How is materials technology education shaped by teacher leadership within the technology department?

By Anthony Hawkins

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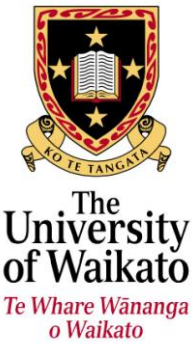

The University of Waikato

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ABSTRACT

The New Zealand Curriculum (MoE, 2007) introduced late 2007 was required to be fully implemented by 2011. Technology being one of the eight learning areas in The New Zealand Curriculum (MoE, 2007) referred to as NZC (MoE, 2007) has been dominated by its own curriculum reform. Which has impacted on the way Technology departments across every New Zealand school implemented and planned the development of the new curriculum in their school. Technology departments will need to meet the NZC (MoE, 2007) requirements by planning implementation strategies with their staffs. The curriculum leadership and management of the HoD and those teachers who have a deeper understanding of technology in the NZC (MoE, 2007) will play a pivotal role in the survival of a learning area which has undergone significant developments to date. Technology departments will need to continue to deliver the current *Technology in the New Zealand Curriculum* (MoE, 1995) referred to as TiNZC (MoE, 1995) and its revised amendments up until 2007 and manage the transition to face issues that must be met by the NZC (MoE, 2007) deadlines for full implementation of the NZC (MoE, 2007) in 2011. Can Technology as a learning area manage change in the near future? This will require an understanding of the technology curriculum developments in the NZC (MoE, 2007), of how technology departments function and how the leadership can influence the future of the technology education. Key questions put to HoDs which supported this investigation were: How was the TiNZC delivered in their school and how their department is implementing the NZC technology curriculum. And how is their HoD leading and managing the intended curriculum to shape the technology education in their school? This thesis is an investigation into:

How is materials technology education shaped by teacher leadership within the technology department?

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Ko te pae tawhiti
Whaia kia tata
Ko te pae tata
Whakamaua kia tina

Seek your distant horizons and cherish those you attain
Set your goals and strive to achieve them, and hold fast to the things attained.

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CHAPTER ONE: INTRODUCTION

1.1 Overview of Chapter One

This chapter provides an introduction to the thesis. It begins with a brief discussion of the context of the study, including the New Zealand Curriculum (MoE, 2007) referred to as NZC (MoE, 2007) and the place of technology education. Next is a description of the Technology in the New Zealand Curriculum (MoE, 1995) referred to as TiNZC (MoE, 1995) followed by a description of the implementation of the technology curriculum. Next it discusses the NZC (MoE, 2007) in more detail, and describes what is known about the new technology curriculum and outlines the administrative structure of New Zealand secondary schools including the role of materials technology teachers teaching the technology curriculum in the classroom.

1.2 Context of this study

The purpose of this study involves ascertaining and exploring the views of five secondary school materials technology teachers who teach materials technology. The teacher's views of: TiNZC (MoE, 1995) delivered in their school and how is their department implementing The NZC (MoE, 2007) technology curriculum. How does the Head of Department referred to as HoD lead and manage the intended curriculum, to shape the technology education in their school?

1.2.1 Background of Technology Education

Technology education has traditional links with technical education. The history of technical education in New Zealand dates back to 1890, when it consisted of metalwork and woodwork for boys, and cooking and sewing for girls (Burns, p. 70, 1992).

More design was introduced into the curriculum in the 1970s and 1980s, through workshop technology and graphics and design with the intention of breaking

down gender stereotypes of the traditional technical subject cultures. At this time the influential model for technology education was the Design and Technology Curriculum introduced in England and Wales in 1990 (Department of Education & Science & Welsh Office, 1990), (McCormick, 1992, p.25). A later revision of this Design and Technology Curriculum in England and Wales narrowed the focus to designing and making, based on a clearly structured progression of skill development and technological activities so that each activity could be assessed in an examination at the end of the academic year. The transition from craft to workshop technology to design technology and to technology education, was highlighted by (Burns, 1992, p. 72) who stated that, "In 1980, Workshop Technology was included into the Department of Education Curriculum as an integration and development of craft subjects, woodwork, metalwork and other subjects, including Graphics and Design."

Prior to the release of TiNZC (MoE, 1995) document, New Zealand schools followed the curriculum document: Forms 1-4 Workshop Craft Syllabus for Schools (Department of Education, 1986) which included subjects such as Metalwork, Woodwork, Home Economics, and Sewing. The TiNZC (MoE, 1995) was produced in response to the changing nature of society, and it was considered there was no longer a need to learn traditional skills and processes using outdated technologies. Society now needed its citizens to be informed about technological knowledge and understanding. Society needed to know about how technology, both old and new, and technological practices impact on society. It also was thought that the future of society would be affected through understanding technology education (Burns, (1997).

The main aim of the TiNZC (MoE, 1995) was the development of students' technological literacy. However, Compton and France, (2007) argue that "the teaching community was largely left to work out for themselves what technological literacy might look like and how it might be supported of TiNZC (MoE, 1995) in the classrooms" (p. 158). Technology literacy was identified in the conclusion as "essential for citizens to become informed about technology and technology education" TiNZC (MoE, 1995, p.15).

1.2.2 Development of the Technology in the New Zealand Curriculum

In 1993 the Ministry of Education document, *Technology in the New Zealand Curriculum (Draft)* (MoE, 1993a) replaced the *Forms 1-4 Workshop Craft Syllabus for Schools* (DoE, 1986). The then 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. The final version took into account the many responses that were received to the draft statement, as well as experience from school trials and pilot teacher development programmes. The draft curriculum statement was published in 1995 and the final curriculum implemented in 1999.

The implementation of TiNZC (MoE, 1995) became compulsory at secondary schools for Years 9 and 10, and as an optional subject at senior level, Years 11, 12 and 13. The TiNZC (MoE, 1995) was organised into three inter-related learning strands. *Technological Knowledge and Understanding* (Strand A), *Technological Capability* (Strand B) and *Technology in Society* (Strand C). Within each strand there were sets of achievement objectives, across eight levels progressing from junior primary (Year 1), to senior secondary (Year 13). Students were expected to carry out technological activities within the context of the seven technological areas identified in the curriculum document: *Electronics and Control Technology*, *Structures and Mechanisms*, *Productions and Process Technology*, *Food Technology*, *Biotechnology*, *Materials Technology*, and *Information and Communications Technology*. Additionally, *Graphics and Design* was a component of each technological area, each with its own curriculum guidelines. In particular, design and graphics are vital areas of knowledge and skills for the technology curriculum.

According to the TiNZC (MoE, 1995, p.12) :

> 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. Graphics can also provide valuable knowledge and skills to students participating in drama and the visual and practical arts. The National Certificate of Educational Achievement (NCEA) achievement standards for graphics are based on the material in this guide. These guidelines will be supported by the publication of, Design and Graphics in Technology (MoE., 1998), and Graphics Education Guidelines for Years 9 – 13. (MoE, 1997).

These guidelines were developed from the draft syllabus for Graphics and Design: Forms three to Four (MoE, 1991) incorporating aspects of technical drawing, visual communication and design practice in context with a relevant technological area.

Schools were required to teