum, for example, food technology, soft materials technology, hard materials technology, and information and communications technology, and offered them at Years 9 and 10 as part-year courses; however, these developments have not necessarily resulted in changes to the content and approach within the walls of the classroom (Jones, 1997a).

At this point I will draw on personal reflection in terms of the above. The present study responds to a situation that has been apparent to me as a teacher educator since 1999 when implementation of the technology curriculum became a legal requirement for attending school Years 1 – 10. My enthusiasm at that time for what I viewed the curriculum to be promoting, namely, open-ended problem-solving, design, and creative and critical thinking, had, until recently, outweighed any desire to stop and observe what was actually happening in schools. However, my more recent observations indicate that many secondary school teachers, with similar enthusiasm

for the subject, have encountered difficulties in trying to implement the new technology curriculum in a way that facilitates learning for technological literacy. The problem appears to be that teachers' concepts of technology education are varied and do not fully align with the intentions of the new curriculum; this in turn has a big impact on how students perceive the subject (see, for example, Jones, 1997a). In addition, it appears that some teachers have interpreted the technology curriculum as meaning a continuation of traditional technical education; possibly because their understanding of what it really is about has not had the opportunity to develop. There appears to be a mismatch between the intended and interpreted curriculum. This research will shed light on whether this is the case and indicate, to some extent, whether the interpretations are uniform or widely varied.

It should be noted that the curriculum document is designed not to be explicit in directing teachers what to teach (Smits, 1998). It moves away from developing a body of prescribed knowledge and skills, into an open-ended approach that is guided by identified needs and opportunities. Many teachers prefer to have set criteria on what they are to teach, despite the fact that technology education is broad and dynamic and ever-changing. With many interpretations of technology and technological practice, it is not entirely realistic to expect a common understanding of what technological literacy really is and how students can develop this literacy.

Within the environment of implementing new curricula, particularly technology, assessment has played a key role in how teachers define their approaches to technology education, particularly at senior secondary level. Technology-related subjects have been traditionally viewed as vocational courses for those students with less academic ambitions. Since the mid-1990s, New Zealand has been moving towards a standards-based national schools qualifications system. The qualification reforms placed emphasis on preparing all students for a working life and other pathways through the education system. In the senior secondary school the *National Curriculum Framework* (Ministry of Education, 1993) and *National Qualifications Framework* (New Zealand Qualifications Authority, n.d.) overlapped for the final three years of school. These new frameworks were intended to make available within programmes of learning, clearly defined standards, known as unit standards. The intention had been to eliminate the divide between academic and vocational qualifications and allow for multiple pathways and

programmes of study and learning. The aim was to develop a seamless education system identified by the then Minister of Education, Dr. Lockwood Smith, in the following way:

...this new policy initiative would maximise participation and achievement in education and training, from birth throughout life and [barriers] [will] no longer exist between schools and post school education and training; all courses will lead to national qualifications regardless of the place of study. (cited in Lee & Lee, 2000, p.6)

According to Fancy (2004), this was a very ambitious and sophisticated reform and divided secondary school sector personnel between those who supported standards-based assessment and those who wanted a continuation of the traditional ranking systems. (This is again an example of the polarisation of positions as noted earlier by Hall (2005), and misrepresents the views of many critics of the current secondary school assessment system.)

In the late 1990s a new approach named the National Certificate of Educational Achievement (NCEA) was developed that was still standards-based but replaced the competency framework of unit standards by a graded system of achievement standards. This approach took three years to develop and was introduced into schools in 2002 for Level 1 (Year 11 students) to replace School Certificate. This resulted in many teachers in the area of technology having to finally adopt at least some of what the technology curriculum requires. Since 2002 with the implementation of further NCEA levels, the pressure on teachers of technology to conform has increased. However, some schools offer a combination of achievement and unit standards in technology whilst others offer either achievement standards or unit standards only. The question that arises is whether the teaching of unit standards on their own, or alongside achievement standards, is a major factor in some schools still delivering traditional pre-technology curriculum subjects. The important point to note is that unit standards in technology often fit more closely with industry training requirements than the current achievement standards.

Curriculum is not designed and implemented in isolation of its social setting; the way it is interpreted and implemented varies with context. Ownership of the curriculum is difficult to define because there is a range of stakeholders in society who have influence in what is taught (Brady & Kennedy, 1999). McGee and Pennington

(2001) conclude that classroom interaction is the medium through which teachers perform their roles. They play a major role in curriculum implementation as they mediate between official curriculum requirements and their own views on what they decide students need to learn. Cornbleth (1990) sees curriculum as what actually happens in classrooms; it cannot be understood or changed without attention to the context within which it is shaped. This brings to attention the school structures and the social relationships of the school, the nature of the student-teacher relationships, and the organisation of the classes. These elements are sometimes referred to as the hidden curriculum. Kelly (1999) offers a standard definition of the hidden curriculum as:

> *...those things which students learn because of the way in which the school is planned and organised but which are not in themselves overtly included in the planning or even the consciousness of those responsible for the school arrangements.* (p.8)

In other words, such routines as the use of bells and timetables can sometimes be interpreted as preparing young people for the routines and structures within an industrialised world. However, if the idea of curriculum in context is acknowledged, then the existence of a hidden curriculum can be made overt, if not redundant.

> *...no one is neutral when it comes to the curriculum.* (Brady & Kennedy, 1999, p.9)

As mentioned above, there is a range of stakeholders in the curriculum and their existence is important as they interpret curriculum in different ways. Brady and Kennedy outline who these stakeholders are and how they interpret curriculum. The governments' interests, as outlined earlier, appear to have a strong economic impetus. They want their future citizens to have the ability to contribute to their nations' economy. They also want a socially cohesive community, naturally in support of them and their policies. The business sectors share this economic interest as they need workers who are skilled, literate and numerate. Universities also have an interest as they can influence how the curriculum provides school leavers with pathways into tertiary education. Parents have aspirations for their children which tend to be vocational but also they want them to be able to cope and do well in life. The focus of this study, however, looks at the stakeholders most closely associated

with curriculum and these are the students and teachers. The students are a part of a changing and evolving culture which is often at odds with the world of adults. The curriculum for them needs to meet their aspirations or some of them may well become disengaged, as identified within the National Education Longitudinal Study in the United States (U.S. Department of Education, 1988). In this research, a sample of students enrolled in the eighth grade during the spring of 1988 provided trend data about their experiences as they attended school and started careers: curriculum engagement was a significant factor for some of the students.

In relation to the influence of teachers (as stakeholders), it is possible that they, rather than students, are more likely to be disposed to academic interpretations of the curriculum rather than vocational. They are the mediators for the curriculum. This can be a challenge nowadays with greater emphasis in preparing inclusive classrooms capable of catering for diverse learners. Brady and Kennedy (1999) identify several orientations and functions of the school curriculum:

> *The Cultural – to ensure the foundations of society are transmitted to next generation.*
>
> *The Personal – to provide for intrinsic needs of individual and groups*
>
> *The Vocational –to equip students with necessary knowledge & skills to participate actively in work.*
>
> *The Social – to enable society to function in an harmonious way for benefit of all.*
>
> *The Economic – to ensure the productive capacity of individuals and nation as a whole is considered - human capital theory.* (p.8)

In 1999 when technology education became mandatory for Years 1 – 10 within the *New Zealand Curriculum Framework* (Ministry of Education, 1993), teachers were dealing with new curriculum documents for traditional subjects but this particular curriculum area was itself very new. Although some professional development and support was available, many teachers implemented technology into their classrooms without a full understanding of what the curriculum was about. Davies (1998) outlined some of the resourcing and professional development initiatives that were funded by the government; however, many teachers did not get access to this, possibly due to lack of information, opportunity, or recognition of need. Jones and

Carr (1993) highlighted the different teacher perceptions of technology as being directly related to the subcultures that they worked in as well as their own background experiences. Jones (1997b) later indicated how these subcultures within schools' and teachers' experiences did indeed influence how the technology curriculum was interpreted and developed at this point.

> *An imposed curriculum that does not take account of the existing ideas of teachers, and the realities of the school could be distorted in such a way as to threaten the improved learning that could take place.* (p. 48)

In view of this situation – in terms of the nature of the curriculum, teacher perceptions of technology and technology education, school structures and subcultures – the implementation of technology into schools has involved diverse approaches and understandings. The development of support resources and access to professional development were slow in coming, especially at senior secondary level where the national assessment structures were also beginning to be reviewed. Examples of good practice in technology in a New Zealand context that teachers could use as reference points were not in existence, so interpretations of what constituted good practice were varied. Added to this, understandings within school management and subsequent programme structuring and resourcing have influenced teachers' responses to the curriculum. Stables, a reader in design and technology education at the University of London, made a plea in her keynote address at the Technology Education New Zealand (TENZ) 2001 conference in Wellington for a more explicit balance in local curricula to foster the development of both the capability and literacy priorities of technology education. She quoted Smits (2000, p.184) suggesting that technological practice, as referred to in *Technology in the New Zealand Curriculum* (Ministry of Education, 1995), does not necessarily foster a critical literacy, as practice is a narrower concept than literacy. This suggestion raises the question of whether critical literacy in technology is being addressed in schools at all. Do teachers of technology have a common idea of what technological practice is and do they know of a relationship between technological practice and technological literacy? If not, then a response to Smits' idea is difficult.

According to Davies (1998), $22 million had been spent on professional development activities in technology education since 1994. This mainly funded school advisors and teacher development contracts that came out of the colleges of education around New Zealand. Davies suggests that the uncertainty of continued

funding encouraged a "culture of compliance" among providers (p.132). However, contracts were extended to 1996 and 1997 to train technology education facilitators. Ministry of Education resources for schools were also developed, mostly with a Year 1 – 8 focus, in support of the *Technology in the New Zealand Curriculum* statement (Ministry of Education, 1995). The professional development that was offered seems substantial as described here, but it is still not clear if many technology teachers received the support that they felt they required in terms of setting up technology education programmes in their schools; there is an absence of evaluation data on this point. If the support was insufficient, other factors may have been involved, such as internal school management decisions and possibly the level of understanding of school senior management personnel of what technology education is really about and the level of resourcing it may require.

As part of this study, then, it is important to learn what really is in the minds of technology teachers as they set about planning their programmes and how the curriculum is used. For example, do their pedagogical approaches focus on developing divergent, creative and critical thinkers and learners, or do they think of managing their classes in a manner to achieve that which they perceive students need to move ahead in the world today? Such goals may overlap but they are not identical.

The New Zealand Education Review Office (ERO) (2001) describes the concept of technology education in the curriculum as reflecting a growing international body of research on this model. Kimbell (1997) investigated four case studies of technology education in Germany, USA, Taiwan and Australia in 1985 and identified four stages of curriculum development: 1) local innovation; 2) central support for professional development; 3) turning the innovation into a formal requirement; and 4) teachers' adoption of the new practices. Kimbell believes the first and final stages require teacher autonomy, whereas the middle stages require central support.

The distinguishing factor for technology, though, in these countries as well as in New Zealand, is that it is not based on past subjects, although it is possible that the earlier technical subjects are still what is being modelled in some schools now, with a new label. Prior to the new curriculum, the technical subjects focussed on skill development and using materials to make things. When the technology curriculum

was introduced, the teachers of these technical subjects were required to shift their thinking, their approaches, their planning and teaching. A distinction between the New Zealand technology curriculum and the overseas technology education models is that the New Zealand model may provide a stronger focus on society (in Strand C of the curriculum). This strand covers the way people influence and drive technology, and how technology affects people (Brown, Collins & Duguid, 1989; Lave & Wenger, 1991; Rogoff, 1991). Most models in other countries focus largely on the "design and make" component dealt with in the New Zealand curriculum within Strand B, the capability strand. Davies Burns[3] (1998) also discusses similarities and differences between Australian, New Zealand and British curriculum statements. Although differences are apparent, statements have a common thread in aiming to develop students' problem-solving skills.

The legislation for the national curriculum of England and Wales preceded and influenced the development of both the Australian and New Zealand technology curriculum statements. The apparent distinctive aspect of the New Zealand technology curriculum, as referred to in the previous paragraph, was that it raised the profile of the relationship between technology and society, and the recognition and acceptance of this is still developing. In the classroom, critical analysis of stakeholders' positions and the study of technological developments in social contexts is required. There is a need to shift from the technical or vocational training approach to a focus on technological literacy, that is, there is a need to move from craft and skills-based technology to the idea of using authentic situated contexts to allow students to develop the cognitive skills as intended. But is it happening? This study intends to investigate this question.

Critiques of the technology curriculum exist. For example, Jolley and O'Neill (2001) see technology as "training" students for the commercial sector. These authors suggest that the content of technology is politically contentious, thus opening up the whole debate on curriculum in general. They cite Habermas (1971) and his description, the "hegemony of technocratic rationality" in describing the political and social purposes underlying the technology curriculum. They see the technology curriculum as supporting cultural capital in that it "legitimizes the political and economic system through the education and socialization of our children"

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[3] Burns, Davies Burns, and Davies are all the same author

(Habermas, 1971, p.5). Jolley and O'Neill (2001) argue that students are educated to be consumers and producers in the economic system, to value democratic political values, and to assume that a free market economy is of greatest benefit to culture and society.

2.4.3   Teacher views of technology

The transition from a traditional subject-centred, skill-based teaching approach has proven difficult for secondary schools and teachers.   In a study conducted at Auckland College of Education in 1996, eighteen secondary graduate technology student teachers were tracked during their year of training and ten of them into their first six months of teaching (Mawson, 1998a).   The research focused on their personal experiences and development as teachers, and the efforts their schools were making to prepare for the new technology curriculum.   The findings from the research were intended to offer strategies to advance the introduction of technology into secondary schools.   A number of the student teachers who went on to teach found classroom management in a workshop an issue and they had to impose strict, controlled classroom regimes.   The assessment of process in technology proved difficult for some.   The initial enthusiasm and idealism was challenged by time constraints and the actual practice of teaching.   The study found that the theoretical grounding presented at the college of education did not reflect the reality of the classroom at that time (Mawson, 1998a).   One may ask if this is perhaps a generic phenomenon that is not curriculum specific.   However, technology education is unique in its newness as an essential learning area, thus providing additional challenges for teaching and learning.

In Mawson's study, during the time that the student teachers were carrying out their teaching experience in a range of schools, surveys were conducted to ascertain the degree of preparation for implementation of the (then) new technology curriculum. More often than not, there were negative sentiments and lack of preparation for its implementation, although within the sample there were some positive, proactive approaches.   Generally there was teacher resistance to the curriculum, and a compromise in making a few cosmetic changes to the existing programmes.

Trends reported in other countries reflect a broad spectrum of interpretations of what technology education and technological literacy really entail.   Since its introduction,

however, technology education has developed a range of meanings and usages. In the United States it is asked whether current technology education *practice* is reflective of a "new paradigm" or simply a case of old wine in a new bottle, as discussed by Sanders (2001):

> *The dynamic between change and legacy seems to characterize the field at this point in time; technology education is a work-in-progress.* (p.19)

Hansen and Lovedahl (2004) ask:

> *Are we attempting to prepare pre-service teachers to teach for technological literacy (rationale, structure, and standards) with teacher preparation programmes based on the traditional industrial tool use model?* (p.11)

They suggest that if teachers are not offered professional development to teach for technological literacy then their programmes will continue to focus on technical (tool use) competencies. They use the old wine metaphor as offered by Sanders (2001).

> *Are technology teacher preparation programmes putting the new wine of technological literacy into the old wineskins of industrial tool use programmes? Do we have the courage, wisdom, and foresight to examine our well-worn wineskins and then to decide that it might be time for new ones?* (Hansen & Lovedahl, 2004, p.11)

These questions are in line with this study, to identify if there is a need to critique technology teacher approaches at this stage, ten years into the implementation of the curriculum. Mawson (1998a) noted the following common aspects in secondary schools where progress was being made towards the implementation of the "new" curriculum:

> *acceptance that implementation was going to be a legal requirement so had to be dealt with;*
>
> *senior or middle management had involvement in the leadership for the implementation;*
>
> *planning process and unit development using a cross-curricular approach;*

staff development plan in place;

effort to involve parents and wider community;

rejected common arguments put up by schools resisting implementation. (p.4)

In their 2001 report on the *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) document, ERO confirms that teachers and students enjoy the problem-solving approach as endorsed in the capability strand, but that teachers generally plan units with pre-determined student outcomes so that the students are confined to fitting the teacher's plan as opposed to establishing and experiencing their own needs and solutions. Teachers may need more guidance as to what is really meant by statements in the curriculum that promote the interlinking nature of the three strands.

In relation to assessment, ERO also commented that teachers tend to assess skills as opposed to students' wider knowledge and understanding of technology. Where teachers have little knowledge of technology, they tend to use experiences from other subjects as reference points. The fact that many secondary schools do allocate different parts of the curriculum to different departments can limit student experience of authentic technology. Each technological area has its own technological knowledge and approaches (Education Review Office, 2001) and this provides a challenge for teachers. The risk of dilution, or assimilation of the curriculum area as a whole, highlights the argument against allocating different technological areas to different departments. Added to this, the approaches used within the information and communication technological area often do not address technology education at all.

Black and Atkin's (1996) international study of innovation and change in education, describing twenty-three projects in thirteen OECD countries, concluded that teachers have to find their own ways of incorporating innovation into the existing patterns of their classroom work if substantial change is to happen. This may suggest that there is a contradiction in terms of how the technology curriculum may be interpreted and whether the multiple approaches to teaching technology create a tension at all. In this respect, McCormick, Murphy and Hennessey (1994) have noted that there can be problems where the design or problem-solving cycle is over emphasised. This cycle

assumes that students are able to access and use knowledge from across the curriculum and integrate it into the design process. The design process has also often been taught and understood in a linear way such that students may have problems with transferring technical skills to solve technological problems because the students are taught in isolation from the tasks to which they need to be applied (Jones & Carr, 1995).

The technology curriculum requires teachers to have understanding of technology pedagogy as well as technological knowledge. They also need to know what comprises authentic technological practice:

> *...students' technological experiences should reflect the interlinking nature of the strands.* (Ministry of Education, 1993, p.35)

However, teachers tend to focus on "doing" technology (procedural knowledge) as opposed to also dealing with conceptual knowledge inherent in technology (Education Review Office, 2001). Another tension arises for teachers who have experienced a range of previous "successes" with their pre-technology curriculum, skills-focussed, teacher-directed approaches. They are reluctant to give up control in terms of the direction an activity may take. Where authentic contexts are used and students come up with their own solutions, the activity can divert away from what has been initially envisaged (Bondy, 1999). This open-ended, student-centred approach may be a challenge for some teachers, particularly those who may want to continue to manage their resources and students in a manner that they believe has worked for them in the past. In addition, Davies (1998) draws attention to the impracticalities of carrying out open-ended technological activities with classes of over thirty students.

Turnbull (2001) discusses the confusion amongst teachers about the meaning of "authenticity" in terms of whether technological problems need to be authentic to students or to the nature of the technological practice. Research has shown that if learning is situated in authentic practice it is more likely to motivate students to achieve (Hill, 1998; Hill & Smith, 1998). McGrath (2003) reinforces the idea of authentic situated cognitive settings but highlights the difficulties many teachers have, particularly in secondary schools, because they lack the skills to make the transition from their traditional mode of teaching. They are not accustomed to

facilitating constructive knowledge. Students cannot be expected to embrace such learning that stems from the technology curriculum until teachers embrace the theory.

Treagust and Rennie (1993) report on an evaluation of approaches and programmes used to implement technology into secondary schools in Western Australia. A variety of approaches was used. The evaluation identified three factors vital for successful implementation by schools. The first factor supports the idea of someone co-ordinating the time and resources to oversee and monitor what is happening in the school. Secondly, reports show that well-documented and clearly-set goals and progress are needed to keep all staff informed. Finally, time factored into planning is needed to allow staff to accept and action ownership of their classroom programmes and teaching strategies, as well as engaging in reflective practice in relation to student outcomes.

As a means of comparison, in a study carried out by Rasinen (2003), the technology education curricula of six different countries were examined. The countries of Australia, England, France, The Netherlands, Sweden, and the United States were chosen because they had developed their technology education programmes quickly in the last ten years. Rasinen concedes that although technological literacy is a universal goal, the content included in the curricula of the six countries is broad and extensive, making it very difficult to condense. The long-standing argument of breadth versus depth was clearly evident across all of the curricula, with the former being more prevalent than the latter. Since technology education does not have a long tradition, the standards of teaching varied widely (Rasinen, 2003).

International decisions show shifts in the definition of subjects (Ministry of Education, 2004). One of the innovations that was picked up as a frequent pattern was the introduction of a separate curriculum for technology and/or information studies. However, a question was also raised as a consequence of the introduction of these new curriculum areas: were they high or low stakes and what were the consequences for learning in them? Moreland, Jones and Chambers (2001) have identified that there are gains in learning in technology when teachers have a clear subject knowledge base. This is not just in terms of subject content in relation to

capability and how things work, but in terms of knowing about the nature of technology and what technology really means.

2.4.4 Creative and critical thinking

Further to knowing about technology, teachers can offer opportunities to foster creative and critical thinking. Ings (2001) argues the need for critical thinking as an integrated aspect of technology education because:

> *...we run the risk of producing consumers of technology, not discerning users. Are we intending to give our students skills in designing systems and products, without the ability to critically appraise the value of such developments?* (p.123)

He claims that currently in technology classes in New Zealand a critical approach is not as significant as it has been in senior school English classes. He notes that if the purpose of the curriculum is to develop certain qualities of thinking, then technology is the vehicle but is not the driver (i.e., the student); it is the driver who needs to develop theses qualities, such as making effective judgements. The metaphor of vehicle and driver is extended in that we as educators have the responsibility to teach students how to drive (p.127). In a later paper, in a subsequent discussion on creative thinking, Ings (2003) points out that creative thinking is often unable to develop at secondary school level as the environment is not able to be sufficiently flexible for this.

> *What we get is readable processing and solutions that have a high guarantee factor in terms of successful completion.* (p.3)

It may be that many teachers are likely to continue to teach in a manner where students are directed as opposed to driving their own directions, because the added responsibilities for senior assessment accentuate the need for successful completion of tangible solutions.

2.4.5 Student views of technology

The nature of technology and the implementation of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) have been critiqued here. At this point it is appropriate to also examine how the curriculum has been received or learnt by the

students. Research on this aspect especially at senior secondary level in the New Zealand context is scarce, hence the need to gather information regarding this; however, although this thesis gathers the views of students, the scope and analysis is limited due to the size of this study. *The Curriculum Project* (Ministry of Education, 2005) to be discussed later in this chapter, identified some responses from students and their views on technology. These responses emerged from face-to-face consultations with over one hundred intermediate and secondary students from a range of backgrounds. The results of the project highlighted that most of the students' comments about technology made reference to its potential or perceived disadvantages. In general, most students felt that technology is an increasing necessity in life, but with dangers. Student experiences and opinions of technology are important and must be considered alongside the literature and voices relating to intended and interpreted curriculum.

2.5   Curriculum stocktake

The *Curriculum Stocktake Report to the Minister of Education* (Ministry of Education, 2002) was begun in 2000 and was completed in 2002. It involved analyses of the New Zealand curriculum and Te Marautanga o Aotearoa in view of the current educational, social and economic climate; the purposes of these curricula; and how well they contribute to improved student outcomes, and how they compare to international curricula (Ministry of Education, 2002). The purpose of the stocktake was to inform an agreed direction and process for the ongoing development of the New Zealand national curriculum. The report used a range of findings taken from international studies and the National Education Monitoring Project reports.[4] It sought critical comment on *The New Zealand Curriculum Framework* (Ministry of Education, 1993) from international curriculum expertise, held meetings with teachers and principals, and also used data on teacher perceptions of technology curriculum implementation through establishing a school sampling study which used a 10% sample of all New Zealand primary and secondary schools. The following bullet points summarise aspects that particularly relate to technology in secondary schools and secondary school technology teachers (these are abbreviations of the Ministry of Education report):

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[4] The NEMP project aims to obtain a broad picture of the achievement and other educational outcomes of representative samples of students in New Zealand schools at Years 4 and 8. Each year, over a four-year period, different areas related to the curriculum are assessed (Ministry of Education, 2006a)

The traditional technological areas of food and materials technology have been the areas most developed in secondary schools.

Challenges facing teachers in implementing the technology curriculum relate to resourcing, equipment, finding time in a crowded curriculum, and coming to grips with the new curriculum and the terminology.

Food technology and materials technology were considered to be the easiest technological areas in which to provide experiences for students.

The amount of teacher knowledge was the most important factor influencing ease of providing technological experiences.

The largest group who wanted changes to the structure/organisation were secondary Year 9-13 teachers.

Secondary school teachers tended to place more emphasis on self-management and competitive skills, physical skills and work and study skills.

53.1% of secondary Year 9-13 teachers placed more emphasis on Strand B - technological capability.

"Practical tasks" were the method secondary teachers most often used for assessing student learning in technology.

Secondary students worked on individual projects more often than students at primary school level.

There was evidence of issues surrounding the changes that traditional home economics and wood/metal teachers have had to make. (Ministry of Education, 2002)

These summarised comments offer support for undertaking the current study in that they highlight some of the patterns that have emerged for secondary teachers of technology in interpreting and implementing the curriculum. As Jones (1997b) suggests, the development and implementation of technology can easily be undermined by misinterpretation. This links to previous discussion on technological literacy and teachers' interpretations of it. France and Davies (2001) raise the case that reflection on technological practice is impractical for students who have not had

the chance to develop a liberating technological literacy. A liberating technological literacy discourse examines values and beliefs of all participants, including the stakeholders, who are involved in the activity. Jones (2003) highlights the need for teachers to have developed a concept of technology coupled with awareness and understandings of technological practice if they are to implement successfully technology in their classrooms. The provision of authentic contexts for technological activities responds to this.

2.5.1 Curriculum project and futures in technology education

As this research intends to examine the existence of discrepancies between intended and interpreted curriculum in technology education, it is timely to also consider the Curriculum Project which followed the Curriculum Stocktake leading to the revised *New Zealand curriculum draft 2006-2007* (Ministry of Education, 2006b), a document that has been circulated for discussion and feedback. This draft built on the recommendations from the *Curriculum Stocktake Report to the Minister of Education* (Ministry of Education, 2002). The draft revision of the curriculum was developed through employing the knowledge, experience, and different perspectives of working groups, online input, and focus groups of working professionals in education associated with the curriculum. (As a point of clarification, *New Zealand curriculum draft 2006-2007* was circulated for discussion after the data collection for this thesis that is reported in Chapters 4 and 5; in fact, many of the details for technology were provided after the main document had been prepared.)

The evaluation of the technology curriculum, as part of the stocktake, identified "a general degree of satisfaction" (Harlow, Jones & Cowie, 2002, p.164) although a third of the sample wanted changes to the curriculum. These changes identified a need for a document that is easier to understand and a supply of clear assessment and learning examples to support teachers in their work. It should be noted that the Harlow et al. (2002) report cites statistics on categories of technology teachers' responses to questions relating to their experiences of implementation. However, information on how these teachers have interpreted the technology curriculum in the first place was not included. Literature cited in the current review for this thesis emphasises the multiple understandings and interpretations of technology and of the curriculum.

Of relevance to the Harlow et al. report, is later work undertaken by Compton and Harwood (2004). Their analysis of the research findings for two Ministry of Education funded research projects, which investigated approaches in assessment and progression, identified a lack of understanding amongst many teachers of assessment and progression of learning in technology. On the positive side they noted that technology has often centred on contexts with learning outcomes that link to the essential skills. However, this has been done with no clear sense of progression in technological learning. Compton and Harwood therefore set out to identify the key features of learning in technology so that progression could be recognised by teachers and students alike. The results of this work significantly contribute to the technology curriculum achievement objectives that have been made available as part of the *New Zealand curriculum draft 2006-2007* (Ministry of Education, 2006b). The achievement objectives for the draft curriculum are presented in the form of a matrix which has the eight levels of the curriculum represented by columns and the strands of the curriculum by rows. The strands consist of *technological practice, the nature of technology,* and *technological knowledge.* Technological practice encompasses three components of practice, thus taking up three rows of the matrix within this strand. The components are: *planning for practice, brief development,* and *outcome development and evaluation.* The strand dealing with the nature of technology takes up two rows covering *characteristics of technology* and *characteristics of technological outcomes.* The third strand, technological knowledge, takes up three rows covering *technological modelling, technological products,* and *technological systems.* Within each row at each level, is an achievement objective, the intention being that they show progression as the levels increase across the columns.

From the perspective of the research for this thesis, it will be of interest to note the extent to which the issues that contributed to the stocktake and the consequential draft technology curriculum, are evident in the analysis that is provided in Chapters 4 and 5.

The indicators of progression within the technological practice strand have been trialled in a number of whole-school settings and by a number of other individual teachers, thus allowing for the development of key features of technological practice at increasing levels of sophistication. Compton and Harwood (2004) argue that the components of practice will support the development of liberatory technological

literacy (Davies Burns, 1998; France & Davies, 2001; and Compton, 2004), enabling students to apply technological practice to a whole range of needs and opportunities they may encounter.

From evidence gathered earlier from research on teachers' and students' concepts of technology and their subsequent practice, Compton and Jones (2004) also argue that the *nature of technology* needs to be included as a strand in the revised technology curriculum. The research indicates that broader understandings about technology lead to a positive impact on technological practice. The focus of this strand would have students developing an understanding of the significant qualities of technology as a human endeavour and exploring historical and contemporary developments in technology:

> *...and understanding them in terms of social, cultural and environmental impacts and implications.* (p.4)

Another area of focus in this strand would be the impacts and influences on technological development.

It should be noted that the point of the discussion has been simply to describe the influences that have led to the draft statement (the matrix) for the technology curriculum, not to provide an in-depth critical analysis of the matrix. In a sense, the circulation of the document for comment is needed first. However, it would be surprising if critical comments were not received about some features of the matrix. For example, under "planning for practice" the "Level Seven" and "Level Eight" objectives state:

> *Level Seven:*
> **Planning for Practice**
> - *Critically analyse their own and others' past and current planning and management practices in order to develop and employ project management practices that will ensure the effective development of an outcome to completion.*

Level Eight:

Planning for Practice

- *Critically analyse their own and others' past and current planning and management practices in order to develop and employ project management practices that will ensure the efficient development of an outcome to completion.*

<div align="right">(Ministry of Education, 2006b)</div>

The only difference between the two levels is that at Seven, students must be "effective" and at Eight "efficient". One could easily argue that "effectiveness" subsumed "efficiency", not the other way around, but more importantly, such a difference hardly identifies "progression" that is easily interpreted by teachers.

The *Curriculum Stocktake Report to Minister of Education* (Ministry of Education, 2002) established that achievement objectives (at the legal level) do not have a lot of relevance in the classroom, so one of the aims of the curriculum project was to look for a resemblance between the intended curriculum, taught curriculum and learnt curriculum. ERO (2001) have identified some of the discrepancies between the intended curriculum and the taught curriculum in technology, with the reasons linking either to teacher knowledge of technology and pedagogy, or to school structures. Teacher knowledge of technology, technology education, and technology pedagogy is crucial for successful implementation. Not only this, teachers also need to take a holistic approach in assessment rather than assessing isolated aspects. They tend to overlook the assessment of students' overall ability in technology and focus on their skills, often in isolated contexts. At the school administrative level, many school structures tend to plan all curriculum overviews and programmes in the same way. The technology curriculum requires its own distinctive approach (ERO, 2001). Each technological area has its own technological knowledge and at secondary level many schools allocate these areas to different departments so that there becomes a risk that the content will be subsumed by the other subject approach.

Curricula are "experienced", "learned", and "internalised" by students (Harland, 1988). Curriculum reform aims for reflection and change at all the different levels of curriculum: intended ("planned"), taught, and learned ("internalised") (Ministry of

<div align="center">46</div>

Education, 2002). The goals are to clarify and refine outcomes, focus on quality teaching, strengthen school ownership of curriculum, and support communication and strengthen partnership with parents and communities. These aims provide contextual background for the current research, although as mentioned, the data reported in Chapter 4 were collated before the most recent curriculum initiatives.

2.6 Some definitions

As the previous sections indicate, clarity of understanding of key notions in technology is generally lacking, at least in the sense of common interpretations. For this research, the following definitions have been adopted (and derived) mainly from the literature reviewed in the previous sections.

Technology:

This definition draws upon, in particular, Burns' (1997, p.15) view that technology is *the means by which human beings have sought and provided for their survival and enjoyment of life on this planet* thus arguing that technology is more than a product. It also involves the processes required to develop products, systems or environments.

Technology education:

This draws on the technology curriculum document (Ministry of Education, 1995) where technology education is introduced as being *a planned process designed to develop students' competence and confidence in understanding and using existing technologies and in creating solutions to technological problems* (p.7). This introduction further states that technology education contributes to the intellectual and practical development of students as individuals and as informed members of a technological society.

Technological practice:

This term refers to the integration and incorporation of aspects selected from all three technological learning strands as set out in the technology curriculum. These three strands are as follows:

Technological knowledge and understanding:

The technology curriculum describes conceptual technological knowledge, and procedural technological knowledge. The conceptual knowledge refers to an awareness of the existence of a particular technology and the principles underpinning how it works. Procedural knowledge involves knowledge of how to use technologies.

Technological capability:

Is the practical application of knowledge and ideas to develop technological solutions.

Technology and society:

Considers the relationship between people/society and technology and vice versa. It builds on the premise that no technological activity or outcome is value free.

Technological literacy:

Technological literacy is a culmination of the three strands into technological practice and is a person's ability to competently undertake and understand technological practice within authentic contexts. This definition is derived from Compton and Jones (2003) and is consistent with the Ministry's intention: *The aim of technology education is to enable students to achieve technological literacy* (Ministry of Education, 1995, p.8).

2.7   Conceptualisations of the intended and interpreted curriculum

As already noted, this study intends to investigate the relationship between what has been intended with the implementation of the curriculum and what is actually interpreted and practised. Such an investigation needs to be grounded in the historical context of why and how technology education has become either a new or revamped curriculum in many countries, as this chapter has outlined. The rationale and history of its implementation into the New Zealand education system also has been examined so as to provide the study with a theoretical foundation. A theory-practice discrepancy depends on different interpretations of what technology is (as noted by Treagust & Rennie (1993) in their examination of the implementation of technology education in six different

schools in Australia). Perceptions of technology influence exactly how the intended curriculum is interpreted and what decisions are made on resourcing and implementation. The intended curriculum is the curriculum that the designers intended to be received and implemented. It is often referred to as the *written* or the *official* curriculum for schools and is usually developed under the direction of people in positions of political power at the time. Definitions of technology range from a practical view where technology is seen as the application of scientific and other knowledge to practical tasks, to a wide view such as that found in the introductory page of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995).

> *... a creative, purposeful activity aimed at meeting needs and opportunities through the development of products, systems, and environments. Knowledge, skills, and resources are combined to help solve practical problems. Technological practice takes place within, and is influenced by, social contexts.* (p.6)

These different perspectives can be attributed at least in part to the idea that some people approach technology education from a vocational/industrial background and others from a liberal arts background. Similarly there are different interpretations of what is technological practice.

Since its publication, *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) has been implemented in schools in a range of ways, depending on teacher perceptions of technology, school structures, support and resources. For example, in his paper on the implementation of technology education in secondary schools, Mawson (1998b) concludes that barriers to the introduction of the technology curriculum into secondary schools have been reinforced by the rigid separation of subjects in most secondary school timetables, the overcrowded curriculum and the wide-ranging cross-curricular nature of technology. More significantly there also remains, among the secondary technology teacher workforce, a range of interpretations and understandings of the technology curriculum (Mawson, 1998b). If, as Jolley and O'Neill (2001) suggest, technology education is synonymous with vocational education due to the fact that it is sustained by an "economically instrumentalist rationale" (p. 4), the question can also be asked about the intent of the earlier syllabi for workshop technology and home economics and why female students were channelled into home economics.

Compton and Jones (2003) provide a different perspective from the "new right" interpretation of O'Neill and Jolley (1996). Instead Compton and Jones (2003) focus on technology teachers in terms of their belief in, and feelings of, ownership of this learning area. They argue that, ideally, students should be able to experience technological practice with a reflective and critical approach. In other words they need to become empowered decision makers. Compton and Jones reinforce the idea that technological literacy can be thought of as a person's ability to competently undertake and understand technological practice within authentic contexts. The notion of this as a liberating literacy is referred to by Davies Burns (1998), Davies (1998), and Compton and Harwood (2001).

One question mentioned in the introduction to this study, and earlier in this chapter, that many teachers ask is why the technology curriculum does not tell them what to teach (Smits, 1998). Compton and Harwood (2001) emphasise the need for technology to be implemented in an environment that both supports and sustains itself as a curriculum area through the attainment of a practitioner culture in which theory and practice are mutually valued. This practitioner culture is possibly what needs to be the point of focus. In trying to define the social, cultural and ethical contexts of technology, Custer (2000), although referring to an American context, stresses the need for technology educators to maintain a balance between the emphasis we place on teaching technical skills and our emphasis on broader social and cultural values and ideas. He suggests that social sciences and technology must not be separated and the best way to understand this relationship is to place them in a creative tension with each other. If the study of technology is treated as a separate subject, then there is the risk of ignoring technology's vital context. MacKenzie and Wajcman (1985) used the idea of society shaping technology as opposed to a common belief that technology shapes society. Technology sits within a social, political and economic context. Social groups influence directions of technological development which can be viewed as evolutionary and continuous. On a slightly different tack, Davies (1998) argues that the association of technology with *"hi-tech"* products – perhaps a manifestation of the belief that technology shapes society – undervalues non-Western technology. Further to this, it is my belief that we can learn much from non-Western approaches which have a closer co-operation and liaison with nature and our natural environment.

2.7.1   A theoretical framework

Research in this country and in others shows that the discrepancies between the intended curriculum and the implemented curriculum are reduced if the teachers' knowledge and understanding of the nature of technology and technological practice is clear, if they are well resourced, and if they are well supported by school management (Treagust & Rennie, 1993).   A broad range of issues has been recognised in relation to technology education in New Zealand at senior secondary level. Already referred to is the fact that there were thirty-seven approved subjects for entrance to university in 2004, but it was not until 2006 that technology was added.   At another level, technology education has not tried to mirror industry. There are industry unit standards for those students "training" for a vocation, but this has not been recognised as technology education within the *New Zealand Curriculum Framework* (Ministry of Education, 1993); it is seen as vocational training. Hammonds (2004) sums up this curriculum situation succinctly when he highlights Henry Ford's mass production ideas, namely that students, like a car production line, progress through a chain of sequenced curriculum events with little variation to account for individual needs.   He sees the need for schools to be transformed into new and evolving learning communities and for teachers to understand different roles.

Compton (2004) explores suitable categories for technological knowledge, using the rationale that our use of technological knowledge needs to be valued by the community. Technology education has an intrinsic value for individual and social development if it supports students in their development of technological literacy. Compton describes technological literacy as a person's ability to function in a technological society.   A movement to the liberatory technological literacy, as discussed earlier, is intended to foster critical, informed people in our society.

The examination of the literature in this review lays the foundations for the theoretical framework for this study. The framework sits beneath the umbrella of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995), which has developed from technology's perceived beginnings, its nature and its knowledge base, as discussed.   Also discussed, has been the evolution of the technology curriculum from the original conception of "technical education" to the wider conception of technology as developing within the New Zealand curriculum today.

The review has highlighted the distinction between the taught and learnt curriculum but the documentation (including research) on this distinction within the New Zealand context is far from comprehensive; this thesis focuses on the distinction with reference to the interpretation of the curriculum in four secondary schools.

A theoretical framework for examining the data in this research is provided in Figure 2.4. This figure shows a "top-down" flow which reflects the idea of a prescribed or intended curriculum. It also considers the idea of the distinction between the "intended", "taught" and "learnt" curriculum (Harland, 1988; Ministry of Education, 2002). The focus of this research is principally on the degree of alignment or mismatch between the intended and interpreted curriculum, which influences how technology is taught; to a lesser extent, the students' perception of the "received" curriculum is also examined, but with the main focus of shedding further light on how teachers have interpreted the curriculum.

Technology Curriculum

Government Policy

"Research informed"

Experience, Knowledge, Beliefs, Attitudes, Professional development

Intended Curriculum

School *policies, structures, resources, understandings, perceptions, community involvement, aspirations*

Teachers

Pedagogical approaches, Management, Resources

Interpreted Curriculum

Background, Prior learning, aspirations, Knowledge

Received Curriculum

Students

Figure 2.4: Theoretical framework

The diagram shows how these main ideas are positioned and linked. The title, technology curriculum, enables the research to be situated within a tangible setting. Government policy may represent political aspirations, but is, at least to some extent, research informed. The New Zealand technology curriculum has been developed as a result of various influences: overseas developments; beliefs about sound pedagogy; beliefs about the needs of society and the economy; and so on. All of these factors have influenced the construction of the intended or prescribed curriculum.

2.8 Summary

Schools and teachers have been obliged to embrace and implement this curriculum. How this has been done has been dependent on a range of factors. Teachers' own prior experience, backgrounds, beliefs, understandings and attitudes have played a huge role in how the curriculum has been received. Further to this, the extent of their access to professional development, support, and curriculum resources is significant. Coupled with teacher perceptions of, and responses to, the technology curriculum have been the school environments in which teachers work. School structures, resources, and community aspirations and involvement all play a part in how the teachers interpret and implement the curriculum. School management personnel and their own beliefs and understandings are important factors too. Even with the support of school management and the best possible learning environment, teachers need to be effective practitioners, able to manage resources and the learning environment, and plan for student assessment and learning. The variables are many.

One would like to believe that students themselves are the reason for the curriculum in the first place. Why have they chosen to take technology at the senior level? Their own prior learning, experiences, aspirations, goals, and motivation are of major significance. All of these factors, along with the particular interaction or relationship that they form with their teachers, are direct influences on the way students receive (or perceive) the curriculum. This in turn impacts on the nature and depth of their learning.

The theoretical framework offers guidance for fine-tuning research questions and methods so that procedures for data collection and analyses can be formalised. This leads on naturally to the focus of the next chapter, where methodology and procedures are discussed in depth.

CHAPTER 3

Methodology

This chapter examines and justifies the research approach, setting out the design and implementation methods used. It begins with a restatement of the aims of the thesis and the key research questions as they emerged from the research theoretical framework. An explanation of research methodologies, data collection and analyses follows. A diagram is given at this point to illustrate how the research has been designed and to provide an indication of this chapter's composition. The diagram complements the theoretical framework that came out of the literature discussions in Chapter 2 by representing the key components of the research design with reference to the relationships between the intended and the interpreted curriculum.
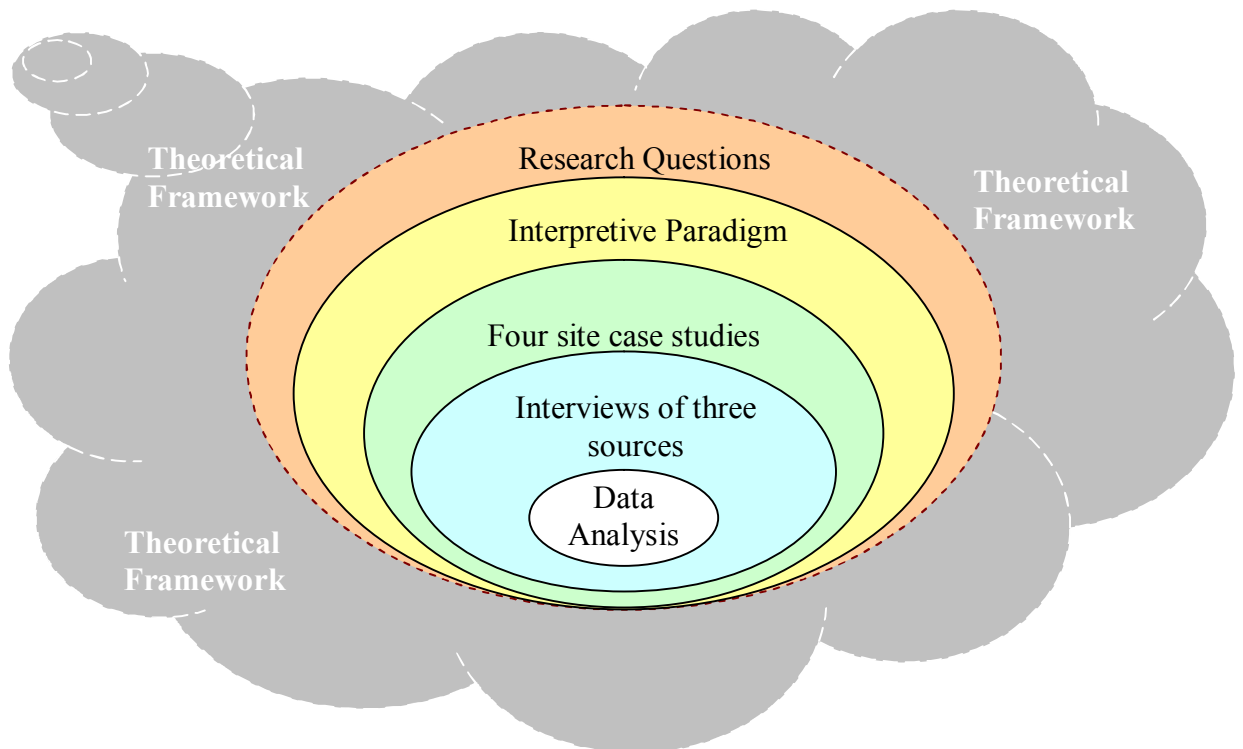
Figure 3.1:Methodology overview

3.1   Research aims and questions

The research questions emerged in response to my observations and subsequent reading of how technology education has been interpreted and implemented in schools. The aims of the project seek to:

❖ explore and compare the ways in which technology education has been implemented in a sample of Wellington secondary schools.

❖ describe and explore the views of those involved as to how technology education is interpreted within their schools.

❖ identify discrepancies that may exist between the intended curriculum and the interpreted curriculum for technology teachers.

As noted already, the latter aim includes interviews with students to identify their interpretations of what technology is about in order to provide further insight into how teachers may have interpreted the curriculum.

These aims led to the following key research question and subsequent sub-questions. The key question is reflected in the project's title:

> How is *Technology in the New Zealand Curriculum* (1995) interpreted and practised in a sample of secondary schools in the Wellington area, and what discrepancies exist between the intended and interpreted curriculum?

The research has, therefore, addressed the following questions:

❖ How is senior secondary technology education interpreted and practised at senior level in a sample of Wellington schools?

❖ What are the school senior management experiences of, and expectations for, technology education and its implementation?

❖ What are teachers' expectations and experiences of technology education and technological literacy? (This question is intended to clarify better the preceding research questions.)

In order to answer the research questions, the research methodology sits within an interpretivist framework in line with the aims of describing and interpreting what is

happening in the schools under study. This is shown in the yellow circle of the methodology diagram (see Figure 3.1). The research also uses case studies of the four schools to structure the data collection and analysis, based on interviewing as the main data gathering strategy.

3.2 Interpretive (qualitative) versus normative (quantitative) approaches to research

This research seeks to identify and describe the different ways in which technology education is interpreted and practised in Wellington secondary schools by using the stories and views of school managers (principals), teachers and students to establish if there are any tensions between the intent, interpretation, implementation and reception of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995).

Quantitative research methods essentially measure variables in a quantifiable way whereas qualitative research methods attempt to capture holistic situations and images, usually in the form of words (Mertens, 1998). In such a study as this, it is critical that the understandings of the people involved are presented as authentically as possible and so a qualitative approach has been selected. Qualitative research focuses on processes and meanings that individuals give to experience, whereas quantitative research refers to counts and measures (Berg, 2004; Denzin & Lincoln, 1994). For this reason qualitative research is often criticised as non-scientific and lacking validity. However, it is difficult, if not impossible, to capture *stakeholders'* responses to the curriculum, in different school settings, using quantitative techniques. Qualitative research strategies examine social interactions and settings, exploring the socially constructed nature of reality rather than looking at the measurement and analysis of causal relationships between variables. The researcher endeavours to make sense of a situation without imposing pre-existing expectations on the case under study (Mertens, 1998). The categories for analysis emerge out of the data as the study proceeds. It is not pre-arranged as in quantitative strategies. The experiences of the people involved with the technology curriculum cannot be easily communicated by numbers. Qualitative research strategies examine social settings and the individuals within them (Berg, 2004). They examine how these individuals, namely, school principals, teachers and students, make sense of the

technology curriculum in their schools. Meaning comes through human interaction such as how people use or respond to the curriculum. A qualitative research approach employing an interpretive perspective enables the principals', teachers' and students' ideas to be presented and examined. This approach derives from the work of Wilhelm Dilthey (cited in Rickman, 1961) who argued that in order to recognise the perspectives of the participants of the study, an interpretative approach is needed. These interpretations can be made within familiar contexts. Qualitative reports do not naturally generate answers but provide narrative accounts, explanations of phenomena and theoretical frameworks. Reasons for the selection of the interpretivist paradigm in this study are now outlined, along with an examination of other familiar perspectives, leading to the justification of the case study method adopted in this research.

3.2.1 Positivist/post-positivist

In his critique of positivism, Habermas (1972) sees the normative approach to research as viewing all knowledge as equated with scientific knowledge. Such an approach reduces behaviour to numbers that risk, in their summary of events or beliefs, loss of the detail that gives the data their full meaning. Opposition to positive science is seen by positivists as an attack on reason and truth whereas a positive science attack on qualitative research can be seen as an effort to overrule one version of truth with another (Denzin & Lincoln, 1994). Although both qualitative and quantitative researchers can be concerned with an individual's point of view, the qualitative researcher believes they can get closer to the person's perspective through interviewing and observing, whereas the quantitative researcher relies on more remote, inferential, empirical data. Principals', teachers' and students' views and perspectives are central to this investigation and need to be genuinely represented so a post-positivist stance makes this approach more acceptable. The subjective nature of such an approach leans to an interpretivist method.

3.2.2 Interpretivist/constructivist

The qualitative interpretivist paradigm is subjective in nature and puts the teacher (and in this case school managers and students) at the centre of the inquiry. This approach is based on the idea that reality is a process of social construction, letting participants tell their stories to show how they act in response to the "meanings" that their situations have for them. Rich descriptions of their social world are more

valuable than quantitative measurements which do not give the detail of participants' thinking (Denzin & Lincoln, 1994). Cohen, Manion and Morrison (2000) outline some aspects of interpretive approaches to research where people actively construct their social world and make meanings in, and through, their activities. Their activities are "situated" in that they change and adapt within their context. The situations are examined through the eyes of the participants and not the researcher, so the view of the social world is not manipulated by the researcher. My theoretical framework (see Figure 2.4) presents the theory that curriculum is interpreted and received according to the context in which it is embedded.

3.2.3 Emancipatory/critical

Habermas (1972, 1974) proposes three interests as the basis of how all knowledge is constructed. The "technical" can be equated with the idea of *imposed* where knowledge is transmitted in one direction to the learner who is, in turn, expected to learn it. The "practical" allows for some reflection by the learner in order to gain understanding; and the "emancipatory" is based on the learner's critical reflection in order to question for further understanding. The latter requires that teachers are able to interpret and implement the curriculum within the school community's social and political context.

The implementation of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) into schools is recent, having become mandatory between academic year levels 0 – 10 since 1999. Implementation of senior technology education has followed at a varied pace and manner. In many instances it may be argued that some implementation has been in response to the development of the National Qualifications Framework. This led me to examine the implementation of technology education at senior level at four Wellington secondary schools. Case study methodology has been employed to examine how each of the four schools has interpreted, managed and taught technology education, and how students have responded to it.

In referring back to the research methodology overview diagram (Figure 3.1), the circle shaded green shows the use of case study from four sites.

3.3   Case study

The term *case,* in a quantitative study, can be seen as a unit of analysis (Schwandt, 2001); however, in education it is more likely to be qualitative (Merriam, 1998). Huberman and Miles (1994) define a case as "a phenomenon of some sort occurring in a bounded context" (p.440).   The advantages of the case study method are the ways it can be applied to real-life situations, providing a foundation to apply explanations to those situations, or to describe an object or phenomenon.   If the phenomenon is not intrinsically bounded, then it is not a case (Merriam, 1998).   This can be checked by asking how finite the data collection will be, along with the number of people involved.   Unlike experimental, survey, or historical research, case study does not lay claim to a particular data collection method, although case study method does tend to use some data collection strategies more than others.   The *case* is central to the inquiry and Yin (2003, 2004) defines case study method in terms of investigating a real-life set of events (the case itself, or phenomenon) in their natural setting (contexts) so that data can be drawn from this.   He describes case study as the "method of choice" when the phenomenon being examined is not easily differentiated from its context.   Merriam (1988) describes case study as a research design in its own right as it can be distinguished from other responses to a research problem. Merriam (1998) explains how qualitative case study can be characterised as being *particularistic, descriptive* and *heuristic* (p.29).   Particularistic refers to the case study focus on a particular situation, event, programme or phenomenon, and descriptive in that the end product of the study consists of a rich, *thick description* of the phenomenon. Thick description is an anthropological term which means the complete, literal description of this phenomenon.   Heuristic means that case studies illuminate the reader's understanding of the phenomenon.

In this qualitative context, the particular phenomenon of study is each school's actualised interpretation and implementation of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995) at secondary senior level, including students' responses and perceptions of it.   Case study methodology fits well here as it enables insights into how teachers and students interpret and use the technology curriculum within the setting and structures of their school environment.   This methodology allows the research to develop an *interpretive* perspective of responses and also the relationships between them.   Interpretive research considers education to

be a process and school to be a lived experience. In this study, the interpretive methods use interviews in order to emphasise the production and teasing out of meaning for the interviewees.

Figure 3.2 offers a diagrammatic overview of how the present case study research is structured, and how it sits within the wider context of the qualitative paradigm.
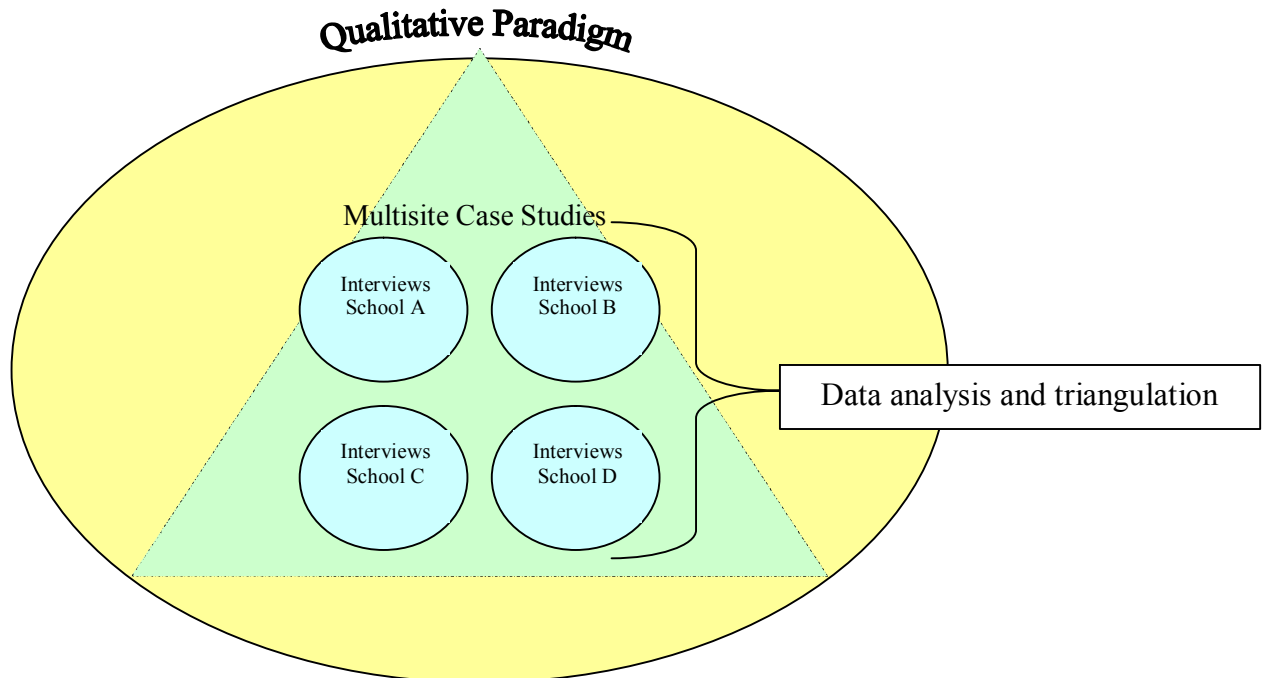
Figure 3.2: Case study overview

Stake (1995) sees the study of a case as being implemented when it is of particular interest. He identifies three types of case study (1994). The *intrinsic* case study is undertaken in order to gain a better understanding of a particular case. An *instrumental* case study examines a case to provide insight into a broader issue or theory. A *collective* case study may involve a number of cases in order to inquire into a phenomenon. Matching this study with one of these types is difficult and so a blend of all three is used. Four sites are used to examine responses to the technology curriculum, suggesting the use of intrinsic case study at each site. While the nature of the examination at each site is the same, the sites themselves have their own cultures. However, it can be expected that the responses from these sites will still provide an indication of the way schools respond to the technology curriculum. This idea links to Stake's (1994) instrumental case study model. The collective model also cannot be ignored as the identified phenomenon is being examined in four separate sites.

The case study involves four Wellington secondary schools. A large group of Wellington technology teachers, who attend the local subject organisation meetings, were initially invited to participate. The schools' selection was decided through a process of elimination from a larger group of schools whose technology teachers had offered to take part in the research. There was no known bias in this process of elimination as each of these schools in the larger group was considered in terms of commonality of technological area to be offered, principal/management availability, and access to consent for interviewing students. The group was narrowed to four schools covering a range of decile ratings, and where all of the teacher interviewees were working mainly in hard and soft materials technology and graphics. An explanation of school decile ratings follows, along with descriptions of each school.

All state (government funded) schools in New Zealand are allocated a socio-economic decile ranking. The decile rating of a school is determined by the Ministry of Education and is calculated on a range of aspects within the school community, including average salaries and the percentage of community members who are welfare registered. Decile 1 is the lowest, and decile 10 is the highest ranking. Schools receive *additional* government funding based on their decile ranking; decile 1 receives most whilst decile 10 receives none at all.

School A is a co-educational state secondary school consisting of students in Years 9 – 13 of schooling (on average, 13 – 17 years of age). It is situated in a Wellington regional suburb. The roll was approximately 700 at the time of the interviews (in the second half of 2005), and the decile rating was recently assessed as 4. The technology focussed on in the interviews was that of hard materials, with food or soft materials technology not on offer. Technology is taught in module form, with a limited time allowance, to all Year 9 and Year 10 students, who work through a technological activity over six weeks. At senior level it is offered as an option. A combination of unit standards and achievement standards are used for assessment purposes. At the time of conducting the data collection interviews, the school was considering whether to press on with plans for a new technology block[5].

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[5] The school management and Board of Trustees decided to continue with the planned new technology facility which opened early 2007.

School B is a decile 8, co-educational, state, secondary school which serves a wide range of communities including a significant number of international students. Over the last five years the school roll has grown substantially and the ethnic make-up of the student population comprises mostly European but with 15% Māori. A wide range of other ethnicities provide diversity to the school. Whilst Year 9 and 10 students generally get opportunities to do module-type technology courses involving graphics, materials, information and communication technology (ICT), and food, senior students generally have opportunities to select from a range of courses that provide pathways through senior secondary school. These may be assessed for the National Certificate of Educational Achievement (NCEA) by unit standards or achievement standards. For example, a course in automotive engineering will generally use Industry Training Organisation unit standards for assessment and credentialing purposes within the NCEA, whilst courses in food, jewellery making, electronics or materials may use unit or achievement standards from general education in technology, generic design or from other domains. There is also a range of industry-based certificates available that can offer students opportunities to gain credits towards the NCEA. School B is also part of a Ministry of Education supported scheme that encourages technology education links with industry. This scheme is called Beacon Practice where, in this instance, a class of Year 12 students were involved in responding to a genuine client with a genuine need. The learning was assessed using a combination of unit standards at the outset, and achievement standards as the project developed. The entire project, as with other Beacon Practice projects in other schools, was documented and published on a website[6] hosted by IPENZ (Institute of Professional Engineers New Zealand).

School C is a co-educational state secondary school located north of Wellington. The school is multi-cultural with a decile rating of 2. It has a roll of around 550 students, and 37% of the students are of Māori descent. This school's technology programme operates separately for food and soft materials, due to the physical positioning of the facilities and the traditional, pre-technology curriculum separation of these subjects. The interviews for this study involve the permanent staff members who work with hard materials and graphics. A choice of one term modules is available for Year 9 and 10 students. The choice ranges from materials, structures and materials, mechanisms

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[6]   www.techlink.org.nz

and materials and production and processes. One stream is offered at Year 11 and 12 levels. This is called Building Construction and uses unit standards designed by the Building Construction Industry Training Organisation (BCITO). It has a vocational focus where the students have work experience on a building site once a week.

School D is an integrated girls' secondary school (Years 8 – 13) with over 800 students. The school serves a wide geographical area. It is a multi-ethnic, decile 7 school with a significant Māori and Pacific Island population (each being 15% of the total school roll). A specialist technology building is available alongside the classroom where graphics is taught. Students design solutions in response to genuine needs and opportunities. This begins at Year 9 and is developed through to senior level where achievement standards (NCEA) are used for assessment pathways.

Within each case study site there are three interview sources, namely, principals, teachers and students involved in technology education.

3.4   Interviews

The methodology overview (Figure 3.1) shows the selection and placing of interviews as the data collection method for this study, allowing the voices of the participants to be presented and examined. Kvale (1996) describes the interview as being just that, an "inter view", where the interviewer listens to what people themselves say about their own world, from their own point of view. He suggests that if conversation did not exist, there would hardly be any shared knowledge, although he also warns that interviews can be resorted to as a data collection method when certain areas may be better covered by other methods (e.g., avoidance in using statistics). Interviews are best suited for studying people's understandings of the meanings and clarifying their own perspectives in their lived world. As discussed earlier when explaining the selection of a qualitative research paradigm, the move away from obtaining knowledge through external observation and experimental manipulation and towards an understanding through conversation and interview can lead to "knowledge that can be used to enhance the human condition" (p.11). The qualitative research interview employed here has the purpose of obtaining descriptions of the interviewees' lived world so that meaning can be interpreted. Use of a metaphor by Kvale relates the role of interview to the *miner* and *traveller*. A

move from the miner metaphor of interviewing where the miner digs up nuggets of meaningful data is made, to the traveller metaphor of interviewing. This refers to the construction of stories, enabling the researcher to construct knowledge through the interaction of the partners in the interview conversation (Kvale, 1996).

As there is no common procedure for interview research, in order to highlight the strengths and limitations of interview as a data gathering instrument I have used Kvale's aspects of qualitative research interviews (1996, p.30-36) to make up the following table.

Table 3.1: Strengths and limitations of research interviews

Aspects of Qualitative Research Interviews (Kvale, 1996)	Strengths	Limitations
Life World	Describe and understand central themes the subjects experience and live toward.	The theme must be of interest to interviewee and researcher so that the interview can be analyzed where a common understanding is possible.
Meaning	The research interview seeks to describe and understand the meanings of what the interviewees say.	This meaning is dependent on the interviewers and/or researcher's interpretations of what is said.
Qualitative	Aims at obtaining nuanced descriptions.	Precision in description and stringency in interpreted meanings is required.
Descriptive	Qualitative research aims at obtaining uninterpreted descriptions.	How does the researcher evaluate these descriptions?
Specificity	The qualitative research interview seeks to describe specific actions and sequences from the interviewee's world.	Based on rich descriptions of specific situations, the interviewer will arrive at meanings that depend on the level of mutual understanding between the interviewer and interviewee.
Deliberate Naivety	Absence of pre-formulated questions and categories allows for openness and new and unexpected phenomena.	Researcher must be sensitive to what is said and not said, and critical of his/her own presuppositions during the interview.

Aspects of Qualitative Research Interviews (Kvale, 1996)	Strengths	Limitations
Focus	Interview is focused on certain themes in the interviewee's life.	Keeping the focus of the interview on the identified themes.
Ambiguity	Able to describe precisely any possible ambiguous or contradictory meanings.	The ability of the interviewer to clarify whether ambiguities and contradictions are due to a failure of communication or are they reflecting a real situation?
Change	In the course of an interview subjects may discover new aspects of the themes they are describing.	The researcher needs to recognise why subjects may change their descriptions and meanings about a theme.
Sensitivity	The interviewee seeks to obtain the different nuances and depths of the themes of the interview.	Responses to different interviewers using the same interview guide may well be different, depending on the interviewer's sensitivity to the interviewee.
Interpersonal Situation	The interview is the interaction between interviewer and interviewee/s and it may reciprocally influence each other allowing for positive feelings of common intellectual curiosity and a reciprocal respect.	The interview may also provoke anxiety and defence mechanisms in both parties.
Positive Experience	A qualitative research interview can be a favourable experience for the interviewee.	Without consideration of the other aspects mentioned in this table, it could also become a negative experience.

As researcher and interviewer, in a qualitative framework, my task is to ask questions that lead the participants to share their responses regarding technology education according to their own experiences and situations. What they share may lead to new knowledge and it may also enable new ways of understanding the phenomenon at hand. It may enable transformative effects, where, in this study, the research interview is based on Kvale's description of a *semi-structured life world interview* as, "an interview whose purpose is to obtain descriptions of the life world of the

interviewee with respect to interpreting the meaning of the described phenomena"
(p.5). I have chosen interviewing as the optimum strategy for learning participants'
views and experiences in relation to technology education.

There are three layers to the interviews. They comprise participants,
instruments/schedules, and the implementation of the instruments/schedules. Tape-
recorded informal interviews were used to record the responses of the participants.
The interviews were *semi-standardized* (Berg, 2004, p. 79) in that they were
structured in a uniform way but the order of questions or the wording was modified
to take account of interviewees' responses to each question and the need to probe
further. This is explained in more detail shortly.

3.4.1   Interviewees

In a study such as this it is useful to identify the interviewees in terms of how they
have been selected for interviewing so that the nature of the interview can be better
understood.   There are many ways of selecting samples or interviewees for
interviewing.   Berg (2004, p.34) calls these, sampling strategies.   In quantitative
research, the researcher will use *probability* sampling. This is based on the idea that
a selected sample of a smaller group will mathematically represent a larger group.
Non-probability samples are often used in social science research where all possible
elements in a full population are difficult to access or investigate.

Berg (2004, p.35) describes four common types of non-probability samples.   The
convenience sample, which can also be known as an *accidental* or *availability*
sample, relies on those subjects or, in this case, interviewees who are available. A
convenience sample must be first considered in terms of appropriateness for the
particular study.   A *purposive* or *judgemental* sample is selected to ensure that
certain types of individuals with certain attributes are included. *Snowball* sampling
is initially similar to convenience sampling, but can then grow to include more
subjects who may be referred to during interviews as having particular
characteristics, common to those already in the sample. A *quota* sample may begin
with a table or matrix where cells are filled to identify those subjects who fit a pre-
determined quota such as gender, age or education, depending on the research
questions and the related relevance of these attributes.

The sample selection of participants in this study was based on the notion of non-probability samples, where not every single teacher or student involved in technology education could be interviewed, thus not every perspective was able to be captured. A convenience sample was employed based on the availability and willingness of teachers and students to participate. Although the selection of this sample is described in detail earlier in Section 3.3, it is worth noting that within each school, three groups of participants were used, namely principals, teachers and students. Their availability was affected by staff and student timetables, the timing within the related technology education programme, coupled with the researcher's availability and timetable. These groups reflect responses relating to the theoretical underpinning of the study, and the intended, interpreted and received curriculum. The intended curriculum refers to the curriculum document, *Technology in the New Zealand Curriculum* (Ministry of Education, 1995). The interpretation of the curriculum is guided by the two interviewee groups, the principal group, and the teacher group. Teachers operate at the classroom teaching and learning level in a school structure. How they interpret the curriculum not only relies on their knowledge, beliefs and professional practice, but is also very much influenced by the parameters, resourcing and opportunities set by the principal and school management group. In each school, the head of the technology departments were male and worked within the area of materials technology and/or graphics. This was not intended but stems from the convenience sample of willing and available participants. For this reason, the interviews were carried out with teachers and students who also worked in these technological areas. The students in the research offered an insight as to how the curriculum was received.

More specifically, the participants were as follows:

❖ school principals and senior management personnel who oversee the senior curriculum.

❖ secondary teachers who have been engaged in technology education in the Wellington region.

❖ willing students from senior technology classes of the above selected secondary school teachers.

Table 3.2 gives an overview of the sample group.

Table 3.2   Interviewee selection

School	Type	Senior management Interviewed	Teachers interviewed	Students interviewed
A	Co-ed, decile 4, small suburban	Principal (male)	HOD[7] (male) and two teachers together (1 male, 1 female)	Yr 12 (x 13 present, 7 actively engaged. All male)
B	Co-ed, decile 8, large urban	Principal (female)	HOD and two teachers separately (all male)	Yr 12 (x 17, equal spread of male and female)
C	Co-ed, decile 2, small suburban	Principal (male)	HOD and one teacher together (both male)	Yr 12 (BCITO) (x 3, all male)
D	Girls integrated Catholic, decile 7	Principal (female)	HOD (male) and one teacher (female)together	Yr 12 & Yr 13 graphics (x 3, all female)

The number of participants involved varied from school to school. Principals, teachers and students took part on a voluntary basis. There was no statistical importance or significance in the number of participants used, although the size of the sample needed to be sufficient to reflect school perspectives. Manageability of the project was also a factor where interviews with principals varied according to the time they could spare. The principal in School D was only able to be interviewed by phone as she was too busy to give time to a face-to-face interview. Most interviews were set during school periods, so there were time limits. The principal of School D met me during the school holidays so we had a slightly longer interview. The HOD in School B was also interviewed during school holidays so did not rush his responses. In summary, then, of the sample and interview set-ups, there was only consistency in the interview schedules. The responses from each group of interviewees often determined the direction of the unstructured interview questions. That is, a small level of diversion from the questions did take place to enable further clarification of comments to be achieved.

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[7] Head of Department

Kvale (1996) emphasises that there is no one ideal interviewee or interview subject, where some may seem polite, interested, articulate and honest. However, these interviewees were not selected for this reason, but to provide either accurate unbiased accounts of their experiences and ideas, or to offer sensitive accounts in the form of story. Ethics approval for this project was granted and, these principals, teachers and students agreed in writing to participate (see appendices 2a, 2b, 2c, 3a, 3b and 3c).

3.4.2 Interview schedules/instruments

There were three interview schedules, one for each group of interviewees (principals, teachers and students) within each school. The three schedules were tailored to obtain the different perspectives of each group of the technology curriculum. In terms of the theoretical framework, these perspectives, by the nature of the interviewee group, linked directly to the notions of intended, interpreted, implemented, and received curriculum. The principal/school management interviewees were expected to have perspectives linking to notions of the intended, interpreted and implemented curriculum, whilst the students' perspectives were expected to lean more towards the experienced or perceived curriculum. The interview schedules were structured within headings to link to these different expected experiences. The headings and questions were adjusted in the schedules to make sense for the interviewees. The intention was to allow for questions to be related directly to respondents' particular experiences.

The principals' interview schedules (see appendix 4a) contained the following headings under which specific questions relating to their management of curriculum are presented. Each heading is followed by an example of a related question.

> *Implementation of technology education in the school*
> *2.P How do you support technology education at senior level in your school*

> *Technology in the New Zealand Curriculum and assessment practices*
> *8.P What methods of national assessment do you use with your senior technology classes and how are they implemented?*

The teachers' schedules (see appendix 4b) were constructed under headings focussing on their interpretation and implementation of technology education.

Personal philosophy of technology education

2.T Explain why you became a technology teacher

Technology in the New Zealand Curriculum and assessment practices

4.T Describe how you use the technology curriculum when you plan your senior technology programmes

Teaching technology

11.T What are some of the most effective aspects of this programme in terms of students' learning in technology?

Technology education in the future

17.T How would you like to see technology education implemented across secondary schools in the long term? What will be your role as a technology teacher and what will be the role of the students as learners in technology?

The students' schedules (see appendix 4c) used headings which allowed for their perceptions of technology education they experienced as learners:

Views of technology education

3.S Describe your views of learning in technology

Assessment in technology education

5.S What methods of assessment in technology do you think are best? Why?

Learning in technology

7.S Identify some helpful points within the technology programme that support your learning and explain how they support your learning

Technology education in the future

13.S How would you like to see technology education implemented across secondary schools in the long term?

The questions provided in each schedule link to the theoretical framework as shown in Figure 2.4 described in Chapter 2. Schedule themes listed in the following table,

Table 3.3, address the participants' responses to the intended curriculum in terms of the way they have interpreted, implemented, and in the case of students, received or learnt from it. All of these themes and subsequent responses sit within the context of each school and their policies, structures, resources, understandings, perceptions, community involvement and aspirations, as well as the relationships between them.

Schedules for each of the three groups of interviewees were designed using the headings and general questions linking to the schedule themes (Table 3.3). The differences between the three sets of interview schedules are the composition and wording of the questions under these headings in order to suit the nature of the interviewee groups being targeted, namely principals/school managers, teachers, and students.

Table 3.3: Breakdown of major research questions into specific questions on interview schedule

	Major Research Questions			
	General	**Principal**	**Teacher**	**Students**
Schedule Themes ↓	How is senior secondary technology education interpreted, managed and implemented in a sample of Wellington schools?	What are the school senior management expectations and experiences of technology education?	What are teachers' expectations and experiences of technology education and technological literacy?	What are students' expectations and experiences of technology education in terms of their intended learning?
Implementation of technology education in the school	P1, P2, P3, P4, P5, P6, P7, P12 T4, T5, T6, T9, T10, T11, T12 S7, S8	P1, P2, P3, P4, P5, P6, P7, P12	T4, T5, T6, T9, T10, T11, T12	S7, S8
Views of technology education	P1, P12 T1, T2, T14, T15, T16 S2, S3, S10, S11, S12	P1, P12	T1, T2, T14, T15, T16	S2, S3, S10, S11, S12
Teaching technology education	P1, P3, P4, P5, P6 T2, T3, T4, T5, T6, T9, T11, T12 S7, S8	P1, P3, P4, P5, P6	T2, T3, T4, T5, T6, T9, T11, T12	S7, S8
Learning in technology education	P7, P9 T11, T12 S1, S3, S7, S8, S9	P7, P9	T11, T12	S1, S3, S7, S8, S9
Assessment in technology education	P8, P9 T7, T8 S4, S5, S6	P8, P9	T7, T8	S4, S5, S6
Technology education in the Future	P10, P11 T13, T17, T18 S9, S13, S14	P10, P11	T13, T17, T18	S9, S13, S14

3.4.3 Implementation of the interviews

Interviews were carried out entirely at the convenience of the interviewees, starting with the principals. They were fully informed of the research intentions and procedures, as referred to in the final section in this chapter on ethical considerations. The interviews with the teachers were conducted either individually or in teams, depending entirely on the teachers' own decisions relating to their availability and desire to participate. The way these interviews were conducted is reported in the next (results) chapter. It was agreed in discussion with the principals and teachers that the students would be interviewed in their class groups, during a class time that was set aside as a *downtime* for some reflection and revision, such as at the end of term. This downtime was a time when no new learning was scheduled so that the interviews did not encroach on the normal school programme. Although students' responses may have influenced each other, it was decided that the students would be more open to me as researcher if they remained in their class groups, familiar surroundings and routine as much as possible. It was acknowledged that some students may have tended to agree with the rest of the class group as they were reluctant to speak out. This factor was weighed up against the possibility that they may also have been reluctant to speak out to me, a stranger, on a one-to-one basis, thus justifying the decision to interview the students in their normal class groups. Within the interview setting, I was careful to ensure that all students had an opportunity to speak. They were all, however, given the option not to participate if they chose. Prior to the interviews, the participants were all given information sheets (see appendices 2a, 2b and 2c) and a consent form to sign (see appendices 3a, 3b and 3c). On my entry into the interviews, my first task was to reiterate my purpose for being there and reinforce the idea that I was looking for honest, sincere responses, using the statement that there were no right or wrong answers in this case.

3.5 Data analysis

The taped interviews were transcribed into word documents and then considered alongside the schedule themes as shown in Table 3.3. Responses to each question in each interview were then categorised into response themes according to their interpreted meaning by the researcher. The following two examples in Table 3.4 illustrate the process.

Table 3.4 Identification of response themes

> ***Interview focus/ schedule theme: implementation of technology in the school***
>
> Response Theme 1:   The Principal is advised by the Head of Department: Technology (data derived from interview questions P1, P2 and P6).
>
> Response Theme 2:   The new technology curriculum is not meeting the needs of students (question P3).

The various response themes from the interviews with principals, teachers and students were then grouped and coded according to the broad focus of the response (see appendix 5).   For example, if response themes focused on issues or concerns about staffing, then they were grouped under the label of "staffing". These response themes were identified during the coding of responses. The codes that emerged did not necessarily match the questions they were responding to, but they reflected interviewees' actual responses.

3.6   Validity and reliability

The notions of *validity* and *reliability* originate from the positivistic approach to research.   These concepts open up a range of ideas and practices that enable the quality of research to be assured, if considered at the outset, and evaluated on completion.

Validity is a requirement for both quantitative and qualitative/naturalistic research (Cohen, Manion, & Morrison, 2000) and relates to the idea of "fitness for purpose"; that is, the design of the study will answer the research questions that have been set. This includes selecting the appropriate broad approach (e.g., qualitative, quantitative, or a blending of the two), and the particular methodology (e.g., case study research, action research, ethnography).   Within positivistic designs, validity also has two main dimensions: *internal validity,* which focuses on the key features of the design so that the researcher can be assured that the results are a consequence of the experimental manipulations rather than random or other uncontrolled effects; and *external validity,* which focuses on the strength of the design for enabling generalisations to be made to the wider population.

Reliability in quantitative research is concerned with precision and focuses on the notion that accurate results have been obtained; that is, that the measurements of the phenomenon being studied contain minimal error. Thus if a questionnaire is used, the results accurately depict the true beliefs or opinions of the subjects. Operationally, reliability is assessed through concepts such as *consistency, stability,* and *repeatability.* These notions convey the idea that if a study, or instrument within a study, was repeated, the same findings would result.

Within interpretive (qualitative) designs, the concepts of validity and reliability become modified or adapted to emphasise what is relevant and possible within such designs. For example, whereas "repeatability" is an important feature of an experimental design, a qualitative study may not provide for circumstances that enable a repeat of the research to be undertaken. If a study was undertaken of unruly crowd behaviour, it is very unlikely that the same conditions, the same context, and the same sequence of events would arise in exactly the same way again. If such a study were undertaken to find the means of modifying crowd behaviour, the hope is that the behaviour will not occur again.

In respect of validity, *trustworthiness* is the key qualitative idea. It focuses on an overall assessment of whether the research results can be trusted because they are *credible* (make sense to readers), provide rich detail or thick description of the process, events and participants' views (procedures and findings can be monitored), and use methods that can be assessed as representing good research practice. A further important difference is that instead of the research being able to provide generalisations to wider populations (the notion of external validity), the comparable concept is *transferability* which requires that enough rich detail of the design, process and results has been provided to enable readers to determine whether the findings can be transferred to their own context. The onus of "generalisation" shifts from the researcher to the reader. In qualitative terms this can be seen as contextualization (Kvale, 1996).

In respect of reliability within interpretive designs, the operational focus shifts from consistency, stability or repeatability, to that of *dependability.* Because the research cannot be replicated in all its details again, the researcher is obliged to provide enough information so that the process followed can be audited by those entrusted with

evaluating the research. In other words, the key idea is that an audit of the research should enable the conclusion to be reached that the findings can be "depended" upon.

The research methodology has been explained in terms of why it has been selected in place of other approaches. It is necessary to identify how *credibility*, *transferability*, and *dependability* are considered within this research. In respect of credibility there are three further aspects that have been addressed in this study:

1. The literature review provides an analysis of the underlying theory and identifies the theoretical framework for undertaking this research;

2. Sound practice in conducting the research, as identified in the literature on methodology, has been applied to the study;

3. Processes for gathering data enabled results to be triangulated.

In respect of the first aspect, Chapter 2, in particular, provides the review of literature and the development of the theoretical framework that underpins the later collection of data. There is no need to describe this further; however, it should be noted that in Chapter 5 the results for this research are looked at from the perspective of evaluating the theoretical framework. In other words, does the present research confirm, refute or extend our theoretical understanding?

The significance for "credibility" of applying sound research practices, the second aspect, should be apparent. Attention to detail on matters such as selecting the most appropriate methodology for answering the research questions, choosing appropriate samples, developing valid and reliable research instruments, conducting interviews and other data gathering procedures in a systematic way, and paying close attention to ethical considerations, are examples of activities that impact on the judgement of credibility. This, and subsequent chapters provide the evidence for allowing readers to judge this aspect of research credibility.

The third aspect, triangulation, is a cornerstone of validity in qualitative designs. This notion captures the idea that data are gathered from different sources, or in different ways, thus enabling results to be corroborated. Denzin (1989) identifies four different forms of triangulation. These include the use of:

1. *multiple data sources*
2. *multiple investigators*
3. *multiple theoretical perspectives*
4. *multiple methods.* (p.237)

For this research, the first and the second are particularly relevant, although aspects of the third are covered through the literature review and the later discussion of results where different theoretical perspectives are presented. In respect of number 1, this research draws together data from interviews with principals, teachers and students within each school. In respect of number 2, the researcher's supervisor independently coded a range of interview data in order to confirm/modify the classification for coding data and at a later stage a further coding exercise was undertaken to confirm the researcher's classifications. Both processes led to a professional discussion resulting in minor modifications to codes and classifications.

In respect of transferability, as mentioned earlier, the key process relates to the provision of "thick" or "rich" description of the research processes and data analysis, thus enabling the reader to infer the relevance of the findings to their own context. This chapter, along with the results chapter, provide most of that description.

From the perspective of reliability, it is again the provision of thick description that is the key basis for enabling "dependability" to be audited and inferred. Specific examples in this research include the repeat coding of data by the researcher's supervisor, the triangulation of data using principals, teachers and students as participants, and the application of ethical standards to the research process.

One step that was omitted was the return of interview data to participants for their confirmation. Because of the scheduling of the data collection (through Term 4, 2004 and Term 1, 2005) followed by the need to transcribe interviews, there was insufficient time to return transcripts before the end of the 2005 school year. It was considered that the summer school break represented too long a period for participants to recall and confirm what they had originally said earlier in the previous year. Also some teachers had moved schools whilst some students had left school altogether and were no longer accessible. This represents a limitation on the

accuracy of the data and subsequent interpretations. For this reason, a potential ethical issue related to the use of direct quotes also arises (see next section).

3.7   Ethical considerations

Concerns regarding research ethics revolve around issues of harm, consent, privacy and confidentiality. Historically, there were few laws prior to the 1960s regarding the research process and some horror stories have emerged from that time (Berg, 2004) where especially behavioural scientists used studies involving human subjects. Since the 1960s, qualitative practices have become more abundant giving rise to a wider range of potential problems and harm for participants, including their rights to privacy and confidentiality. Today, standard practice requires researchers to obtain ethics approval from their university or equivalent research institution before embarking on any data collection for their study. Ethics guidelines offer a form of quality control within research communities.

In devising the methods of data collection, ethical considerations were integral to the planning and were scrutinised by the Massey University Ethics Committee. As researcher, it was my obligation to ensure the rights, privacy and welfare of the people and communities involved in this research. All prospective participants were given details of the research intentions and procedures (see appendices 2a, 2b and 2c.). The adult participants, namely the principals and teachers, were able to independently decide whether they wanted to be involved or not. However, the consent of teachers also involved the consent of their principal that they be allowed to participate. The principals had an overview of the school community and were able to make informed decisions as to the availability of their staff, and subsequently the groups of potential student participants. Once it was established which staff members were available and willing to be interviewed, a consent form was signed (see appendices 3a, 3b and 3c). Interviews took place when convenient for the teachers and at a time of least disruption to the school timetable. Principals were also interviewed at their convenience. Student participants were drawn from senior technology classes that were taught by the participant teachers. At a time, convenient to the teachers, based on the timing of the students' learning programmes, I made an initial visit to the classes, with the teachers present, to share information with the students regarding the intended interviews. Students were also given

information sheets about the research. During my initial visit I carefully explained these information sheets, took questions from the students, and made it absolutely clear that they were not obliged to sign the consent forms to participate in the interviews. Because all of the potential student participants were over 16, their own signatures on the interview consent forms were sufficient. Their anonymity in relation to data analysis and reporting was guaranteed. The intention was that no school or individual would be identifiable. Consent from participants was given in writing, and they were free to withdraw their participation in the research at any time. The process of receiving ethics approval prior to the conduct of this research was carried out as a requirement, guided by the stringent procedures set out by the University Human Ethics Committee. These procedures have been carefully formulated to protect the individuals involved in the research.

However, as indicated in the previous section, one issue that was not fully resolved in this research was the implications of not returning transcripts to participants for their verification. While this step was not included in commitments given to participants (see appendices 2a, 2b and 2c), obviously it is good practice to provide an opportunity for participants to verify their comments. In this respect, two potential problems arise:

1. Were the views sufficiently accurate?

2. Were the participants comfortable with being quoted?

In relation to question 1, clearly some loss of accuracy will have resulted because, as always when scripts are returned for checking, some subjects will want to have made alterations. However, to help offset this problem, scripts were carefully examined for their "internal" coherence or consistency. In other words, if inconsistencies were present in a subject's transcript, these were given less weight in the analysis because of the possibility that they reflected comments that needed further development or reflection.

In relation to the second question, paraphrasing is provided in relation to the comments made by participants, but quotes have still been used where these show "proof" of the paraphrasing **and** do not in any way provide a basis for recognising the participants.

CHAPTER 4

Results

The results in this chapter are presented in three parts: Part A gives the detailed case study report on Schools A and D. These schools were chosen because A (like C) is a lower decile co-educational school, and D shares with B a higher decile rating. In many respects A and C identify similar concerns as evidenced in the interviews, and B and D share similar/overlapping concerns. As will be seen, A and C align more with the "older" view of technology in respect of the comments of participants whilst B and D align more with the newer view of technology. There was no particular reason for choosing A over C and D over B. Part B gives an overview of themes that emerged from the responses in the two schools that are not reported in depth (Schools B and C). Part C draws together the results from all schools, examining the commonalities and differences in relation to the themes identified.

Part A – Results for Schools A and D

As stated in the introduction to this chapter, the detailed case study reports of Schools A and D are given here, drawing on interview or focus group responses (principal, teachers and students). In respect of each interview and focus group, results are presented under headings corresponding to the focus of interview questions (e.g., *Interview Focus: Implementation of technology in the school*). Under each of these headings the response themes are then presented; these identify the "themes" that emerge from the interview or focus group.

4.1 School "A"

4.1.1 Interview with principal

This interview resulted in eight response themes. Each is discussed in turn.

Interview Focus: Implementation of technology in the school

Response Theme 1: The Principal is advised by the Head of Department: technology (data derived from interview questions P1, P2, P6).

The Head of Department has an influence on how technology education is implemented in the school. The principal puts responsibility on the head of the technology department as the curriculum expert to interpret and adapt the curriculum to suit the school context.

Response Theme 2: The new technology curriculum is not meeting the needs of students (question P3).

The principal explained that the HOD has a trades background and although he supports the curriculum, he also sees it as not meeting the needs of students who want to prepare skills for trades vocations.

> *...the requirements of the new course are quite demanding for that group of kids. The kids have the mindset that it's about picking up the hammer or that sort of stuff, but the brief of preparing a portfolio of your design and the theoretical they're just not interested.*

<u>Response Theme 3</u>: School resourcing will be influenced by future direction for technology education in the school (questions P2, P3).

With a $1.7million technology block development ready to begin, school management have decided to undertake a last minute stocktake on whether to invest or not in the technology block. The belief that new approaches in the curriculum do not meet the students' needs raises the question that this may not be a wise use of money.

> *Each school must find its own pathway, and the pathway we take will be that every stakeholder is going to have an opportunity and a fair opportunity to be part of the discussion right now. So ultimately it's going to be my decision but it's going to be a 'we' decision. It's a big decision*

<u>Response Theme 4</u>: School resourcing is also influenced by the nature of its personnel (questions P1, P2, P3, P4, P5).

The principal states that human resourcing for technology education is difficult. Teachers are doing their best in a demanding situation. There is a shortage of technology teachers and a response to this shortage is to transplant aspects of technology education into other curriculum areas. The principal and his school want to have teachers who are confident with the new curriculum but they are just not there.

> *…certainly not someone who has done their training in the traditional trades areas, ideally and also someone who is younger because those two kind of sit together and ideally a person who will role model for the kids……and someone who has been trained in the new philosophy…*

> *…The only area that I can identify is the shortage of suitable staff. I advertised several times between the end of last year and the beginning of this year and for a number of the advertisements there was no response. Then finally we had no choice we took whoever it was who presented…*

> *…we have teachers who are teaching more than one subject area and this is the extreme, we have an English teacher who is a technology teacher.*

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Interview Focus: Views of technology education

Response Theme 5: Implementation of technology education is influenced by the head of the technology department (questions P1, P12).

The principal looks to the head of the technology department for guidance and advice on implementation procedures.

> *Totally driven by the HOD, and what his philosophy is and to whatever extent he or she decides we must implement you know either in its purest form or whatever variation in terms of compromise what needs to occur.*

Interview Focus: Learning in technology education

Response Theme 6: Timetabling is a response to students' choices and they want technology to be 'hands-on' (questions P7, P17).

Students choose to take technology but are disappointed when they find it is not so much hands on as they would like. Timetabling and availability of technology courses respond to student choices rather than student choices offered being constrained by the timetable.

> *...and then when they're finding it's a bit more than hands on some of them are just really not enjoying it so much...*

> *...What happens in terms of how we structure the choices that the kids have made is an outcome of the timetabling process. Now our timetabling is deliberately designed to be one that accommodates the choices that the majority of the kids have made and we historically get somewhere in the order of 90-93% of the choices the kids have made in all the subjects to be what they want...*

Interview Focus: Assessment in technology education

Response Theme 7: Student needs, wishes and attitudes to assessment drive their choices. Assessment should be incidental (question P9).

The principal's response suggests that students do their sums and take the most straightforward pathway to get qualifications to meet their needs. Unit standards are seen as easier although the students must pass every element to reach the standard.

He also thinks assessment should become secondary or incidental in that it just occurs when needed. It should not drive what the teacher does but in reality it does. It acts as a reference point for them.

Interview Focus: Technology education in the future

<u>Response Theme 8</u>: Recommendation for schools to specialise in particular areas of technology (questions P10, P11).

The principal promotes the idea of how, by having specialist schools that concentrate on particular subjects or extra-curricular activities, technology education could be developed and look in the future. If financially viable, these schools may be designed to offer a focus on specific areas of technology.

> *...model that kind of emerges in my mind is something along the lines*
> *where you have senior colleges and you have specialist places so kids*
> *could go to say, a school where they are specialising in the delivery of*
> *let's say technology in the senior school and that the design in layout*
> *and the staff and all of the resources needed are there.*

4.1.2 Interview with teachers

Three teachers participated in this interview. They consisted of the Head of Department and two younger teachers. They all work in the area of hard materials. The interview resulted in eight main themes which link back to the schedule themes identified in Figure 3.3. Each will be discussed in turn.

Interview Focus: Implementation of technology education in the school

<u>Response Theme 1</u>: The curriculum is difficult to interpret and professional development has been inadequate (questions T4, T6, T9, T11, T12).

The teachers initially found the curriculum difficult to interpret. In their view the Ministry of Education funding for professional development and support materials focussed on primary school level. At secondary level, they had to interpret the structure, intentions and recommended approaches of the curriculum and decide on how to implement it themselves. Coping with change was difficult without support.

> *I mean the government at the time and the powers that be talk about the*
> *millions that was spent on technology. The truth is that the majority of*

that went into primary schools and was needed. But the secondary where we not only had to try and work out what it was about and how we were going to implement this, we also had to make major mindset changes from where we were and take colleagues with us, that have had enough problems changing from workshop to design tech…

The Ministry provided Jumbo Days as professional development for implementing NCEA but:

…They spent the whole morning arguing about whether it was the right thing or not and in the midst of that some guy's passing around a piece of paper…

…But that was an expression of the feeling at that time and other Jumbo Days weren't any better.

Interview Focus: Views of technology education

<u>Response Theme 2:</u> The technology teaching team includes a range of perspectives on, and approaches to, the technology curriculum (questions T1, T2, T3, T4).

The Head of Department has a trades/hard materials/carpentry background, the other male teacher brings architectural drafting and design experience, whilst the female team member has a design background with experience in hard materials. Despite the diversity of these backgrounds, the team works collaboratively.

…where possible use the individual's skills to work in the areas that do the same thing but still attempting to get an overview of the whole technology area..

…but yes where we tend to try and use some individuals who are involved and their skills and in the past we've had for instance a Māori teacher who used to be involved in this. So it's allowed us to present a wide range of skills bases to the students.

Prior to publication of *Technology in the New Zealand Curriculum* (Ministry of Education, 1995), the HOD was a technical teacher of technical drawing and workshop technology. He feels he had no choice but to become a technology teacher using the curriculum as the guide for how the programme is now structured.

If we take the old technical drawing, it was nice for some students. You could be neat and tidy but it had virtually nothing to do with the skill sets that were actually required in industry. Now there is graphics which is right in line and applies over a huge range of areas.

Response Theme 3: Encourage students to extend themselves (questions T4, T9).

The other male team member looks at risk taking as being a way for students to find out more about themselves. He promotes a 'can do' philosophy.

I think that you must take risks to be happy, you know and in that risk you find out more about yourself and that's what I'm trying to do and I think that's where technology sits and I see it's about people taking risks to go outside the norm…

I guess there's an overriding philosophy to me, there is no such word in my vocabulary as can't. I constantly stress that the whole time. It underlies how I work with the students.

The female member of the team looks at being a role model in a traditional male domain and also the idea of encouraging the students to go beyond their level of natural ability to raise the level higher.

Oh because I'm a woman in an area that is not traditionally seen as having a woman in it…

…with my classes I always draw two lines on the board. The long line I say this is your natural ability. My responsibility as a teacher is for you to reach the next line so that you go beyond your natural ability and you raise it to a higher level so that that becomes your natural ability.

Interview Focus: Teaching technology education

Response Theme 4: School resources and students' choices drive what teachers offer (questions T2, T3, T6, T9, T10).

The teachers confirm that there is a struggle to get staffing, especially to support the variety of curriculum interpretations and approaches that are put into practice. In this instance, strong skills backgrounds are required allowing for safety with available

machinery, along with being able to take an approach that follows the interpreted recommendations of the curriculum.

> *But you're also after different people with a technology-type approach with the whole thought process and an understanding and acceptance of what's going on there and being able to teach in multi areas, so yep pretty hard to find.*

Timetabling influences what the teachers will be able to deliver, the students vote with their feet by walking into courses of their choice, and the physical resources and geography of the school also influence what can be taught.

> *We, up until last year we had an actual food tech component to our technology. This year timetabling as it is, it's just not allowing us to be able to use that specialist.*

They suggest that double periods and collaboration with other staff members would be an ideal but in reality staffing, student numbers and the timetable drive what happens.

> *But in the end you're a school and staff and the numbers and the spaces drive what happens and it can cripple some really good ideas.*

Interview Focus: Learning in technology education

<u>Response Theme 5:</u> Students learn through technological practice (questions T11, T12).

The teachers state that the students initially have to be told what they have learned. They work through a technological activity without identifying learning points. Formative interactive discussions with their teachers alongside the assessment tools mean they eventually get to recognise how they have learnt through their technological practice.

> *I think with the technology side of it I don't know whether it's learning but I am constantly throwing the question back at them and getting them to come up with the answer. I mean even if you know what it is you don't tell them. And say well I need those two materials, those two parts to fix you've got to find out how you're going to do it and come back and tell me later. You know so they're making a model of it and*

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then they're starting to come up with problems and solutions as they go through. If that's learning then maybe that happens when we are actually more involved in the practice side.

Response Theme 6: Students are not aligning with the new technology education initiatives (questions T6, T12).

The students do not like the writing. They say so and they write as little as they can, using minimal language. The teacher recognises their learning as being in two forms:

…the imposed grinding 'learning' and the spontaneous 'light bulb' learning.

The teachers find the students' prior knowledge of technology is a constraint with the continued lack of support resources and with intermediate schools still concentrating on the 'design and make' approach from the traditional technical education model and not on process.

…they think that's technology because they're doing a technological process in the production. But they're not teaching the production process within the manufacture of it.

Interview Focus: Assessment in technology

Response Theme 7: The programme uses mixed methods of assessment; NCEA forces teaching to the assessment (questions T4, T5, T6, T7, T8, T9).

In order to support the students' learning the teachers believe a mixed method of assessment approach is needed. They refer to it as NCEA technology and unit standards technology.

…we also run workshop classes, a more traditional approach with our unit standard base…

…we've got ITO [Industry Training Organisation] *ones too…*

…We still have a very strong segment in our community that feels that the boys need to get a trade. And we have interesting discussions with them but in the end it's what they're actually after.

The curriculum is in the background of NCEA so there is a focus on learning, but it is in the teachers' view that it no longer allows the potential to pursue students' interests. It is prescriptive, and assessment appears to stifle creativity as evidenced in the following quote.

> *It doesn't happen that often but it is, it definitely is a limitation because you can see them* [the students] *varying this way and then you've got to say hang on that's really cool but you know they're not going to test you on that, they're going to test you on this.*

Interview Focus: Technology education in the future

Response Theme 8: Technology education needs to have academic status (questions T13, T14, T15, T16, T17, T18).

The teachers describe the situation at senior level where technology education is not getting enough academic students who show potential as budding technologists, but instead it has a large number of traditional "hands on" students. In Year 13 the class numbers are low, especially with technology not being a University Entrance approved subject (as at the time of the interviews).

> *…what technology is going to be about is to pick up budding technologists who genuinely are actually academic students, right. To use the old phrase, and I guess, I mean maybe it's partly our decile number but we really are not getting enough of those taking them through. At the senior school they're trying to present technology to a large number of those students who are opting to take it who are still traditional hands on students…*

4.1.3 Interview with students

The students in this group were a Year 12/13 composite class studying for Levels 2 and 3 NCEA technology. There were thirteen in attendance but only seven of them actively engaged throughout the interview, whilst the others tended to listen, contributing occasionally later in the interview. As the facilitator, I chose to allow this dynamic so as not to inhibit the more vocal students as a result of setting rules, but through the use of the "round robin" technique all students had the opportunity to contribute on several occasions. I did, however, negotiate with them to speak one at a time as the most effective way to communicate clearly with the recorder going. All

participants were boys although the school is co-educational, indicating the extent to which technology in the area of hard materials is male dominated in this school. Seven main themes were identified within these interviews.

Interview Focus: Views of technology education

<u>Response Theme 1:</u> The senior programme requires identifying and working with a stakeholder (questions S1, S2, S3).

The course for Year 13 is called "design technology" and involves Level Three NCEA technology which includes solving a problem for a client. Level Two students were using their teacher as their client. He gave them all the same brief and they were working on individual solutions.

> *Like Level 3 you go out and look for a business and you talk to the client and ask them what they want you to design and if they've got a problem and you solve it and design it for them to a standard – to specifications.*

<u>Response Theme 2:</u> Student reasons for selecting technology as a subject relate to staying together as friends, their perceptions of its content as easy, and their future careers (questions S1, S2, S3).

Students' reasons for taking the subject ranged from them wanting to be with classmates and friends, and the belief that it would be easy. These students were all boys. Two students saw it as being good for their careers as an engineer and plumber, respectively.

> *Because I thought it would be easy…*
>
> *… Because of all the classmates…*
>
> *…Well I thought it would be good as a career. Helps you with your career…*

<u>Response Theme 3:</u> The subject has too much paperwork (questions S3, S8, S9).

Some students found that there was too much paperwork which was a disincentive as they had expected to focus on making things.

> *…I thought it was going to be easy until I saw all the paperwork we had to do.*

> *I just wanted to make stuff.*

Interview Focus: Learning in technology education

Response Theme 4: Learning in technology is about developing skills (questions S7, S8, S9).

Students see the learning in the development of their skills. They enjoy designing and then "building" their design. They see this as an intellectual challenge for them.

> *I think it's good for me…*

> *…I really enjoy it, it's a lot of paperwork but in the end you get to build pretty much what you want…*

> *…You've got to be onto it to achieve otherwise you get left behind, it's just another thing…*
> *…Makes you, exercises your brain…*
> *…Makes it a bit more of a challenge.*

Interview Focus: Assessment in technology education

Response Theme 5: Students see assessment as a measure of how good they are and as a means of getting qualifications (questions S4, S5, S6).

Students believe the purpose of assessment is to inform them if they have passed, met the standard or met the criteria. They see themselves as being assessed so that they can get the credits and go to the next level. It is their view that assessment is for them and for their prospective employers.

> *To see if we've passed…*

> *…If you've met the standard that is asked of you…*

> *… If you've met the criteria…*

> *…To see if you're good enough to step it up to the next level…*

> *…For employers.*

<u>Response Theme 6</u>: Students think external achievement standards (NCEA) are not reliable (questions S4, S5, S6).

In terms of which type of assessment they think is best, they refer to the internal achievement standards as being the preferred method.

> *Because you get to work with the teacher so that way like you actually know what they want instead of just getting on a piece of paper blah, blah, blah, do this.*

The students had a different outlook on the external achievement standards, possibly based on experiences from their previous year where a number of students did not achieve some external standards as they and their teachers had misinterpreted some of the criteria. Also they saw some inconsistencies with the results, where some students reached the standard and others did not.

> *A lot of time we don't know what they want. So we just, you know we're told what's what and then the teacher knows to an extent what the external assessment they want but we don't... you know,.. what are we supposed to do?*

Interview Focus: Technology education in the future

<u>Response Theme 7:</u> Students want to have a choice of project and how they do them. NCEA makes it less relevant (questions S10, S11, S12, S13, S14).

The students would like in future to be able to choose their own project so that they can achieve what they make. Students interpret technological knowledge as knowing about technology in life and in the future. They also see technological practice as putting their ideas into practice and then they see technological literacy as talking, writing and making speeches. In stating this, though, they would like some guidelines so that they know what is needed. They ask for more funding to give them better resources and a bigger choice of tools to use and more opportunities for practical work as the volumes of writing required make the technology courses boring and time consuming. In terms of the open-ended nature of technology, the students find it unhelpful. They also found NCEA less relevant.

Technology's gone downhill since NCEA. Why? Because they've made it more hard-out. You have to try and do the paperwork and all that kind of stuff, but when it was School Certificate it was more laid back…

…We're just here because everyone else is here…

…But the veterans in the class, you know, we took it because we found that easier than say like biology to get our credits and stuff like that…

…It's something useful that we will have…

…The main thing is people. They start doing the paperwork - they don't understand how to do it and stuff like that but once you've done it for a year it comes more easily.

4.1.4   Summary of responses from School A

The results from the previous sections have been summarised in the form of three tables, one each for the principal, teachers and students. Two levels of interpretation are presented. The first level records the response themes, but these have been rearranged from the order they were reported to enable the clustering of ideas. The second level then codes these themes into groups under a common label.

Table 4.1: Breakdown of responses into summary ideas – School A principal responses

Level 1: Response Themes	Level 2: Grouping of Responses Themes
• The Principal is advised by the Head of Department: technology • Implementation of technology education is influenced by the Head of the technology Department	*Curriculum control:* The Head of Department directs and controls curriculum implementation and resourcing in technology education
• School resourcing will be influenced by the future directions for technology education in the school • School resourcing is also influenced by the nature of its personnel	*Resources:* Human and physical resourcing for technology is guided by existing staffing and will be influenced by future pathways.
• The new technology curriculum is not meeting the needs of students • Timetabling is a response to students' choices and they want technology to be 'hands-on' • Student needs, wishes and attitudes to assessment drive their choices. Assessment should be incidental.	*Student choice:* The school responds to students' choices.
• Recommendation for schools to specialise in particular areas of technology	*Idealised structure:* A new school model is needed to enable effective technology teaching and assessment

Table 4.2: Breakdown of responses into summary ideas – School A teacher responses

Level 1: Response Themes	Level 2: Grouping of Responses Themes
• The curriculum is difficult to interpret and PD has been inadequate • The technology teaching team includes a range of perspectives on, and approaches to, the technology curriculum • Technology education needs to have academic status	*Curriculum:* The curriculum is unclear, PD is inadequate, but the teaching team use their own background and experiences to design the content and assessment; technology needs greater academic status
• Students learn through technological practice • Encourage students to extend themselves	*Learning:* Students learn through technological practice and by being extended
• School resources and students' choices drive what teachers offer • Students are not aligning with the new technology	*Student choice:* Resources and student choice drive what is offered; students want hands-on content
• The programme uses mixed methods of assessment; NCEA forces teaching to the assessment	*Assessment:* Variety of assessment strategies used, but NCEA forces teaching to the assessment

Table 4.3: Breakdown of responses into summary ideas – School A student responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• The senior programme requires identifying and working with a stakeholder • The subject has too much paperwork	*Curriculum:* Senior technology requires working with stakeholders but involves too much paperwork
• Learning in technology is about developing skills	*Learning:* Students want more independence in what and how they carry out their technological activities
• Students see assessment as a measure of how good they are and as a means of getting qualifications • Students think external achievement standards (NCEA) are not reliable • Students want to have a choice of project and how they do them; NCEA makes it less relevant	*Assessment:* Assessment is seen as being for qualifications but external assessment is not viewed as being fair
• Student reasons for selecting technology as a subject relate to staying together as friends, their perceptions of its content as easy, and for their future careers	*Motivation/Choice:* Students have a narrow understanding of technology. Their decisions to study it are based on social and vocational reasons and the idea that it is easy

4.1.5 Summary ideas overview from School A

As noted in Chapter 3, School A is a small, suburban, co-educational, decile 4 school. The interview with the principal identified themes that were coded as "curriculum control", "resources", "student choice" and "idealised structure". From the principal's perspective it appeared that the HOD controls the implementation of the curriculum, but this is affected by the background and qualifications of existing staff as well as students' choices. Physical resourcing will be influenced in the future by the direction that the school takes based on consultation with all stakeholders. The principal believed that a new cross-school model is needed with each school offering their particular specialisation in technology and students moving between schools accordingly.

The interviews with teachers also identified four categories of responses, namely, "curriculum", "learning", "student choice" and "assessment". The comments of teachers indicated concern over clarity of the curriculum and the adequacy of professional development. Programmes were designed based on the background and experiences of the staff but taking account of resources and students' choices and their desire for hands-on content. The teachers believed that students learn most effectively through technological practice and by being extended or challenged. Although a variety of assessment strategies were used, the teachers expressed concern that NCEA forces them to teach to the assessment.

The students' responses were coded under the labels: "curriculum", "learning", "assessment", and "motivation/choice". The comments of students indicated that they work with stakeholders but that the curriculum involves too much paperwork. Students would have liked more independence in deciding upon, and carrying out, technological activities. It appears that students interpreted technology in a narrow sense and their reasons for selecting the subject appear to be based on social and vocational interests. The students viewed assessment as important for qualifications but they expressed concern about the fairness of external examinations.

While each of the three interviews identified differing perspectives, there is a level of coherence in the responses. It is clear that what is offered is influenced by the HOD and takes account of the teachers' backgrounds and experiences as well as choices and interests of students. There were concerns expressed with the new curriculum

indicating dissatisfaction with its clarity and the need for greater focus on a hands-on content in line with students' motivation for studying the subject. Assessment was also seen as problematic by teachers and students – NCEA appears to direct the curriculum and is perceived as unfair by students when referring to external examinations.

4.2   School "D"

4.2.1   Interview with principal

This interview was recorded over the phone at the principal's request, due to a tight time schedule. Four "overlapping" response themes were identified during this interview.

Interview Focus: Implementation of technology education in the school

Response Theme 1: Teachers effective in the new technology are needed (questions P3, P4).

The principal is in agreement with the direction of the national "syllabus" (this is the principal's term for "curriculum"). She believes that technology requires an effective teacher to lift its profile.

> *There are well meaning old dudes with trades backgrounds and then there are highly educated architects who get frustrated working with the old dudes.*

Response Theme 2: The technology curriculum has the status of add-on to an overcrowded curriculum (questions P3, P6).

She also believes the technology curriculum has been imposed on an already crowded curriculum. It has the status of an add-on curriculum area, making the staffing of this subject difficult.

> *The Ministry keeps increasing the curriculum and so technology becomes an add-on, tack-on…*

> *…There are no soft materials or home economics classes as there is a need for more teacher time. Across schools it has become very "Mickey Mouse". The overcrowded curriculum.*

Interview Focus: Teaching technology

Response Theme 3: Shortage of technology teachers who relate to the New Zealand context (questions P6, P7).

A teacher needs a good relationship with the students where there is a good rapport and control. The principal also believes that technology teachers are not being trained and so they are being recruited from the United Kingdom where they are not familiar with the New Zealand curriculum or the cultures in New Zealand schools.

> *...they are being recruited from the UK where they are not familiar with the NZ curriculum and where, in this school there are 30% Polynesian students. These teachers don't know how to relate to them.*

Interview Focus: Technology education in the future

Response Theme 4: Technology needs more resources and status (question P10).

The principal sees the status of the technology curriculum as needing a lift through the resourcing of competent teachers to promote it.

> *There needs to be a policy that if NZ is to have saleable products and move ahead to wow the world market then technology needs more resources, more grunt and more priority.*

4.2.2 Interview with teachers

Two teachers took part in this interview which took place in the department workroom. They were the HOD, who is also the graphics teacher, and the technology teacher who teaches technology from Years 9 to 13. This interview resulted in 18 main themes, each of which is discussed in turn.

Interview Focus: Implementation of technology in schools

Response Theme 1: Teachers plan collaboratively, knowing they have support from the principal and Board of Trustees (questions T4, T5, T6, T9).

The teachers feel as though they are being supported by management and so they can submit suggestions and the principal will follow up on them with the Board of Trustees and return the following day with permission to proceed.

> *She* [the principal] *trusts what we're doing...*

… And in some of the initiatives like we had, we went to the board meeting and presented at the board and they were very supportive of us…

… We just kind of you know submit some suggestions, things that would make it better and X [the principal] will come back the next day and say yep okay.

Response Theme 2: The technology programme is guided, rather than driven, by NCEA assessment requirements (questions T7, T8, T9, T10).

The newly appointed technology teachers at this school during 2005 had to re-design the technology programme from a traditional framework to one that suits NCEA Levels 1, 2 and 3, and also in consideration of student knowledge and abilities.

Yes I've just planned Level 1, 2 and 3. So basically we needed to re-plan them. They didn't fit with the context of the ability level of the students and it seemed to be design technology….

…We've got a free reign. And so the sky is the limit as far as I am concerned – yeah…

…We've changed. We've redone all of the technology programmes and graphics.

Response Theme 3: Staffing is limited (questions T9, T10).

The programme cannot provide a teacher for technology NCEA Level 3, so students who cannot work independently are filtered out. With only three students remaining in the group, they work independently with regular mentoring from one of the technology teachers. The teachers explain how technology was decimated in the school over previous years due to the nature of staff knowledge and capabilities. It has provided, for them, a big challenge to rebuild its popularity. They believe there has been an excellent response from the students doing NCEA Level 2; however, the curriculum support resources for this have been limited.

Because of the nature of where the subject has gone it has diminished so it's actually building it up to where there is no choice. We have to have a stand-alone class. So I have them for 1 hour on their own an I've filtered them to be 3 because Level 3 is that much of a jump up to

actually go out and find a client and that's what I believe I had kids doing that at Level 2 so I should see at Level 3 they should be able to actually go and formulate their own context and actually have a client. So there are three that are doing the Level 3.

The teachers who are involved in teaching technology are spread throughout the school in different departments as a response to the resourcing need for teaching the subject.

It's disjointed because of the geography basically. We do, yeah I do pop over there and we share membership and they're both part-time teachers

Response Theme 4:   There is reluctance across schools for technology teachers to share their knowledge (question T6).

The teachers feel frustrated at the culture that has developed across schools in this area, where technology teachers need to network, but instead, many are finding their own way, with their own interpretations and then keeping their work to themselves.

Because you know that information isn't readily available unless you go hunting and I mean how much time, we're supposed to be in a classroom delivering you know…

…And we get, we get phone calls and stuff asking and there needs to be more of that. A lot of teachers that are doing really well are not sharing. That seems to be the message coming through. But it's the old head space that you know, sharing the knowledge.

Interview Focus: Views of technology education

Response Theme 5: The teachers embrace the technology curriculum document (question T2).

There are two teachers in this team – the HOD was teaching graphics at the time of the interview, the other teaching technology to Year 13. The HOD is a recent Diploma of Teaching graduate, following a career as an architect, and the second teacher has come to the school with a background in early childhood education, Montessori and secondary teaching. Both teachers have embraced the new

curriculum. The HOD explained that his first encounter with technology was when he was still deciding whether to be a teacher. He was required to spend a day in a school and the teacher there introduced him to the curriculum document and he was convinced from then.

> *I thought in those days, "woodwork and metalwork" but it's now called technology. Spent the day with him and he kind of showed me that thing now that we now know as the "Chockie Dockie" and he said "Take this home and read it." And I did and I thought, "Wow! There was nothing like this when I was at school." I thought it was the most fantastic thing. I thought it was the coolest thing and I had no idea and I had no understanding at all of what people thought about that document. I took it home and thought, "Wow, if this is a subject that is being taught in high school, I want to teach it".*

Response Theme 6: Teachers' interpretation of the technology curriculum is varied (questions T4, T14, T15, T16).

Technological practice is seen as including the underlying intention of all three strands in the curriculum.

> *What, how and why. So society is the why, is there any point in developing a new toy. So it's a societal thing*

Technological literacy is viewed as "fluency" in relation to technological processes.

> *I think of it as like someone who is playing a musical instrument. It's like the fluency that comes, when you have a familiarity with the instrument you can then, you can play set pieces quite easily but then you can also experiment with new things that, or sight reading it's like a familiarity which enables you to explore you own little thing.*

The interviewees believe that some teachers are still floundering over the interpretation of the technology curriculum and a number of them were teaching technical subjects prior to the gazetting of technology.

> *I think they've got in their mind – woodwork, metalwork, sewing and…*

...Forget about teaching kids how to change an oil filter on a car cos' when you're in an apprentice ship you learn that...

...So I believe that technical skill stuff shouldn't really be taught in schools I don't believe.

<u>Response Theme 7</u>: The new technology should promote student confidence and provide challenge (questions T3, T5).

The interviewees are of the opinion that at secondary school level technology education is seen as providing students with the opportunity to try new ideas and give things a go. They believe its focus should not necessarily be on academic rigour.

I think technology education, what it is for – I reckon philosophically the purpose of high school is not really to make kids special or experts at specialist things, it's to make them confident at giving things a go and kind of developing your own character and your own viewpoint and feeling confident with the world...

...once they start feeling good about themselves then they start to think I've got this under control, now what about my design and my research and my analysis.

Interview Focus: Teaching technology

<u>Response Theme 8</u>: Students respond well to the new approach (questions T5, T6, T9).

The teachers believe they now have the possibility to show the students a pathway to university via technology and design school. The numbers of students taking up graphics at a senior level are booming. The traditional status of technology had it ranked as the subject for students with lower academic ability. This traditional status makes the choice to take technology as a subject nowadays a brave one.

You see you've got some kids who do graphics and technology who are bright. They're kind of deciding "Am I going to be an optometrist or am I going to be an architect?" and they're thinking about that at Year 12 and it's a really gutsy thing to decide. That's a big decision, you know, and it's quite a brave student who says "No, I'm going to do technology. I'm going to do graphics at Year 13." That's kind of a

gutsy thing. And so, because their parents grew up in an era when tech drawing was a dummy's subject…

…That's one thing that struck me – it was the idea that kids could actually adapt stuff from their own cultures, their own experience, their own – make stuff meaningful to themselves – which – I don't know whether maths does that or – they probably do but that's the thing that appealed to me was that…

…When we had Level 2 I was rapt with … once we got over the "Oh God this is totally a different focus" they really put lots of work in to actually try and understand technological practice, how it all fits together, why they're doing it. Um so they really did work hard…

Response Theme 9: Need to rewrite curriculum in simplified language for the students (questions T9, T11, T12).

The teachers identified a need to rewrite curriculum material into simple language so that the students can understand it.

> *… rewrite it and I actually use that version (referring to a simplified version of the achievement objectives) and what I did was the steps on the board for the students. And got them to follow the steps and they understood that in the very simple language…*

> *…Well language, English language is a barrier for some of our students, let alone for the English speakers.*

Response Theme 10: The newness of technology leaves too many grey areas (question T12).

Although professional development has been offered for technology education the teachers have found the facilitators struggling with uncertain material.

> *…but there's too many grey areas and one subject that can't afford to have that because you know it's been a little bit hard to implement.*

Interview Focus: Learning in technology

Response Theme 11: Students respond to technology education as diverse learners (questions T11, T12).

The teachers note that some students start to do some creative thinking that has been locked away, while other students will just do what is required in order to meet criteria, using given examples as templates to work from. The teachers feel they are dealing with students of all abilities, with a range of approaches and learning goals.

> *…when they do their own design you can see that they're really, they've really got it and for the rest of their life they will. It's been locked away. But other kids they're kind of, well, show me an example of what was achieved last year and you get it out to just kind of show and here's an achieved, here's a merit. And they go oh, oh that's what I have to do and then what happens is one of those kids will start like not copying but they'll kind of use the same format and all of a sudden you're taking the work for like checking half way through and all the kids that have sat at that table you can tell they've all been talking to each other and it's all based on the same kind of like achieved standards from last year. You think what are you doing? You're just kind of going through the motions…*

> *…Some kids you know they really, they really do learn. Others, they just play the game.*

Response Theme 12: Students reach secondary school with a lack of prior learning in technology education (questions T11, T12).

The teachers see the students arrive at secondary school having experienced a subject in Year 7 and 8 called "technology", but they have no prior knowledge of technological practice as described in the curriculum. The students usually have developed some technological skills such as measuring, cutting and joining timber, but in isolation of the other important components of technological practice.

> *To be honest with you when they come to Year 10 I feel they don't know a thing, and because they've had technology at Year 7 and 8 as well…*

> *… But they come in, and to me, the skills are part of it but the curriculum needs functional solutions to fit the purpose…*

...It's getting in the way with not having that joinery craftsmanship aspect which is hard for some of the older teachers.

The interviewees believe paperwork needs to happen in the junior technology education programme so that there is a build-up to make it easier at senior level.

But the paperwork I mean you'll get that complaining about the paperwork if it's not in the junior programme. It should slowly build up so it becomes easier for them.

Response Theme 13: The learning needs to be made relevant to the students (questions T11, T12).

The teachers see that the students need to have ownership of their technological activity. When they are given a choice of what to do they come up with some original ideas.

I said well this is what we did this year and they go oh what about if we did such and such. And we just sat down and talked about it. And they had some really cool ideas you know.

...when kids can relate it to something that's meaningful then you can, they switch on.

The use of situated learning opportunities in technology, therefore, gives course activities meaning and encourages student motivation.

So I reckon if kids engage then you've got the battle won. And that's all there is to it really...

...If they can see like a meaning and kind of like a purpose for the [activity], it just kind of makes sense you know and it's more real and they kind of think they're not just going through the motions.

They agree that having a genuine need or opportunity and using a stakeholder motivates the students. Those who choose their own client and write their own brief tend to do better.

Reading in the reports the people that did better actually chose their own client and actually wrote their you know whole thing so I think that Year 10 start developing that and in fact it is great because they've

worked hard and I think if we narrow it so much, I mean it is tricky I suppose if it's too broad. I mean if you have the same breadth and same specifications you end up with similar outcomes. But it's quite nice having different outcomes.

Interview Focus: Assessment in technology

<u>Response Theme 14</u>: NCEA can allow for technological practice (questions T7, T8).

With NCEA now having been implemented for three years, the teachers feel that they are able to settle down and focus back on technological practice, where assessment falls into place as part of the whole process. For example, they have confidence now that supporting sound technological practice in teaching and learning provides for assessment requirements without having to design programmes based directly on assessment criteria. In their conversation about how they have developed their programme for NCEA to Level 3, they say:

> *…we're almost going back to technological practice or just basic good teaching and then almost not worrying so much about how it's going to be assessed…*

> *…Just kind of do normal holistic technology practice or graphics or whatever and the chances are if you do that, you're going to cover this stuff* [NCEA requirements] *anyway and now I think because I'm feeling a bit more comfortable with NCEA and I have a bit more faith in the way it's marked externally. That's the way I'm leaning now.*

Their experience tells them that if good practice is employed, learning can happen without it being driven by assessment.

> *…we can step back from it and look at it at the big picture and kind of think well if we just get the process right then we just trust that the assessment will take care of itself.*

<u>Response Theme 15</u>: Student motivation is influenced by workload and assessment (question T8).

The teachers interviewed recognise that the workload between subjects is not equitable. In their view, NCEA for technology and graphics requires more input than many other subjects.

> *I have to admire the kids who do graphics and technology. It's a lot of work for those credits…*

> *…it's a sad fact that the kids will look at it and they will ask if this is being assessed and if it's not, they'll think oh well it's not a real lesson.…*

In their experience, they note that the students will balance up the workload and choose the easiest route.

> *…they* [the students] *look in detail at what they have to do and they will make sure that they do it but they won't do much more…*

> *…For some kids assessment is like a finishing line and as long as they get over that finishing line that's all that matters.*

They also note that the students need to be able to trust the assessment system. Students need to have trust that there are not going to be any surprises.

> *…like with my Year 13 kids this year, they did a project where they had to, they write their own specifications and go and find a client and in a way right at the start of a project they are saying the way they want the final thing to be evaluated. You know like negotiating the specifications and the criteria then they really can't go wrong because as long as they do that then there are no surprises at the end and I thought that was really good you know.*

<u>Response Theme 16</u>: There is a developing gap between achievement standards and unit standards (questions T17, T18).

The interviewees acknowledge that there is a wider belief that technology as it is presented in the achievement standards is aimed at the more academically inclined student whereas unit standards are better oriented to those with a trades focus.

I think there is a place for unit standards and offering a pathway. I mean I think that technology will develop into more an academic subject and unit standards will continue and you will see that split…

…But that's okay because you're meeting the needs of the kids…

…It's all changing but you have to undo so many barriers.

Interview Focus: Technology education in the future

<u>Response Theme 17</u>: Acquisition and retention of technology teachers needs to be promoted (questions T17, T19).

The technology teachers at this school believe that technology education needs to be promoted and supported for new teachers to both enter and stay in the profession. There have been many retirements since the gazetting of the curriculum in 1999.

I think it's got to be fun for the teachers to stay in the profession. It actually does need to be supported because there is a lack of it and there's going to be more [teacher shortage] *because they're retiring you know and how many* [not enough] *are being trained?*

<u>Response Theme 18</u>: New pathways are developing beyond secondary school (question T17).

Opportunities are opening beyond school for technology education students. Tertiary schools of design are numerous and performing arts is becoming a viable career option.

Well there's something opened up through the performing arts.

And costume making. Very exciting stuff. And I reckon that will be fantastic. And you know they just about go and get a job there.

In this school, the technology programme changes each year as new opportunities appear. The teachers see it as a dynamic curriculum and resources need to be developed and adapted to meet the changes.

… but so I want to combine fabric and you know so we're looking at puppets and they actually created, it's quite interesting because they're in that workshop with the materials they go for wood. But you know so I have changed a bit for that…

4.2.3 Interview with students

This comprised a group interview with the Year 13 technology students, of whom there were only three, mostly working independently of the teacher. This interview resulted in 17 main themes, each of which is described in turn.

Interview Focus: Views of technology education

<u>Response Theme 1</u>: Technology is about solving problems for your own clients (questions S1, S2, S3).

The students see technology as all about finding your own clients. They view it as being harder than previous years as it is original. The process involves their own research and design, using a broad range of areas and materials. The constraints relate to costs so they tend to choose projects that involve skills and materials that are accessible.

> *We identify our own clients, so we've got to go out in the community and find someone who we want to design for and then identify an issue. So it's actually giving you, just go out and do something with a brief, you have to go out and make your brief and find your own client and find your own issues. So that's a lot harder this year and it has to be something that hasn't been invented before you know so it has to be something that isn't freely available in the market...*

> *...Because once we've gone through that and done all the paperwork we have to make what we set out to do so it's not just design, it's you know finding materials and making and constructing, like woodwork or soft materials or like metalwork. Quite a broad range of materials...*

> *... Like because we have to find our own like projects, that would be quite unlikely to choose an issue where we're involved in electronics because of the expense to construct something like that....*

<u>Response Theme 2</u>: Decisions not to take technology as a senior subject are related to students' understanding of future pathways with this subject (questions S1, S2, S3).

The students say that with no one explaining to them where technology leads to at tertiary level, the numbers drop due to the perception that the course does not head anywhere. With the case of this class being without a teacher due to low numbers, the students who were eventually selected need to be able to work independently.

...and people have pulled out over the years because up until last year everyone thought that there would be no seventh form equivalent for tech...

...This is the first year they've had a seventh form technology class, a lot of people in fifth form or whatever had to choose, like me, had to choose between art and materials technology, so we lost quite a few people there. I'm sure in the fourth form classes there were two classes of 24 people, because I remember they, they were taking people in the fourth form and then fifth form when everyone found out that it didn't go anywhere. They just dropped it.

...There were a lot more people interested in doing materials this year but they weren't allowed to because we have not [got a teacher], *like basically it's a non-contact subject so we just do without a teacher...*

Response Theme 3: Student choices not to take technology as a senior subject are also related to its perceived status as a subject, or the known workload involved at this level (questions S2, S3).

The students say that technology is seen as a "dumb" subject by those who think of it as it used to be, as a subject suited to those students who were not good at paperwork. In actual fact the paperwork now required in technology is more than other subjects.

I think the other thing too is like heaps of people perceive, like who haven't done material design, perceive it as like a dumb subject, and that it's really easy...

... The ones that weren't good at paperwork they would do materials...

... was amazed at the amount of paperwork I had last year, you just looked at my book and went there's pages and pages of it .

...It's certainly set up from the university training, that critical thing but it is a bit of a shock and if they do graphics and technology together there's a huge amount of work.

<u>Response Theme 4</u>: Students who have chosen to take technology as a senior subject have prior knowledge of what it is about (questions S2, S3).

The students who have chosen to take Year 13 technology have seen the way it allows for independent problem solving. One student saw her sister do it until Year 12 and other students became inspired in Year 10.

> *…and I saw the stuff what she* [sister] *brought home and what she was making and I kind of wanted to do that as well…*

> *…And that's why I think it's so wonderful to see students come say in Year 10 and by Year 13 like I don't think they realise how independent, what skills they're picking up by doing this now and I've just seen a change from last year in them and it's not down to the teacher's direction, it's actually down to their training and problem solving and when they're at university I mean they'll find it an asset and also if you go into marketing, areas like that.*

Interview Focus: Learning in technology

<u>Response Theme 5</u>: Learning in technology education is supported by booklets produced by the teacher (question S7).

The students appreciate the fact that the teacher translates from exemplars to make the terminology and the requirements understandable to the students.

> *We didn't have anything last year but I believe she's done them for like Level 2 and Level 3. It's real good just to refer back to all the time. It's got all the explanatory notes about what the stuff actually means.*

> *That's what we need because it's sometimes hard to understand. Because she has, she has the one off the website, she has her own translation of it which is great.*

<u>Response Theme 6</u>: Students find the language and terminology in technology education unhelpful (question S8).

There is agreement amongst the students that the language used in the technology curriculum is obstructive. They believe that they need definitions and support regarding this terminology, especially with them working independently.

I guess some of the stuff is like, when you're working independently it's got these hard core definitions and they're pretty much in a different language, just you know over our heads all the time we're sitting there and just having to ask each other what does it actually mean…

… The translation of what they're actually asking you is probably the hardest part because once you actually understand what they want it's not a problem at all…

…But it's basically the same with the next step but the definitions of exactly what we have to do is getting harder and harder.

<u>Response Theme 7</u>: Access to resources to support learning in technology is difficult (question S8).

The students see the difficulties of access to information regarding technology as discouraging them from trying new and different things. With the workload, time span and lack of clear access to resources, they feel pressured.

There are no text books whatsoever. There's nothing like that for not even like even technology subjects that aren't so popular because not so many students do them. They haven't actually come up with those kind of books and anything you can find is always American or British, of no relevance to what we're studying so you're sort of sitting there going; How can we match this with this?

…The other thing is like finding books on like research information. I find that real hard. The materials. Especially if you're doing something that's not so practical you know and you want to do something a little bit out of the ordinary. To find information about say if you wanted to use a plastic that they use like quite industrialised every day, but to actually go out into the shop and try and buy it is another thing. You know it's a lot more difficult they just don't have it like that.

There's not the access we would want. So then if we ever have a subject that has that plastics in it, I mean they have books and that sort of thing and although they're helpful, like sometimes you want to do something a little bit different, using unusual materials.

<u>Response Theme 8</u>: The students develop technological solutions ultimately to meet assessment criteria, not so much for the use of the clients (question S9).

Although the students are developing technological solutions for assessment purposes, they would like to see them being utilised beyond the assessment as real solutions.

> *Well mine is, we're developing a school regulation pack, you know I wouldn't mind if maybe the principal came up to me and goes well I like your idea so much we might actually use it. It's really debatable whether or not that would happen. I don't know if I'm that good a designer to please everyone out there. I think the other thing is like at the moment our priority is the grade that we achieve and then it would be a bonus if the idea actually went into manufacture but the grade overall is what you're aiming for regardless of whether you turn out something that's never going to be used again or that could be used in everyday life and then manufactured at the 10,000s you know. Yes but the main aim for us is just to get that grade.*

Interview Focus: Assessment in technology

<u>Response Theme 9</u>: Assessment motivates the students to meet criteria and deadlines (questions S4, S5, S6).

In their opinion, assessment motivates them to meet deadlines and provides them with criteria to meet.

> *The assessment actually motivates you into actually do the work…*
>
> *…It shows us what we need to do…*
>
> *…If I don't know a due date to actually have to have this finished by, I would be bumming around.*

<u>Response Theme 10</u>: Achievement standards are preferred to unit standards because of the range of grades available (questions S4, S5, S6).

In comparing the national assessment methods of unit standards with achievement standards, the students explain their preferred model is achievement standards as they allow for variation.

With the unit standard it's like you can do exactly what's written on the criteria and with this one [achievement standard] *where it's graded, you know, "Excellence", you can have more information and it makes it seem that much more depth to what you're making.*

Response Theme 11: Students want benchmarks to compare their work with (questions S6, S9).

The students feel as though they are working in a vacuum as they have no examples to measure their work alongside.

Because we don't have anything to compare our work with because there's been no Level 3 materials before so although they have it on the website but you want something you can actually look at and relate to.

They would also like to network with their equivalent levels in other schools so that they can know how their work compares to a wider technology learning group.

It's hard to compare yourself to others because you can look at your class and that's graded on one sort of level standard and then you send it away and you don't know whether or not this marker has a very high standard or a very low standard and whether or not some of the other work she saw was absolutely amazing. Yeah I think that's the hardest thing. We don't know what's going on in the other schools. Like it would be really interesting to get together.

Response Theme 12: Students have lost trust in the external assessment system (questions S4, S6, S9, S14).

The students have expressed their lack of faith in the external marking system for achievement standards in technology. This has come about through personal experience.

Oh well we had one external where we sent all our work and pretty much half the class failed and half the class passed because they got two different markers and unfortunately I was in the half that failed. I still had much more than some of the people that passed so I'm very much not happy about that. That was what happened in fifth form. We

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did an assignment and we had to like hard out go and find all this information about how trees grow and just do research about wood and then you have to move on to metals and plastics and so for last year a lot of people just submitted that fifth form work and chucked out their paperwork and had one page linking it to the actual work during the year. Whereas people like XX who had pretty much done it all over again, and actually linked and still not achieved.

Another observation was that the assessors do not seem to be taking in all of the reading. This was commented on by these students more than once.

I kind of have the feeling that they're just in there going through it because they have so much work to go through, they just go through it and they don't seem to take in all the reading…

…I think more reading what we actually write you know I think I don't know if they actually, I don't know if they actually do it or not. Because we actually sit there and do heaps of work like writing and incorporating all these technological things and all that kind of thing and then you sometimes wonder how they mark it. Like do they actually just go through the words you've used or do they actually read what you've actually written and see how it relates to your project you're designing.

After striving hard to do well in achievement standards during the previous year, and then receiving "not achieved" results, the student finds motivation to re-do the standard difficult, especially when they do not trust the examiners.

Everyone's freaked out though because this whole scholarship board here you've got to wonder though because people at scholarship level have been marked that badly, what about the rest of us who are just at normal level, if the real brainy, smart, intelligent intellectual people don't pass.

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<u>Response Theme 13</u>: Internal assessment is a preferred method of assessment (questions S4, S5, S6).

The students' experience of internal assessment has allowed them to recognise the merits of assessment.

> *But internal assessments are so much more better. Like you can sit there and because your teacher is the one marking it she has the same standards for everyone with the class and she can sit there and say look at the moment, it is achieved level but if you do just a little bit more extra paperwork you will be merit level so you actually the chance and go back in and do a bit of extra paperwork just to help that grade up.*

Interview Focus: Technology education in the future

<u>Response Theme 14</u>: Technology education emphasises understanding and finding out (questions S10, S11, S12).

The students believe that technological knowledge is not just about what you already know. It is about being able to source new knowledge and knowing why.

> *…if you don't know how to do something, like say if it's weaving and you don't know how to weave but you're thinking about using it in your design, that would be going out and finding out how to weave, so it's not just what you already know. It's about going out and sourcing ways to find new skills…*

> *…technological knowledge is just understanding why you're doing what you're doing.*

On technological practice, the students see it as having knowledge and skills and performing them.

> *Because it's easy to find out how to do something but it's how to figure out how you can actually do it practically.*

The students' interpretation of technological literacy suggests a culmination of the practice components into action.

> *When you're technological…*

... So people like builders and architect probably just are technologically literate and they don't even know it. Because they just sit there and oh there's a problem got to go fix it.

Response Theme 15: Networking between schools is needed in future to strengthen the subject (question S13).

The students believe that networking between schools will allow for the sharing of resources, knowledge and a potential to remove the stigma about technology.

More communication between colleges so that schools can share resources…

…it's kind of shoved away like from the rest of the school while there is more kind of emphasis on science and maths…

…But it's still seen as a dumb like the teachers say, "What are you doing this year? Oh technology?" and they kind of look at you funny, "Why aren't you doing physics or something like that?" Well actually, "Why aren't you doing something academic?"

It's still a Level 3 subject you know if not more so. It's time consuming. So it's still got that stigma around it.

Response Theme 16: NCEA is accepted but external assessment practices need refining (question S14).

The students interviewed believe that external assessment should be carried out collaboratively.

Apparently one year the external assessment sort of happened at school and a whole group of assessors came in and just looked over all the paperwork together. I actually seriously think that is a good idea rather than some low level assessor sitting at his desk at night looking through the paperwork. Because when that assessor gets to interact with the people, get their ideas on what your mark is rather than just one person's opinion.

I mean don't get us wrong. We think NCEA is way better than the old assessments.

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<u>Response Theme 17</u>: Technology education should not be confined to traditional classroom settings (question S15).

The interviewees see that inspiration for design can be sought beyond the classroom. They are referring to the real situations in the community.

> *You sort of do the boring stuff like typing out your brief and your decorating and making sure that everything looks nice in sort of the classroom. But you do most of your coolheaded thinking outside the classroom.*

4.2.4   Summary of responses from School D

The results from this section on School D have been summarised in the same way as for School A: Tables 4.4 to 4.6 contain the details.

Table 4.4: Breakdown of responses into summary ideas – School D principal responses

Level 1: Response Themes	Level 2: Grouping of Responses Themes
• Technology needs more resources and status • The technology curriculum has the status of an add-on to an overcrowded curriculum	*Resources and Status:* Technology education needs to be adequately resourced and promoted; at the moment it appears to be add-on
• Teachers effective in the new technology are needed • Shortage of technology teachers who relate to the New Zealand context	*Quality of teachers:* There is a need for teachers to be effective in the new technology curriculum and to relate to the NZ context

Table 4.5: Breakdown of responses into summary ideas – School D teacher responses

Level 1: Response Themes	Level 2: Grouping of Responses Themes
• Teachers plan collaboratively, knowing they have support from the principal and Board of Trustees • Staffing is limited • Acquisition and retention of technology teachers needs to be promoted	*Staffing/resourcing:* Staffing is limited; there is a need to train and retain teachers competent in the new technology curriculum; teachers are supported by the management
• There is reluctance across schools for technology teachers to share their knowledge	*Networking:* There is a need for more networking between schools
• New pathways are developing beyond secondary school • The teachers embrace the technology Curriculum document • Teachers' interpretation of the technology curriculum is varied • The newness of technology leaves too many grey areas • Need to rewrite curriculum in simplified language for the students	*Curriculum:* Teachers embrace the new curriculum with pathways opening beyond school; teachers' interpretations of the curriculum are varied, there are grey areas in the content, and the language of the curriculum needs simplifying for students
• Students reach secondary school with a lack of prior learning in technology education • The new technology should promote student confidence and provide challenge • Students respond well to the new approach • Students respond to technology education as diverse learners • The learning needs to be made relevant to the students • Student motivation is influenced by workload and assessment	*Learning:* Students enter secondary school insufficiently prepared in the new technology, however they respond well to the new approach although being diverse as learners; the curriculum needs to be relevant to students' backgrounds, and provide challenge and promote confidence; workload and assessment affect student motivation
• NCEA can allow for Technological Practice • There is a developing gap between achievement standards and Unit standards • The technology programme is guided, rather than driven, by NCEA assessment requirements	*Assessment:* NCEA guides, not dictates teaching and assessment in technology; there is an increasing gap between achievement and unit standards

Table 4.6: Breakdown of responses into summary ideas – School D student responses

Level 1: Response Themes	Level 2: Grouping of Responses Themes
• Decisions not to take technology as a senior subject are related to their understanding of future pathways with this subject • Student choices not to take technology as a senior subject are also related to its perceived status as a subject, or the known workload involved at this level • Students who have chosen to take technology as a senior subject have prior knowledge of what it is about	*Students' Choices:* Students' decisions to study technology are influenced by prior knowledge of the curriculum, its perceived status, the workload, and future pathways
• Technology is about solving problems for your own clients • Technology education should not be confined to traditional classroom settings • Technology education emphasises understanding and finding out	*Curriculum:* Technology involves understanding and finding out, solving problems with clients, and working beyond the classroom
• Learning in technology education is supported by booklets produced by the teacher • Students find the language and terminology in technology education unhelpful • Access to resources to support learning in technology is difficult	*Learning:* Access to learning resources is difficult but students are supported by teacher developed booklets; students find the language of technology unhelpful
• The students develop technological solutions ultimately to meet assessment criteria, not so much for the use of the clients • Assessment motivates the students to meet criteria and deadlines • Students want benchmarks to compare their work with • Students have lost trust in the external assessment system • Internal assessment is a preferred method of assessment • NCEA is accepted but external assessment practices need refining • Achievement standards are preferred to unit standards because of the range of grades available	*Assessment:* Solutions, criteria and deadlines motivate students moreso than meeting clients' requirements; students want more benchmarks for self-assessment; students prefer achievement standards over unit standards, and internal assessment over external assessment; external assessment is not trusted and needs refinement
• Networking between schools is needed in future to strengthen the subject	*Networking:* Networking between schools is needed

4.2.5 Summary ideas overview from School D

School D, as described in the previous chapter, is an integrated catholic girls' school with a decile rating of seven. Two categories were identified as a result of the interview with the principal. These were coded as "resources and status" and "quality of teachers". In respect of resources and status, the principal believed that technology is currently viewed as an "add-on" subject to an already overcrowded curriculum and this needs changing. The principal felt that technology needed greater promotion as a subject along with appropriate resourcing to enhance its status so that it was on a par with other curriculum areas. The second category regarding the quality of teachers highlights the need for technology teaching staff who are effective in using the technology curriculum and applying it to New Zealand contexts. The principal believed that a shortage of these teachers exists and should be addressed.

Five categories resulted from the interview with the teachers in School D. These were coded as "staffing/resourcing", "networking", "curriculum", "learning" and "assessment". As with the principal, the teachers also highlighted the need to promote the acquisition and retention of technology teachers. They believed that support from the school management can help this. The teachers also identified the need for technology teachers across schools to support one another through networking and knowledge sharing. The category coded as "curriculum" emerged from a number of responses where the teachers saw the new curriculum as opening new pathways beyond secondary school. Although these teachers embraced the new curriculum, they acknowledged that interpretations of it are varied and the language and the content along with the newness leaves many grey areas. They believed the language needs to be simplified for students and their motivation is affected by the workload and assessment. The teachers design their assessment of technology using NCEA as a guide for their programme development rather than having NCEA drive what they teach. They also acknowledged that there is a gap between achievement and unit standards.

The students interviewed in School D numbered three. The categories were coded as "student choices", "curriculum", "learning", "assessment", and "networking". The students believe that prior knowledge of the new technology curriculum and its

possible future pathways influenced their decisions to take this subject at senior level. They also believed that its perceived status along with their knowledge of the workload influenced these decisions. They interpreted the new curriculum as involving the need to go beyond the traditional classroom setting and to work with clients to solve problems; technology involves understanding and "finding out". They believed that access to learning resources is difficult although they acknowledged teacher support through the development of booklets. They found the language in the curriculum unhelpful. The students felt that their goals to meet assessment requirements and criteria directed them and their efforts more than a desire to meet their clients' needs. They expressed a need for a set of benchmarks to self-assess their progress and achievement. They preferred achievement standards over unit standards as the former provide a range of grades, and they rated internal assessment as more effective than external assessment, as internal assessment provides feedback whereas external is seen as not being trustworthy. The students believed that networking in this subject between schools will further strengthen it.

The principal, teacher and student perspectives, as with School A, also contain some commonalities, despite their different experiences of the new curriculum. The status of technology was a concern for all three groups, where the principal viewed the subject as an "add-on" to an already crowded curriculum, and teachers acknowledged that the newness of the curriculum allows for varied interpretations. The students also mentioned that the status of technology (along with workload) influenced their choice as to whether to take the subject or not. They also made reference to the language it contains as being unhelpful. The principal and teachers expressed similar concerns regarding the shortage of technology teachers who understand and implement the new technology curriculum in a confident manner within its New Zealand context. The teachers and the students expressed a common concern for the way the assessment can drive the technology programme; however, the teachers felt that they had avoided this problem to a large extent. The students also felt that a gap existed between the achievement and unit standards; they also indicated a preference for internal assessment as the teachers are able to guide them and give them good feedback on their work.

Part B – Results for Schools B and C

As described in the introduction to this chapter, Part B provides a summary of results for Schools B and C. These results are not given in detail for the reasons noted earlier: the results for Schools A and D are sufficient to illustrate the research process of coding material from the interviews into themes, and some similarities exist between Schools A and C and between Schools B and D in respect of their decile levels and, to some extent, the nature of the results. The focus of this section is therefore on the "summary" tables for Schools B and C. The tables for School B are presented first, followed by a summary description for the school's data. The same is then done for School C.

4.3   School "B"

Table 4.7: Breakdown of responses into summary ideas – School B principal responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• The repositioning of a traditionally non-academic subject as an academic subject is a challenge. Choice of both pathways are still offered • School management needs to understand the new technology curriculum • Student-centred learning incorporating problem solving is a model the school wants to promote	*Curriculum:* The school promotes student-centred learning, providing both academic and non-academic pathways; there is need for greater understanding of the new curriculum within school management
• Need to find teachers with an understanding of technology education as opposed to technical education	*Staffing:* There is a need to find teachers competent in the new technology
• There are physical constraints within the school for implementing the new technology programme	*Resourcing:* Physical constraints limit the implementation of the new curriculum

Table 4.8: Breakdown of responses into summary ideas – School B teacher responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• Class sizes rely on students choosing technology for pragmatic reasons, in particular, workload for credit rating	*Student Choice:* Students choose technology for pragmatic reasons such as the need to balance workload against credit rating
• There is a shortage of technology teachers with knowledge of the curriculum and the required experience and qualifications • The background experiences of teachers and their qualifications influence responses to the technology curriculum and choice of assessment pathways (achievement or unit standards) • Technology teachers with diverse backgrounds have been able to implement the curriculum	*Staffing:* There is a shortage of teachers competent in the new technology curriculum; the background of teachers influence their responses to the curriculum; despite the diversity of such backgrounds, teachers have been able to implement the curriculum
• Senior management need to know the curriculum • The technology curriculum is seen by some as having been imposed in a way that does not recognise teachers' backgrounds, nor is it accessible to students in terms of its language and its approaches • The school supports student-centred learning, but manageability is complicated by the diversity of students' abilities • The students' work with stakeholders is seen as making technology genuine and relevant • Student-centred learning occurs when a client and student relationship is developed • The status of technology education is limited by not being a university approved subject • Attitudes towards technology in the school have to change • All those involved in technology education need a clear vision of what it is about • The Head of Department's role is to support technology teachers cater for the diverse backgrounds of students • Communication and planning for progression between the primary and secondary sectors is required	*Curriculum:* There is a need for greater understanding of the new curriculum throughout the school, including management; a clear vision is needed for the new curriculum, but its status is limited by not being a university approved subject; the curriculum has been implemented without sufficient recognition of existing teachers' backgrounds and qualifications; the language of the curriculum needs simplification for students; the school supports a student-centred approach but manageability is complicated by student diversity; students working with stakeholders makes the subject authentic and more student-centred; the role of the HOD includes fostering student-centredness; there is a need for stronger links between primary and secondary schools in what they provide
• Assessment models are encouraging some technology teachers to view technology education differently from the past • NCEA assessment requirements can be a barrier to the scope of the curriculum and student learning • The combination of unit and achievement standards provides an assessment pathway for students • External assessment standards need to be clear and transparent to both teachers and students	*Assessment:* Assessment models developed in the school are encouraging teachers to view technology education differently from the past although NCEA requirements can be a barrier to curriculum implementation and student learning; the school employs a combination of achievement and unit standards to provide pathways for students, but external standards need to be clearer and more transparent for both teachers and students
• The technology curriculum is not sufficiently resourced nor explained for teacher implementation • Professional development opportunities in terms of collaboration and networking are needed in order to know the curriculum • There is a desire and a need to know more about the technology curriculum and its assessment	*Professional Development:* PD is needed for greater explanation of the new curriculum and assessment pathways; PD should include collaboration and networking across schools

Table 4.9: Breakdown of responses into summary ideas – School B student responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• Technology is about designing • The design focus in technology makes it a good subject for getting jobs • Students would prefer more hands-on and less paperwork • Independent learning with teacher support is preferred • Language used for briefs and assessments is often difficult to understand	*Curriculum:* Technology is seen as being useful for getting jobs because of its design component, but students would prefer more hands-on content than paperwork; the language of the curriculum and assessment needs to be simplified; students prefer independent learning but with teacher support
• Teacher feedback contributes to learning • Internal assessment is preferred because of teacher feedback and not waiting till the end of the year for results • Assessment measures achievement and provides feedback • External assessments are seen as unreliable or unfair • Unit standards are easier and help get credits	*Assessment:* Students see assessment as involving both "measurement" and "feedback"; internal assessment is preferred over external assessment because of feedback and immediacy of results; unit standards are seen as easier and useful for gaining credits

4.3.1   Summary ideas overview from School B

School B, as described in Chapter 3, is a large urban co-educational, decile 8 school. The interview with the principal identified three categories coded as "curriculum", "staffing", and "resourcing". The principal expressed the opinion that the repositioning of a traditionally non-academic subject into one with an academic status provides a challenge, so the school offers both pathways whilst simultaneously promoting student-centred learning and problem-solving. The principal also believed that the school management needed to have a better understanding of the new technology curriculum; at the same time she expressed a need to find teachers with an understanding of, and competence in, teaching the new curriculum. The principal also pointed out that the physical layout of the school and available resources provided constraints for the curriculum's implementation.

Five coded themes emerged from the interviews with the teachers at this school: "student choice"; "staffing"; "curriculum"; assessment"; and "professional development". In relation to "student choice", teachers believed that students select technology as a senior subject for pragmatic reasons such as weighing up workload against credit value. This inevitably affects class size. A shortage of teachers competent in the new curriculum was seen as an issue, however; with the varied background of teachers in this school, a choice of pathways in technology had been offered, with the new technology curriculum being implemented as one of these pathways. Both achievement and unit standards were offered alongside these approaches. The theme of curriculum came through in many of the interview responses. Some views existed that the curriculum was imposed without recognition of existing teachers' backgrounds and students' ability to understand its vocabulary and approaches. Whilst the school supports a student-centred approach to learning, student diversity makes the manageability of this within the new curriculum difficult. It was acknowledged that working with stakeholders had made the subject authentic and more student-centred. However, a need for stronger links between primary and secondary school approaches was also stressed. Although NCEA requirements have been seen as providing a barrier to curriculum implementation, the school employed a combination of achievement and unit standards to offer pathways for students. The teachers considered that the external standards needed to be clearer and more transparent for both students and teachers. Professional development was also

needed to support curriculum and assessment pathways and should include collaboration and networking across schools.

The students' responses in School B brought out two main categories, namely, "curriculum" and "assessment". The students indicated that they saw technology as possibly useful for getting jobs because of its design component; however, they maintained a preference for more hands-on content as opposed to the amount of paperwork currently required. It was their view that the language used in both the curriculum and assessment requirements needed to be simplified. They also indicated a preference for independent learning with teacher support. The students suggested that assessment involves both measurement and feedback; their clear preference was for internal assessment because it offers opportunities for formative feedback. Unit standards were viewed as easier than achievement standards and can be useful for gaining credits.

The category coded as curriculum came through strongly in the interviews with all three groupings. The principal described the challenge that had emerged with trying to reposition technology, which in the past had been essentially non-academic, into a curriculum area that has equal status with other academic subjects. In order to meet this challenge the school offered technology programmes that catered for both types of technology, but maintained a student-centred and problem-solving approach. The teachers, however, described student diversity as making the manageability of student-centred learning difficult when using the new technology curriculum, although working with stakeholders has made the subject authentic and more student-centred. They suggested that the new curriculum was imposed without recognition of existing teachers' backgrounds. Its vocabulary and approaches also created a challenge. The students, although having a belief that the design component in the new technology curriculum could be useful for getting jobs, preferred a more hands-on approach than the one requiring a lot of paperwork as experienced with the new curriculum. Similar to the teachers, they expressed an opinion that the language in the curriculum needed to be simplified. The principal and teachers agreed that there was a staffing issue in relation to availability of people competent in teaching the new curriculum. The teachers highlighted the need for support with professional development whilst the principal looked at resourcing as an area of need. Assessment was a theme that came through strongly from both the teacher and student groups. Each group referred to the external

assessment activities and criteria as needing to be made clearer and more transparent. The students saw assessment as being about measurement and feedback and indicated a preference for internal assessments. They also saw unit standards as being useful as providing back-up credits for their overall qualification.

4.4   School "C"

Table 4.10:   Breakdown of responses into summary ideas – School C principal responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• Non-compliance with the technology curriculum requirements while a concern, reflects the background of teachers and students • Giving students confidence and recognition of their own ability is aided by a hands-on approach	*Curriculum:* The teachers and students choose to maintain a hands-on approach as this reflects their background and gives the students confidence in their ability
• Achievement standards are too hard for most of the students at senior level • Student selection of courses drives the programme with unit standards preferred over the more high level design pathway	*Assessment:* Students prefer courses with unit standards assessments rather than design oriented technology as most of them find achievement standards too hard

Table 4.11:   Breakdown of responses into summary ideas – School C teacher responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• New teachers with a university degree are regarded by the government as better qualified than experienced teachers with technical qualifications	*Staffing:* New teachers with degrees are seen as better qualified to teach technology than experienced teachers with technical qualifications
• The senior courses are seen to some extent as a dumping ground for lesser-able students, some of whom have not done technology at junior level • Few girls take up this course, but those who do, succeed	*Student choices:* Many students who struggle in other subjects are placed in technology; few girls choose to take this subject even though they can do well
• Courses offered are in response to the students' desire for vocational and skill building courses • The technology curriculum is seen as being aimed at students with academic aspirations • Practical skills give students confidence and are fundamental to prospective vocations • The technology curriculum has created teaching management issues • Technology attempts to be in context with the local and wider job environment • The technology curriculum and assessment requirements need to deal with skill building and written in simpler language	*Curriculum:* Despite the curriculum being viewed as aimed at academic students, courses are designed with a vocational focus to support the goals of students; management issues in the classroom arise when using the technology curriculum; the curriculum and assessment needs to use simpler language and measure skill development

Table 4.12:   Breakdown of responses into summary ideas – School C student responses

Level 1: Response Themes	Level 2: Grouping of Response Themes
• The main reasons for selecting this course are job related, where the students want to work towards getting employment	*Student choice:* Students choose this course to get jobs
• The BCITO unit standards course is prescriptive and comes to the students in the form of a booklet and numerous notes • The skill building focus provides meaning and satisfaction • Students like the practical component of the course • The unit standards are seen as preparation for the future	*Curriculum:* BCITO unit standards are presented in a prescriptive, text-based booklet; the skill development approach enables the students to see their progress; they like this approach and see it as preparation for their future

4.4.1 Summary ideas overview from School C

School C is described in Chapter 3 as a small, suburban, co-educational school with a decile rating of two. Two themes emerged from the interview with the principal of this school. They were coded as "curriculum" and "assessment". In relation to curriculum, the principal indicated that the teachers and students chose to maintain a hands-on approach to technology as this reflected their background and experiences and built the students' confidence. While the principal was aware and concerned with not complying with the intentions of the new technology curriculum, students' abilities were taken into consideration. Similarly, assessment was geared towards the students' needs and abilities; assessment pathways were offered using unit standards because the students would not select courses based on the new design-oriented technology and its assessment (achievement standards). This was regarded as too hard and not of interest to students.

The interview with the teachers saw three categories of themes emerge and they were coded as "staffing", "student choices", and "curriculum". The teachers believed the government regards new teachers with university degrees as being better qualified than teachers with technical qualifications and teaching experience. They also highlighted an issue in that many students of lower ability who could not be placed elsewhere were enrolled into technology classes. They also noted that very few girls select this subject but the few who do perform well. In reference to the curriculum, the teachers indicated that they designed courses with a vocational rather than academic focus; this was to help students build skills for getting jobs. Where the new curriculum was implemented, management issues arose in the class because students lost interest. They agreed that the assessment also needed to cater for the students' desire to develop skills for the workforce, acknowledging that assessment needs to be written in simple language and measure skill development.

The data from the students interviewed in this school identified two main themes, coded as "student choices" and "curriculum". The students (three in number) selected technology as they see it as a way of working towards obtaining employment. They understand technology in terms of unit standard requirements, involving a text-based, prescriptive booklet, developed by an Industry Training Organisation. They see the importance of building skills so that they can gauge their own progress and prepare for their future.

It appears that with this particular school, the planning and implementation of the technology programmes has a focus on the students' abilities, needs and aspirations. The common coded theme to emerge across the three sets of interviews is the curriculum. The principal and staff are aware that the courses and pathways being implemented are not in line with the new technology curriculum approaches, and that to be so would disadvantage the students in respect of their backgrounds, ability and interests. Students indicated a desire to develop skills for getting jobs. The design of courses has responded to these learning needs and goals. The assessment pathway, the use of ITO developed unit standards in building, is consistent with the focus of students' needs and goals. One aspect that was highlighted by the teachers is the belief that the government views new teachers with university degrees as better qualified than those technology teachers with experience and trade qualifications.

Part C – Analysis of themes across schools

This section provides an analysis of the data across schools, drawing upon, in particular, the "Level 2" grouping of response themes in the summary tables for each school. The main categories of response themes that appear in the various tables cover: curriculum; learning; assessment; staffing and resources; student choices; academic status of technology; and networking. This excludes "idealised structure" and "professional development" – on closer examination the first of these can be linked with "curriculum" and the second overlaps with the discussion in "curriculum", "staffing", and "networking".

Before each of these categories is discussed, a particular observation based on the summaries for each school is needed: it is clear that each school has responded in an original and exclusive way to the technology curriculum taking account of the background, qualifications and experience of its teachers, the goals and needs of students, the teachers' perceptions of the assessment requirements, particularly NCEA, and the resources available for implementing the subject. In this respect, Schools A and C (both lower deciles) and Schools B and D (higher deciles) showed greater similarities with each other. For example, Schools A and C focused more on unit standard pathways whereas Schools B and D included achievement standards as an important component of their programmes.

The discussion now turns to an examination of the main categories of response themes across schools.

Curriculum

The main points arising from the analysis of the schools' responses appear to be:

- All schools were concerned about the language level of the curriculum; this was noted by teachers in each school and students in School B.

- The new curriculum was not considered to be sufficiently hands-on by students; it was seen as involving too much paperwork. These comments came from students in schools A, B and C.

- Schools A, B and D referred to varied interpretations and levels of understanding of the curriculum amongst teachers; this was commented on by teachers in each of these schools.

- Teachers' background and experience appear to play a big part in implementing the technology programme. Teachers from Schools A and B and the principal from School C made reference to this.

- Schools A, B and D have found that having students interact with stakeholders works well. The teachers from School B made this comment and students from Schools A and D indicated their support for this.

As can be seen, only the first of these bullet points spanned all four schools, but the other points involve at least three of the schools, indicating an issue or belief of some importance.

Learning

The theme of "learning" is explained to some extent by the findings under "curriculum"; however, a common student perspective between Schools A and D was the importance given to technological practice (hands-on), the relevance of the topic to the real world, and teacher support. Teachers from Schools A and D supported these views.

Assessment

There were many references to assessment in the interviews. The main findings are:

- In relation to NCEA, Schools A and B offer both achievement and unit standards pathways, School C offers only unit standards, while School D offers only achievement standards. This suggests that schools are selecting pathways to suit their students' needs.

- All schools provided comments relating to NCEA. Schools A and C provided comments that indicated that their programmes were driven by assessment requirements, NCEA in the case of School A and industry unit standards (which may count towards NCEA) in the case of School C. In marked contrast, teachers in School D felt that NCEA guides, but does not dictate teaching and assessment in their programmes. Teachers from the remaining school (School B), while acknowledging the intrusiveness of NCEA in course development, felt that the

different assessment models being developed in the school provided suitable pathways for meeting student diversity. In relation to the responses from School C, it should be noted that the principal considered that achievement standards were generally too hard for the school's students.

- There were comments from Schools A, B and D, including students from all of these schools, that internal assessment was the preferred mode of assessment for the purpose of feedback. In contrast, external assessment was viewed as unfair or untrustworthy because of unclear requirements and the lack of formative feedback opportunities.

- Students in Schools A, B and D saw assessment as being for measurement and qualifications, that is, they see assessment as having a strong summative focus.

- Schools B, C and D commented that unit standards were easier. Teachers in School D highlighted the increasing gap between achievement and unit standards. As mentioned above, the principal for School C considered achievement standards too hard for the school's students.

These findings show some agreement between schools but it is also clear that the approach taken to assessment reflects the local context of each school – the decile level, the background and abilities of students, and the qualifications and experiences of the teachers.

Staffing and Resources

Both schools B and D provided comments from principals and teachers stating the need to have teachers who are competent with the new curriculum. However, the allocation and nature of resourcing was seen by the principal in School A as being influenced by both the current staff (their background and skills) and future directions. Overlapping with the views in Schools A and D, teachers in School C saw the government as recognising new teachers with degrees as better qualified to teach technology than experienced teachers with technical qualifications. Emerging from these views, there is clearly an issue over the nature of technology education and the appropriate resourcing, including staffing, that is needed to support the teaching.

Student Choices

The teachers and principal in School A were in agreement that their programmes were designed in response to students' choices. Reasons given by students for their decision to study technology varied across schools but a common theme was its perceived value for helping students obtain jobs or undertake further study pathways. There was also an indication in the responses for Schools A, B and D that workload and/or the perceived "easiness" of the subject were factors. Other reasons provided included the type of assessment, the status of the subject, and the social element of being in the same class as one's friends. Some of these themes were supported by teachers in Schools A, B and D but with the additional note that the students preferred a hands-on curriculum (School A, but also implied in the responses of schools under the themes of "curriculum", "learning" and "assessment"). In the case of School C, it was also noted that students who struggle at school are often placed in the school's technology programme; this was not identified in the practices of other schools but it is not likely to be a unique response within the wider secondary school sector.

Academic Status of Technology

The teachers in Schools A and B saw the non-academic status of technology as being a constraint on the way it was resourced and this affects the way schools respond. The principal in School D believed technology is regarded as an add-on subject. (Subsequent to this research, technology has been added to the list of subjects that may be offered for University Entrance.)

Networking

School D teachers highlighted the reluctance of teachers across schools to share their knowledge. These teachers, along with those from School B expressed the need for collaboration, professional development and networking across schools to clarify and explain the curriculum. The students in School D also identified the need for schools to network and share their approaches in technology.

4.5   Summary

The analysis of the data across schools – the integration of the findings from the different case studies – identified some commonalities, particularly in relation to curriculum and assessment. However, as noted earlier, it is clear that each school has responded contextually to the technology curriculum, interpreting and implementing the curriculum based on factors associated with the background, qualifications and experience of its teachers, the goals and needs of students, interpretation of assessment requirements, particularly NCEA, and the resources available for implementing the curriculum. Each school's response indicates a uniqueness that recognises the wider social context of the school. For example, School C has close ties with the local building industry and this has influenced their selection of a unit standards pathway to meet the goals of their students. On the other hand, School D has embraced the new technology curriculum and achievement standards as the associated assessment vehicle, reflecting a school with a higher decile rating and the aspirations of students looking for future educational pathways (beyond school) in technology related fields.

The coding of response themes from the various interviews and focus groups indicated that issues or beliefs relating to curriculum and assessment in particular, but also staffing, resources and student choices, were predominant in the thinking of participants from all schools. Not surprisingly, the views of the four principals, although quite different in respect of the themes they identified, revealed a more "high level" concern for technology, for example, the need for a new school model with students moving between schools according to each school's specialisation (School A), the need for greater understanding of the new curriculum within the school's management team (School B), and the need to give technology the status it deserves so that it is not seen as an "add-on" (School D). Staffing and resourcing were also concerns for at least three of the principals.

The responses of teachers shared some of the concerns expressed by principals but clearly focused more on operational details, such as programme development, being hands-on, meeting the needs of students, understanding the new curriculum, and developing assessment pathways (unit and/or achievement standards) to suit the background and abilities of students. The particular solutions found by teachers to

issues relating to curriculum and assessment, while different for each school, at least shared the same important motivation – meeting what the teachers perceived to be in the best interests of their students.

The responses of students across schools, while again reflecting the various contextual differences of the schools (e.g., decile level, qualifications and experiences of teachers), shared a common concern for being vocationally or educationally relevant (i.e., meeting their present and future needs), and for engaging them in ways that were meaningful (e.g., being hands-on or solving problems with clients). However, there was also a concern expressed that the language of technology, as evidenced in both curriculum and assessment requirements, needs to be more accessible to enable all students to engage fully with the subject. This was a view from students in both the higher and lower decile schools.

This leads into the final discussion of the findings in Chapter 5.

CHAPTER 5

Discussion

5.1   Introduction

The purpose of this chapter is to:

- provide a short summary of the results in relation to each research question
- integrate the findings with the earlier literature review
- reconsider the conceptual framework that has been used for this research
- provide some recommendations for practice
- identify possible directions for further research.

5.2   Summary of results for each research question

The previous chapter provided a summary for each case study school (Parts A and B) and a comparison across schools (Part C). This section now provides a summary of the results in relation to the three research questions.

The sub-questions to the main research question were created to narrow down and focus the investigation in each case study site, and to inform the design of the interview questions (see Table 3.3). A review of these sub-questions at this point substantiates the idea that the curriculum is interpreted and implemented according to localised school situations. A closer inspection supports this.

- ❖ How is senior secondary technology education interpreted, managed and implemented at senior level in a sample of Wellington schools?

The data show that decisions on how senior secondary technology education is dealt with in the four case site schools depend on a range of factors. The results suggest there is a relationship between the decile rating of the schools and how the curriculum is implemented. The lower decile schools tend to retain a more conservative, skills-based approach to technology, with unit standards being a tool for assessment purposes. This coincides with other factors such as the teachers' backgrounds and experiences. Those with trades backgrounds tend to stay with a conservative, hands-on approach whereas those with design and university

backgrounds are more inclined to implement the curriculum using a problem solving design model. All of this is coupled with the consideration of students' abilities, learning needs, aspirations and course choices. A pattern also exists between the decile ratings of the schools and the students' aspirations, and teachers respond to this. These approaches sit within the context of the schools' cultural, structural and resource situation and facilities.

❖ What are the school senior management experiences of, and expectations for, technology education and its implementation?

The interviews with the four principals show that their decisions rely very much on consultation with their technology education heads of department, whose advice and suggestions are set within the wider context of the school aims and objectives. Again this is influenced by the background and qualifications of staff and the background and needs of the students. It is also clear, in line with their school leadership role, that each principal engaged with the technology curriculum at a higher level than most teachers and the students. For example, one principal identified the need for a new "inter-school" model with students moving between schools to focus on a particular specification. Similarly, three of the principals identified particular concerns with the need for the education system to produce more graduates capable of teaching the new technology.

❖ What are teachers' expectations and experiences of technology education and technological literacy?

The results confirm that teachers interpret and implement the curriculum according to their own background education and experiences of technology. For example, those with technical qualifications tend to interpret and teach the curriculum with a hands-on, skill-based approach. This, coupled with the nature of their students' abilities, needs, aspirations and interests, determines not only the nature of the programme, but also the choice of assessment tool – that is, a choice of either achievement or unit standards. Once again their school's cultures, structures and resourcing play a part in defining the way they teach technology.

It is clear that the student responses provided evidence that supports the above interpretations. For example, the criticism of the curriculum as not including enough

"hands-on" material was made by students in most schools and supported by some of the teachers. It is clear that teachers and students in all schools were concerned with the future pathways that related to the students' needs, whether that be a university qualification or vocationally related education.

In weighing up comparisons between schools, along with the earlier documented approach to technology education that they each take, it would be fair to say that each school has interpreted and implemented the curriculum in its own way. This pattern emerges in the general interpretations above where it comes to light that although there are some common threads relating to curriculum, assessment and resourcing (see Part C of Chapter 4), the definition of the nature of the implementation shows each school's situation is localised and specific: that is, the way the curriculum and technology programmes are interpreted and implemented in each school is distinctive. Take, for example, the interpretations from Schools A, B and D; the nature of the physical and staffing resources, to some extent, determines the nature of their implementation. In School C, it is evident that the aspirations of their clientele and community play a prominent role in their decisions on implementation. In each case, implementation decisions relate to each school's unique situation.

Localised interpretation of the curriculum and further patterns are discussed as these results are integrated with themes identified in the literature review.

5.3   Linking results and literature

In its examination of technology and technology education, Chapter 2 also examines the New Zealand curriculum statement in technology as it has been intended for interpretation and implementation. The results of this investigation take the examination further in that the interpretation and implementation, as described by the interviewees from the case study schools, emerge as a focus of the summary ideas in the previous chapter, and subsequently, the general interpretations from each school. These general interpretations emphasise the idea that the curriculum is interpreted and implemented according to the context in which the school finds itself. That is, the school resources, both physical and staffing, along with the backgrounds and aspirations of the students and the community, interact to determine the nature of this implementation.

5.3.1 Presenting the links

Section 5.3 locates the common links that emerge from the literature and the results. These links are discussed further under sub-headings that best describe them. The interview summary ideas strongly reflect the interviewees' *perceptions of technology and curriculum interpretation,* and so these perceptions are discussed initially, alongside the references made to this topic in the literature. None of the emerging themes operate in isolation and people's perceptions of technology are strongly influenced by their *social contexts, backgrounds and experience*, as well as the school context within which they work. Social contexts, backgrounds and experience is the second sub-heading. More specifically, *school staffing* (the third sub-heading) has a big impact as well, and this is deeply intertwined with how the technology staff[8], who are operating in different schools, perceive technology and what their social contexts may be. The nature of implementation of technology is also strongly influenced by the *school physical resources.* School architecture, layout and the tools and equipment provided, all play a part in how technology is timetabled and what can be offered to students. The best facilities in the world can be available, but unless the students' *learning needs and choices* are catered for, students may not want to select technology as one of their subject choices. Many factors have emerged in results under this heading and they also are discussed in line with the literature. *Assessment* procedures appear to be closely related to school decisions about the nature of their programmes. These decisions are influenced by all of the previous italicized themes, but of course such themes are also affected by decisions about assessment. The final subheading that has emerged in the summary of ideas deals with *future directions* that technology might take within and beyond the school.

5.3.2 Perceptions of technology and curriculum interpretation

As referred to in Section 2.4, the Ministry of Education had not intended the new curriculum to be for vocational training although they wanted to "engage all students in an intellectual and practical way" (Jones, 1998). Worth noting, as Fancy (2004) described, the curriculum development was in response to fears for the national economy and the idea that a skilled workforce was needed. The persuasive comparison in Table 2.2, used to support the implementation of the new technology

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[8] An interviewee in School C provided the comment that of all vacancies advertised for secondary schools, 20% are Technology positions; in addition the average age of Technology teachers is 57. The writer has not yet been able to locate the data that support this claim.

curriculum, has been discussed in the literature chapter. Whether this has impacted on teachers is another matter, but Jones (1997a), as referred to in Section 2.4.2, confirms the idea of multiple interpretations of the curriculum so that particular school contexts are recognised and catered for in curriculum implementation. However, one may ask whether the polarised views reflected in Table 2.2 instead promote polarised thinking about technology, and thus create tensions in terms of teachers' perceptions of how technology should be interpreted and implemented. This does not seem to align with Jones' (1997a) notion of "multiple interpretations". The question that arises from this analysis, therefore, is not whether "multiple interpretations" are permissible, but rather, what interpretations are – or are not – acceptable to the Ministry of Education. As referred to in Section 2.2.3, technology cannot be defined in a body of knowledge and skills, but teachers are required to embrace the philosophical base underpinning technology (Barlow, 2002), and use appropriate pedagogies. This requirement appears to have been difficult to meet in that teachers' interpretations of the curriculum are varied.

The results of this research in fact show the existence of multiple interpretations, with importance being given by the different case study schools to the needs of the students in their unique situations. Burns (1992) and Jones (1998) referred to the idea that students' and teachers' concepts of technological knowledge and processes impact on their undertaking of technological practice. The summarised results reflect the variation in approaches, confirming a range of perceptions of technological knowledge. The contexts out of which these variations have developed have been further confirmed by linking the results to the literature.

But the question remains: are schools doing what the curriculum designers intended as being in the best interests of technology education? The results of this research in relation to the review of literature and analysis of curriculum documents suggest that not all schools are doing what was intended; yet the needs of students are clearly being considered.

5.3.3   Social contexts, backgrounds and experience

Chapter 2, Section 2.4.2 describes how curriculum is not designed and implemented in isolation of its social context. The results reinforce this idea, thus suggesting that multiple interpretations are inevitable. Investigation of the view that stands out in the

results, that schools interpret and implement the curriculum locally according to their own social contexts, including student and community needs and aspirations, the question arises as to whether it is necessary, or indeed appropriate, to dictate which approach to curriculum a school should take? Teachers mediate between the official national curriculum requirements and their own views on what they decide their students need to learn (McGee & Pennington, 2001). Interview results clearly convey the idea that teachers have their students' learning needs and abilities at the forefront of their planning and implementation. It is fair, also, to agree with the idea that the curriculum was implemented in some classrooms without the teachers having full knowledge of what really was intended. There is a repeated theme in the results that not only teacher understanding of technology education is varied but there is also a shortage of technology teachers trained in the new curriculum "ethos".

5.3.4   Staffing

Results suggest that school principals' and teachers' understanding and perceptions of technology education dictate the type of staff they are looking to employ. Many factors emerge with this. Are they looking for teachers who can prepare the students for university, tertiary technical institutions, trades apprenticeships, or direct employment on leaving school? Do the schools want to employ someone with strong pedagogical knowledge or someone who can use a range of effective management strategies? A description of what a good technology teacher means was not shared in the interviews so it can only be assumed that the more a technology teacher is able to implement technology along the lines the school would like, the better the measure of them as technology teachers. A school will employ teachers according to a "best fit" model, and this relates to the school's culture and the prospective teacher's background. School C particularly highlighted this but they and the other schools have also highlighted a lack of applicants, especially suitable ones. The question to ask at this point therefore would be, is there the privilege of having a choice? The status and acceptance of technology within a school will influence that school's ability to attract "good" teachers. Staffing contributes to how technology will be interpreted and implemented. The school does not always have a choice about who they employ. A shortage of "good teachers" has been identified as a recurring theme even from schools that are fully staffed. According to Davies (1998), even those teachers who enthusiastically implemented the "new" technology into their classrooms had a limited understanding of the curriculum as it was intended.

The summarised response themes show Schools A, B and D as identifying a need for more staffing expertise, where the expertise relates to the new curriculum, perhaps suggesting a desire to have it interpreted and implemented as it has been intended. This provides a dilemma where, in reality, teachers are adapting the curriculum according to their own resources, knowledge and perceptions of student learning needs, and as already discussed, according to the social contexts they find themselves in.

5.3.5   School physical resources

Interestingly, both Schools A and C have similar architecture based on 1950's overseas designs. These schools contain the traditional workshop technology/hard materials spaces, along with the metalwork facilities, all at one end of the school, whilst the home economics, textiles and the cooking facilities sit at the opposite end of the campus. School B was purpose built as a technical school, and although the technology block has been upgraded, it has a strong engineering and hard materials focus on its facilities. Once again the cooking and soft materials facilities sit within another part of the school. Finally, School D has purpose built prefabricated rooms with a mix of facilities. In the four schools studied, facilities, to a large extent, dictate school timetabling and influence curriculum interpretation relating to programme content, that is, the type of technological activities the students have access to. Take, for example, Davies' (1998) suggestion that carrying out open-ended technological activities with classes of over thirty students is not only impractical, but when combined with facilities that involve a purpose-built technical workshop with specific tools available, the central focus for teachers quickly becomes the manageability and safety of the chosen activities. Such activities also influence students' perceptions of technology education and consequently their choice of what to study. Architecture and student choice are interconnected.

5.3.6   Student learning needs and choices

The interviews with teachers and students show differing views between schools about how students' learning needs and choices can be accommodated. For example, approaches focusing on the different needs of learners, offering them a range of choices and processes, were evident in School D. However, a vocational training specific approach was offered in School C as a response to the students' aspirations, needs and choices. Industry unit standards were offered for those students who were

"training" for a vocation. However, this provision is not recognised as technology education within the *New Zealand Curriculum Framework* (Ministry of Education, 1993) as it does not align with the technology curriculum; but it should be noted that unit standards are recognised as counting towards the NCEA. Jones (1998) and Burns (1992) appear to agree that if students have narrow concepts of technology, their technological practice is constrained, and Jones (1997a) has identified that teachers' varied concepts of technology education do not fully align with the intentions of the curriculum, which impacts on students' perceptions of the subject. Again there is the tension between what the curriculum appears to intend and the interpretations by schools of their students' needs.

As noted in the results for School D, students stated that *learning needs to be real*. Teachers have their own views on what students need to learn (McGee & Pennington, 2001) and Turnbull (2001) discusses how teachers view the meaning of "authenticity" in terms of whether it relates to being authentic to students or authentic to the nature of the technological practice. Hill (1998) and Hill and Smith (1998) add to this by emphasising that if learning is situated in authentic practice it is more likely to motivate students to achieve. Furthermore, the "hidden curriculum" as discussed in section 2.4.2, reinforces the notion that the school organisation and planning influence how and what is offered for the students to learn (Kelly, 1999). Curricula are "experienced", "learned", and "internalised" by students (Harland, 1988); however, as the students have stated, their apparent engagement in this learning is dependent on how real and relevant the process is for them. Thus the tension between what the technology curriculum intends, and what is in the best interests of the students, is something that requires conscious harmonisation.

The data in this research suggest that Schools C and D have set up distinctively different (even polarised) approaches to teaching and learning in technology (see Table 2.2); the other two schools provide a mix of both approaches, depending once again on resources, perspectives and social contexts.

5.3.7 Assessment

Although the qualification reforms placed emphasis on preparing a diverse range of students for working life and multiple pathways through the education system (Fancy, 2004), assessment appears to drive the senior school curriculum in most of

the case study schools that the chosen modes of assessment clearly relate to how the subject is interpreted and taught to meet students' needs. School C is focusing on BCITO unit standards as the only assessment pathway, so that the students can aim towards working on construction sites. The classes and programme are designed solely for the students to achieve these unit standards. Schools A and B offer both unit standards and achievement standards, whilst School D has a programme using achievement standards only. The various school programmes offered are designed accordingly, and are directly influenced by the assessment model. It may be asked whether these models offer clarity and variety or do they present a barrier to the students? Certainly many students were unhappy with the marking of previous achievement standards, perhaps reflecting the strong media criticism of NCEA early in 2005.

The literature suggests the nature of assessment practices in schools determine the way the curriculum is delivered and received by students. Evidence from the Curriculum Stocktake (Ministry of Education, 2002) includes the finding that teachers most often used "practical tasks" as the method for assessing student learning in technology at secondary level. For example, analysis by assessment at senior level that exclusively uses unit standards suggests that the implementation of the technology programme has had a traditional skills-based focus. This is reinforced in the results of this research where School C openly describes such an approach as their chosen model. However, such practice not only contributes to the tension noted earlier between curriculum philosophy and meeting student needs, but has also been challenged by ERO (2001) in their report on technology education where concern is expressed about teachers focussing their assessment more on skills than knowledge and processes.

5.3.8   Identified future directions

The first part of the literature chapter discussed the origins, meanings and evolution of technology as a school subject. As already highlighted, this study's investigations into how teachers and students interpret meanings of technology and technology education show that multiple interpretations of the subject exist. The move from viewing technology education as a body of prescribed knowledge (Smits, 1998), which tells teachers exactly what to teach, continues to be a challenge for many. Some of the interviewees have highlighted the need for more professional

development and networking between schools. This perhaps suggests that teachers themselves are recognising the existence of multiple interpretations and feel a need for greater common understanding. It has already been shown, not only through the results, but in the literature also, that curriculum is implemented at school level according to perceived student learning needs, the school structures, resources, culture, and the school community's aspirations (Brady & Kennedy, 1999; Cornbleth, 1990; Kelly, 1999). Future pathways towards common understandings must harmonise with localised needs, otherwise a contradiction occurs; technology education has been hailed as supporting open-ended learning and divergent thinking on the one hand, but unless harmonisation with local needs is present, it will appear to challenge diversity of approach to teaching and learning on the other hand.

The status of technology in schools has been another recurring theme because it not only influences student choices and school programming but it also may have impact on teacher resourcing both within schools and teacher education providers; "resourcing" in this sense refers to both material provisions and staffing. In 2006 technology was finally accepted by the New Zealand University Vice-Chancellors' Committee as a recognised university entrance subject. This acceptance occurred after the interviews for this research and the writing up of the comments provided. Therefore, a changed status for technology at tertiary level may well change student and teacher perceptions of technology education and its future pathways. It may also attract new prospective technology teachers. This, in turn may allow for more common understanding of technology education and impact on how technological practice is undertaken (Burns, 1992; Jones, 1998). Needless to say, there is also a groundswell of concern about a shortage of apprentices (e.g., Bentley, 2007). So, given the way schools localise their curriculum implementation, the vocational approach still requires recognition and should be supported.

Chapter 4, Part C summarises an identified need from teachers to collaborate and network across schools, and with the help of professional development they can be supported in the implementation of the curriculum to meet government requirements, and to respond to the needs, aspirations and abilities of students and the wider school communities.

5.4   Theoretical framework revisited

The theoretical framework was initially developed as a result of the examination of the literature in Chapter 2 in preparation for this research investigation. Following the data collection and the collation and interpretation of the results, prominent ideas have emerged that necessitate a review of this framework. The relationships that were identified between the intended, interpreted and received curriculum require further scrutiny. These relationships are dynamic and recognition of this is crucial in that ongoing negotiation and communication about these relationships between the designers of the New Zealand technology curriculum and schools is required. Likewise, the scope of people (community stakeholders) with an interest moves beyond the school grounds. The school community encompasses the wider community, and this community, to a point, determines the students' experiences, aspirations and learning needs. The revised framework is presented in Figure 5.1 and the changes are discussed following the diagram.
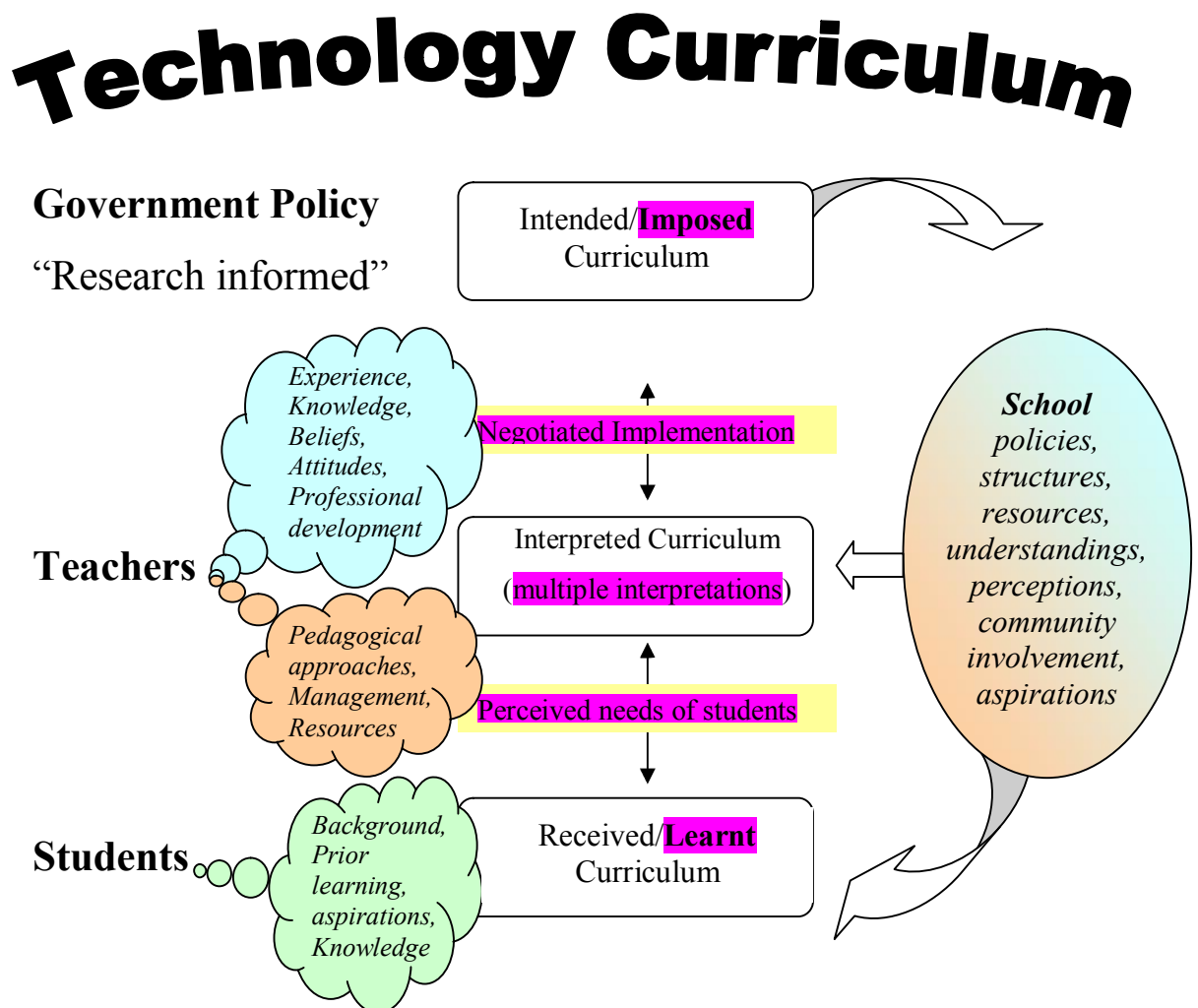

Figure 5.1 Theoretical framework revisited

Changes are highlighted in pink and are included as a result of the preceding discussion linking the literature with the research results. The intended curriculum has been discussed from the outset of this research; however, it is also apparent that the curriculum has been imposed if local interpretations of it are not acknowledged and supported. The curriculum has been interpreted in multiple ways, at multiple levels, depending on the aspirations, understandings and goals of all communities. The multiple interpretations lead into multiple methods of implementation and so this is reflected in the second layer in this revised framework. The received curriculum is meant to involve the notion of learning. Learning opportunities have been offered to students in the four case study schools and appear to be designed according to perceived student learning needs, interests and aspirations. While the curriculum requirements have played an important role in three of the schools, it is clear that a tension exists between these requirements and the interests/needs of students. However, other factors are also involved and include the schools' physical and human resources, timetables and perceptions of the wider community.

5.5   Recommendations for practice

The research question that underpins this study asks: How is *Technology in the New Zealand Curriculum* (1995) interpreted and practised in a sample of secondary schools in the Wellington area, and what discrepancies exist between the intended and interpreted curriculum? The revised theoretical framework highlights the difficulty in answering this question definitively. The answer depends on the nature of the multiple interpretations, and the negotiated implementation and the negotiated intended outcomes within each school. The dynamic nature of this revised framework suggests a rethink is needed regarding tolerance and acceptance of the way teachers interpret and implement the curriculum according to their students' backgrounds, learning needs and aspirations.

The study highlights the fact that teachers work hard to do what they believe is best for their students within their school settings. The constraints that these teachers work within have been identified in the study. They include a shortage of technology teachers, the nature of physical and consumable resources, school and programme structures, parent expectations, student aspirations, and the teachers' own experiences and understandings. A belief that the technology curriculum can further

enhance student learning in technology necessitates the provision of well-researched approaches to professional development at an intensive level. This professional development must not only be aimed at teachers, but also at school senior management and include education for parents. Multiple pathways and interpretations must be supported within this professional development, so that teachers, management and parents are well informed about the nature of the pathways and how they can reflect the best intent of the curriculum, the best intent of the teachers, and the best potential of the students.

Teachers and students have been confused by some of the terminology used in the curriculum and also in the senior assessment. Professional development is a part solution here, but a long-term cost effective approach could be a thorough review and subsequent strategy to give the terminology clarity and accessibility for students, teachers and parents alike.

It is therefore recommended that:

1. A rethink be undertaken by the Ministry and technology curriculum designers regarding tolerance and acceptance of the way teachers interpret and implement the curriculum according to their students' backgrounds, learning needs, abilities and aspirations. This is consistent with the notion of "inclusiveness", which is either a stated or implied goal in many of the policy reforms that took place from the late 1980s to the present time. This is evident, for example, in the development of the National Qualifications Framework, the New Zealand Curriculum Framework and the introduction of NCEA.

2. Professional development opportunities for technology teachers be expanded to enhance both the knowledge and skills of teachers in their implementation of the curriculum and to provide opportunities for a greater exchange of ideas between practitioners. Suggestions for how this might be done can be found in recent Ministry of Education research reports such as Starkey et al. (2006) and Timperley (2003). Both of these research reports provide information that would assist the design of effective professional development programmes including guidelines on engagement of teachers and targeting programmes that benefit both teachers and students.

3. Attention be paid to the resourcing – materials and staffing – of schools and teacher education providers. This includes targeting funds for teacher education in the new technology and for developing further examples of good practice so that students and teachers have benchmarks as reference points for them to work alongside.

4. Attention be paid to the clarification of terminology to reduce the confusion noted in this research from the interviews with teachers and students. This again is an important aspect of inclusiveness; a Ministry of Education appointed working group would be one approach that could be taken.

5.6   Further research

This thesis identifies three key areas where further research can support and promote technology education. These areas involve: 1. the extension of the present research to other schools; 2. the evaluation of professional development programmes; and 3. the evaluation of the impact of school technology programmes on students' learning and students' future educational/work pathways.

1. The extension of the present research to other schools responds to the limitations of the present study which is based on only four schools, using small samples of people for interviews. Results cannot be generalised because, in line with "case study" methodology and the "interpretative" research paradigm adopted for this study, the readers and users of this research need to decide whether the results transfer to their own contexts and situations. An expansion of this research to a wider range of schools would enable a more robust view of technology education in the New Zealand context to be obtained. Clearly, the earlier recommendations for practice are "limited" by the scope of the present study.

2. The recommendation for practice, that professional development opportunities be expanded, also requires that such programmes be fully researched for their content and processes, and be evaluated in terms of their impact. The need for such evaluations is self-evident given the importance professional development has for enhancing student learning. Research should be used to inform professional development programme design and implementation. As noted in the recommendations, recent reports (Starkey et al., 2006; Timperley, 2003)

provide directions for this. The work of Guskey (2000) also provides guidance on the design and evaluation of professional development programmes.

3. Given that local interpretations are made of the curriculum, the question remains as to whether such interpretations lead the students to future education and work pathways that are positive for them. It is, therefore, important that research investigates whether this is so and it also needs to identify the pathways that students follow and the significance of these for meeting their needs, those of the community, and the intentions of the technology curriculum. Such a study may need to be of a longitudinal nature, but the monitoring that is required should not be set aside given the importance of the curriculum for meeting government policies and goals relating to the development of a knowledge society.

This study offers insight into how technology education has been interpreted, implemented and, to a certain extent, received in a sample of four Wellington secondary schools. At the time of completion of the thesis, a further new technology curriculum is being implemented into New Zealand schools. The most significant point to be made here is that during a process of change such as this, teachers need to have their prior knowledge recognised, acknowledged and examined before they can be expected to integrate new knowledge into their realm of understanding, beliefs and values. The introduction of technology education in 1995 into schools required a shift in thinking about technology, teaching and learning. The outcomes of the introduction of this curriculum have been examined in the four schools discussed in the research and these provide an opportunity to inform teachers how they can reposition and reconstruct new curriculum knowledge into their practice.

The final word in this thesis is left to an earlier quote by Jones (1997b – see Section 2.4.2) who highlights a major tension in technology education that this research has further evidenced:

> *An imposed curriculum that does not take account of the existing ideas*
> *of teachers, and the realities of the school could be distorted in such a*
> *way as to threaten the improved learning that could take place.* (p. 48)

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Appendices

Appendix 1:Technological Areas

The technological areas indicate areas in which students will be expected to carry out their technological activities, and suggest the range around which the technology curriculum in schools can be organised and developed. These areas, listed here alphabetically, are not mutually exclusive: **most technological developments and learning experiences encompass more than one area.**

Whichever technological area is selected, **design**, including the processes of specification and development and testing of prototypes, is an essential component of the activity. **Drawing and graphics**, including freehand and technical drawing and the use of computer graphics packages, are also essential in technological practice to depict and clarify ideas and proposed solutions.

Schools and teachers should develop learning approaches and technological activities within the technological areas which will best help their students achieve the objectives of this curriculum.

- **Biotechnology** involves the use of living systems, organisms, or parts of organisms to manipulate natural processes in order to develop products, systems, or environments to benefit people. These may be products, such as foods, pharmaceuticals, or compost; systems, such as waste management or water purification; or environments, such as hydroponics. Biotechnology also includes genetic or biomedical engineering.

- **Electronics and Control technology** includes knowledge and use of electrical and electronic systems and devices, as well as their design, construction, and production. These may be simple electrical circuits or complex integrated electronic circuits, or robotics. Control technologies may be electronic, pneumatic, hydraulic, or mechanical.

- **Food technology** includes understanding and using safe and reliable processes for producing, preparing, presenting, and storing food and the development, packaging, and marketing of foods.

- **Information and Communication technology** includes systems that enable the collection, structuring, manipulation, retrieval, and communication of information in various forms. This includes audio and graphical communications, the use of electronic networks, and interactive multimedia.

- **Materials technology** includes the investigation, use, and development of materials to achieve a desired result. It involves knowledge of the qualities and suitability of different types of materials, including wood, textiles, composites, metals, plastics, and synthetics, and fuels, as well as the processing, preservation, and recycling of materials. Materials technology contributes to many other areas, especially Structures and Mechanisms.

- **Production and Process technology** includes both the manufacture and assembly of products from individual components in, for instance, a furniture or appliance factory or a motor vehicle assembly line; and the processing of fluid-bulk raw materials &; gases, fluids, and fluidised solids &; into products such as paints, fertilisers, and petrochemicals through a continuous process. This area also includes large-scale primary production of agricultural and forest products.

- **Structures and Mechanisms** includes a wide variety of technologies, from simple structures, such as a monument, or mechanical devices, such as a mousetrap, to large, complex structures such as a high-rise office block, or mechanical devices such as a motor car.

(Ministry of Education, 1995:12)

Application No: 04 / 154
This number is assigned when your application is accepted.
Quote on all documentation to participants and the Committee.

Massey University

Te Kunenga ki Pūrehuroa

Appendix 2a:

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

SCHOOL PRINCIPAL INFORMATION SHEET

Researcher Introduction
My name is Ann Bondy and I am currently working towards a Doctorate degree in Education through Massey University. As a teacher educator who works in the area of technology education, and as part of my ongoing professional development, I am investigating ways to improve and inform practice in this curriculum area. Tensions exist between what is promoted in the Technology in the New Zealand Curriculum document (MoE,1995) and what actually happens in many secondary school technology classrooms. My doctoral thesis sets out to identify what the tensions are, both in view of the historical and political contexts of this "new" essential learning area within the New Zealand National Curriculum Framework, (1993) and also in view of current practice. It intends to give voice to a range of stakeholders who use technology education as a chosen curriculum area. In disclosing data gathered from this investigation, professional debate can be developed and sustained in order to frame a technology education culture and acceptable approach in secondary schools, initially in Wellington secondary schools but also nationally. It also plans to inform and influence teacher education.

The aim of this study is to use teacher, student, student teacher, and teacher educator voices to develop a premise of how Technology in the New Zealand Curriculum, (1995) is interpreted and practised in secondary schools in the Wellington area and in initial teacher education. This study is important because it will identify synergies and tensions in the teaching and learning in technology education, which will subsequently inform curriculum policy and practice.

What I am asking your technology teachers to do
Your staff members who have been engaged in teaching technology have had experience in implementing the curriculum at senior secondary level and can offer valuable narratives to contribute to and inform this study.

This request is for willing technology teachers in your school to participate in an interview to be conducted at their convenience between now and the end of Term 1 in 2005. I would also like to conduct a focus group discussion with a group of willing senior technology students from their classes. (see additional 'Student Information Sheet') early in 2005. The interview with your teachers will take place at a time and place at their convenience and will not impact on their teaching time. Arrangements for meeting with the students will be such that their normal lessons are not disrupted. However, the venue for this meeting will most likely need to be on the school premises so as not to inconvenience these students. It is intended that the discussion will take no longer than one hour.

Application No: 04 / 154

This number is assigned when your application is accepted.
Quote on all documentation to participants and the Committee.

Massey University

Te Kunenga ki Pürehuroa

Participants' Rights

They are under no obligation to accept this invitation.   If they decide to participate, they have the right to:

- *decline to answer any particular question;*
- *withdraw from the study at any time;*
- *ask any questions about the study at any time during participation;*
- *ask for the audio tape to be turned off at any stage of the discussion*
- *provide information on the understanding that their name will not be used unless they give permission to the researcher;*
- *be given access to a summary of the project findings when it is concluded.*

There will be an opportunity to respond to the summary of findings made available on request. Continued dialogue on this will be possible as a broad discussion forum or it could very well be a "virtual" discussion using either a list-serv facility or a central place to put comments. This will be entirely voluntary and the participants' identity will remain protected.

Project Contacts

If you have any questions about the project please feel free to contact:
Ann Bondy
Senior Lecturer & Curriculum Leader: Technology
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Donald Street
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Wellington
ann.bondy@wce.ac.nz
Ph. 04 924 2029

Committee Approval

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Application 04/154. If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Human Ethics Committee: Palmerston North, telephone 06 350 5249, email humanethicspn@massey.ac.nz.

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Massey University

Te Kunenga ki Pürehuroa

Appendix 2b

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

TEACHER INFORMATION SHEET

Researcher Introduction
My name is Ann Bondy and I am currently working towards a Doctorate degree in Education through Massey University. As a teacher educator who works in the area of technology education, and as part of my ongoing professional development, I am investigating ways to improve and inform practice in this curriculum area. Tensions exist between what is promoted in the Technology in the New Zealand Curriculum document (MoE,1995) and what actually happens in many secondary school technology classrooms. My doctoral thesis sets out to identify what the tensions are, both in view of the historical and political contexts of this "new" essential learning area within the New Zealand National Curriculum Framework, (1993) and also in view of current practice. It intends to give voice to a range of stakeholders who use technology education as a chosen curriculum area. In disclosing data gathered from this investigation, professional debate can be developed and sustained in order to frame a technology education culture and acceptable approach in secondary schools, initially in Wellington secondary schools but also nationally. It also plans to inform and influence pre-service teacher education.

The aim of this study is to use teacher, student, student teacher, and teacher educator voices to develop a premise of how Technology in the New Zealand Curriculum, (1995) is interpreted and practised in secondary schools in the Wellington area and in initial teacher education. This study is important because it will identify synergies and tensions in the teaching and learning in technology education, which will subsequently inform curriculum policy and practice.

What I am asking you to do
As a teacher who has been engaged in teaching technology, your observations and experiences in implementing the curriculum at senior secondary level during the year can offer valuable narratives to contribute to and inform this study.

This request is for you to participate in an interview to be conducted at your convenience between now and the end of Term 1 in 2005. I would also like to conduct a focus group discussion with a group of willing senior technology students from your class/classes. (see additional 'Student Information Sheet') early in 2005. You will need to reassure your students that neither participation nor non-participation will affect their grades.

Your school principal will be asked permission for this research to be conducted as described in this sheet.

Project Procedures
I would like to interview you at your convenience using a set of prepared questions. I wish to record the interview using a tape recorder, and then later transcribe your contributions into a word document. This will be stored on my computer until such time that I can collate and analyse the data collected from your responses, and those of other teachers. Your identity will be protected throughout the entire project as your name will not be used and you will have the opportunity to have access to a summary of your responses upon request.

Application No: 04 / 154
This number is assigned when your application is accepted.
Quote on all documentation to participants and the Committee.

Massey University

Te Kunenga ki Pürehuroa

Participation in this project is your choice. There will be no risks involved in this participation.

The interview should take no longer than an hour.

There may need to be a selection process based on practicality and manageability if the number of interested teacher participants are too many. Selection will be based on providing a variety in the sample of school types, technology education implementation models and teacher "expertise/t/technological areas" represented.

Participant's Rights
You are under no obligation to accept this invitation.   If you decide to participate, you have the right to:
- decline to answer any particular question;
- withdraw from the study at any time;
- ask any questions about the study at any time during participation;
- ask for the audio tape to be turned off at any stage of the interview;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.

There will be an opportunity to respond to the summary of findings made available on request. Continued dialogue on this will be possible as a broad discussion forum or it could very well be a "virtual" discussion using either a list-serv facility or a central place to put comments. This will be entirely voluntary and your identity will remain protected.

Project Contacts
If you have any questions about the project please feel free to contact:
Ann Bondy
Senior Lecturer & Curriculum Leader: Technology
Wellington College of Education
Box 17-310
Donald Street
Karori
Wellington
ann.bondy@wce.ac.nz
Ph. 04 924 2029

Committee Approval
This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Application 04/154. If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Human Ethics Committee: Palmerston North, telephone 06 350 5249, email humanethicspn@massey.ac.nz.

Research Supervisor contact:
Ruth G Kane (PhD)
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Te Kunenga ki Pürehuroa

Appendix 2c

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

STUDENT INFORMATION SHEET

Researcher Introduction

My name is Ann Bondy and I am currently working towards a Doctor in Education degree through Massey University in Palmerston North. I am a lecturer in technology education at Wellington College of Education in Karori. Your technology teacher has agreed to participate in a research project that seeks to investigate ways to improve and inform teaching and learning in this curriculum area.

The aim of this study is to use teacher, student, student teacher, and teacher educator experiences and observations of technology education to develop an idea of how Technology in the New Zealand Curriculum, (1995) is interpreted and practised in secondary schools in the Wellington area and in initial teacher education. This study is important because it will identify the nature of teaching and learning in technology education, which will subsequently inform curriculum policy and practice.

What I am asking you to do

As a group of students who have been taking technology this last year, your observations and experiences during the year can offer valuable information to contribute to and inform this study.

This request for you to participate as a group from the ……..class at ……..School is because your teacher has also agreed to participate in an interview.

Project Procedures

At the beginning of the 2005 school year, a group of students from your 2004 technology (name may vary) class will meet at an agreed time within the school day. There will be focus questions to direct and sustain discussion. I would like to record that discussion using a tape recorder, and then later transcribe your contributions into a word document. This will be stored on my computer until such time that I can collate and analyse the data collected from your discussions, and those of other groups consisting of teachers, student teachers, other students and teacher-educators. Your identity will not be disclosed throughout the entire project as your names will not be used and you will have the opportunity to have access to a summary of your discussion as soon as it has been completed.

Participation in this project is your choice. There will be no risks involved in this participation.

The focus group discussion will take no longer than one school period.

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Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study at any time;
- ask any questions about the study at any time during participation;
- ask for the audio tape to be turned off at any stage of the discussion
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings on request when it is concluded.

There will be an opportunity to respond to the summary of findings made available on request. Continued dialogue on this will be possible as a broad discussion forum or it could very well be a "virtual" discussion using either a list-serv facility or a central place to put comments. This will be entirely voluntary your identity will remain protected.

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Te Kunenga ki Pürehuroa

Appendix 3a

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

SCHOOL PRINCIPAL CONSENT FORM

This consent form will be held for a period of five (5) years

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to this study being carried out with myself, willing technology teaching staff and students as described in the information sheet.

Signature: ....   **Date:** ....

Full Name - printed ....

Research Supervisor contact:

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Te Kunenga ki Pürehuroa

Appendix 3b

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

TEACHER CONSENT FORM

This consent form will be held for a period of five (5) years

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: .... **Date:** ....

Full Name - printed ....

Research Supervisor contact:

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Te Kunenga ki Pūrehuroa

Appendix 3c

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

STUDENT CONSENT FORM

This consent form will be held for a period of five (5) years

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to not disclose anything discussed in the Focus Group

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: .... **Date:** ....

Full Name - printed ....

Research Supervisor contact:

Ruth G Kane (PhD)
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Massey University
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Private Bag 11 222
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Te Kunenga ki Pürehuroa

Appendix 4a

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

PRINCIPAL INTERVIEW SCHEDULE

Preamble

The role of the researcher in this interview is to support the principal in their examination of their own management plan for technology in their school. This will include their personal responses to the technology curriculum, their own philosophies on technology education and its implementation. They will be asked to describe their own personal philosophies of technology education and how they believe it should be implemented. They will be asked to describe their management plan for the timetabling and resourcing for the teaching of technology in relation to school and community goals and expectations. They will be asked to identify the areas of their technology programme they believe to be working well in relation to student technological literacy, and areas of their programme where they believe student learning is not happening as they would like it to.

The interview will conclude with principals being asked how they would like to see technology education promoted and supported in the future, including their own ideas on what strengths and strategies beginning technology teachers should be equipped with when they embark on a career in technology education.

Interview Schedule

Implementation of Technology Education in the school
1.P Describe your personal philosophy on how technology should be taught
2.P How do you support technology education at senior level in your school?
3.P What constraints may exist with resourcing (human and physical), timetabling, curriculum and assessment requirements for technology education?
4.P What do you look for in a technology teacher?
5.P What do you look for in a beginning technology teacher?

Technology in the New Zealand Curriculum and Assessment Practices
At senior secondary level, your responses to the NZ Technology Curriculum and the assessment approaches you support and promote, are significant.
6.P Describe how you position the technology curriculum in a management plan for your senior technology programmes
7.P Describe any constraints you may have encountered with regards to your management plans for senior technology in your school.
8.P What methods of national assessment do you use with your senior technology classes and how are they implemented?
9.P Do you believe that the methods of assessment that are used in the senior technology programme support students learning? Why or why not?
10.P How would you like to see technology education implemented across secondary schools in the long term?
11.P How would you like to see assessment practice working for technology education in the long term? What will be the role of assessment?
12.P Are there any other comments you would like to make about technology education in senior secondary schools?

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Te Kunenga ki Pürehuroa

Appendix 4b

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

TEACHER INTERVIEW SCHEDULE

Preamble

The role of the researcher in this interview is to support the teacher in their examination of their own teaching of technology. This will include their personal responses to the technology curriculum, their own philosophies on technology education and their own methods of implementation. They will be asked to describe their own personal philosophies of technology education and how they believe it should be implemented. They will be asked to describe their own methods of teaching technology in relation to school and community resources. They will be asked to identify the areas of their teaching technology they believe to be working well in relation to student technological literacy, and areas of their teaching where they believe student learning is not happening as they would like it to.

The interview will conclude with the teachers being asked how they would like to see technology education promoted and supported in the future, including their own ideas on what strengths and strategies beginning technology teachers should be equipped with when they embark on a catreer in technology education.

Interview Schedule

Personal Philosophy of Technology Education

Without considering the constraints that may exist with resourcing, timetabling, curriculum and assessment requirements,

1.T Describe your focus areas of technology learning, practice and experience.
2.T Explain why you became a technology teacher
3.T Describe your personal philosophy of teaching technology

Technology in the New Zealand Curriculum and Assessment Practices

At senior secondary level, your responses to the NZ Technology Curriculum and the assessment approaches you are using, are significant.

4.T Describe how you use the technology curriculum when you plan your senior technology programmes
5.T Identify some helpful points within the technology curriculum that support your planning and explain how you utilize them.
6.T Identify some points within the technology curriculum that are unhelpful and hinder your planning. Explain why they are unhelpful.
7.T What methods of national assessment do you use with your senior technology classes and how do you implement them?
8.T Do you believe that the methods of assessment that you use in your senior technology programme support students learning? Why or why not?

Teaching Technology

The technology programme that you work with in your school may be your own design, it may be the result of a collaborative team effort, or it may be a structure you have inherited from former staff.

9.T Describe the technology programme you have planned in your senior classes

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Te Kunenga ki Pürehuroa

10.T Elaborate on whether the programme is one exclusively designed by you and exclusively implemented by you or whether you work through the programme collaboratively as a technology team.

11.T What are some of the most effective aspects of this programme in terms of student learning in technology?

12.T What are some of the less effective aspects of the programme in terms of student learning?

13.T What would you like to be able to do differently in your next few years teaching of technology at the senior level?

Technology Education in the Future
Your ideas on how technology education can be best implemented and promoted to support student learning in the long term, are important to this investigation.

14.T What is technological knowledge?

15.T What is technological practice?

16.T What is technological literacy?

17.T How would you like to see technology education implemented across secondary schools in the long term? What will be your role as a technology teacher and what will be the role of the students as learners in technology?

18.T How would you like to see assessment practice working for technology education in the long term? What will be the role of assessment?

19.T Are there any other comments you would like to make about technology education in senior secondary schools?

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Appendix 4c

Discrepancies between theory and practice in technology education in Wellington Secondary Schools

STUDENT GROUP SCHEDULE

Preamble
The role of the researcher is to facilitate a discussion with small groups of willing senior secondary technology students in a range of Wellington secondary schools. These students will have the opportunity to examine their own learning of technology within their technology courses at their schools. This will include their personal responses to the technology classes and their own ideas on what technology education should be and how it can support them in their learning. They will be asked to describe how best they learn in technology, and areas where they believe their learning is not happening as they would like it to.

The group discussion will conclude with the students being asked how they would like to see technology education promoted and supported in the future, including their own ideas on what strengths and strategies technology teachers should be equipped with when they teach technology education.

Group Discussion Points:

Views of Technology Education
    1.S Describe your focus areas of learning in technology
    2.S Explain why you chose to take this subject
    3.S Describe your views of learning in technology

Assessment in Technology Education
    4.S What do you think is the role of assessment in technology?
    5.S What methods of assessment in technology do you think are best? Why?
    6.S What methods of assessment in technology may need reviewing? Why?

Learning in Technology
    7.S Identify some helpful points within the technology programme that support your learning and explain how they support your learning.
    8.S Identify some points within the technology programme that are unhelpful and possibly confused your learning. Explain why they were unhelpful.
    9.S What would you like to be able to do differently in your next few years if learning within the area of technology?

Technology Education in the Future
Your ideas on how technology education can be best implemented and promoted to support student learning in the long term, are important to this investigation.
    10.S What is technological knowledge?
    11.S What is technological practice?
    12.S What is technological literacy?
    13.S How would you like to see technology education implemented across secondary schools in the long term?
    14.S How would you like to see assessment practice working for technology education in the long term? What will be the role of assessment?
    15.S Are there any other comments you would like to make about technology education in senior secondary schools?

Appendix 5: Table of Common Themes Colour Coded to Match Interview Schedule Themes

Themes: Principal Teacher Students	School A	School B	School C	School D
Principal advised by HOD	Y			
HOD guides implementation, support teachers	Y	Y		
Resourcing guided by school layout and spaces – constraints	Y	Y		
Resourcing guided by personnel make-up	Y			
Access to resources to support learning is difficult	Y			Y
Timetabling & programme guided by student choices and goals	Y	Y	Y, Y	Y
Student choices guided by their social and academic needs, attitudes, wishes and career goals	Y, Y			
Student choices and motivation is influenced by workload and their knowledge of nature of the subject (incl status)				Y, Y
Recommend specialist schools	Y			
Challenge in repositioning Technology as an academic subject – needs status	Y	Y, Y		Y
Technology curriculum aimed at students with academic aspirations			Y	
Need teachers with understanding of Technology Education: scarce		Y, Y		Y
Acquisition and retention of Technology teachers needs to be promoted				Y
School management need understanding		Y, Y		
Need to rewrite curriculum in simplified language for the students				Y, Y
School supports student centred learning		Y, Y		
Independent learning is preferred		Y		
Student centred learning needs to be manageable		Y		
Teaching using the curriculum creates management issues			Y	
Teaching approaches guided by management and safety issues			Y	
Non-compliance with curriculum a concern			Y	
Difficult to interpret curriculum. Imposed.	Y	Y		
Tech team has a range of perspectives	Y			
Mixed methods of assessment	Y			

Themes: Principal Teacher Students	School A	School B	School C	School D
Teacher produced booklets support learning				Y
Resourcing drives what teachers can offer and access difficult	Y			Y
Tech Ed & its implementation not clearly modelled to teachers – PD		Y, Y		
Teacher background influences implementation		Y, Y		
Teachers' interpretation of the Technology curriculum is varied				Y
Students need confidence			Y	
Students respond well to the new approach as diverse learners				Y
Technology is about designing		Y		
Learning in Technology is about developing skills for jobs	Y		Y	
Students learn through tech practice	Y		Y	
The purpose of Technology is viewed in terms of students' self realisation of learning opportunities				Y
There is reluctance across schools for Technology teachers to share their knowledge/ networking needed				Y, Y
Need common approach and understanding between primary and secondary		Y		Y
New pathways are developing beyond secondary school and this influences student choice for taking the subject				Y, Y
NCEA can allow for Technological Practice				Y
The Technology programme is guided, rather than driven, by NCEA assessment requirements				Y
There is a developing gap between Achievement Standards and Unit Standards				Y
The unit standards are seen as preparation for apprenticeships			Y	
Achievement Standards are preferred to Unit Standards as they enable choice of approach				Y
Assessment models influence teachers' views of Technology		Y		
Assessment can be a barrier to learning		Y		
NCEA too hard for most students at this school			Y	

Themes: Principal Teacher Students	School A	School B	School C	School D
Students think external achievement standards are not reliable	Y	Y		Y
Teacher feedback contributes to learning		Y		
Assessment better serves students if it were all internal		Y		Y
Students see assessment as a measure of how good they are and are for qualifications. They develop solutions to meet assessment criteria, not really for the clients	Y	Y		Y
Assessment motivates the students to meet criteria and deadlines				Y
Assessment needs to be clear and transparent (esp language)		Y, Y		
A combination of assessment tools are used – offers a back-up		Y, Y		
Government sees teachers with degrees as better qualified than experienced technical teachers			Y	
Students' work with stakeholders makes Technology relevant	Y	Y		Y, Y
Practical skills give students confidence and prep them for vocations			Y, Y	
Students want a choice of project and how they do them	Y			
Programme designed with job environment in mind (student choice)		Y	Y, Y	
Students without previous experience			Y	
Few girls who take Technology succeed			Y	
Teachers plan collaboratively, with support from the principal and Board of Trustees				Y
The teachers embrace the Technology Curriculum document				Y
Greater focus on process		Y		
The BCITO unit standards course is prescriptive and comes to the students in the form of a booklet and numerous notes			Y	
Technology Education should not be confined to traditional classroom settings				Y
Students want benchmarks to compare their work with				Y

Key: perceptions of technology, assessment, future directions, learning, staffing, school physical resources social contexts

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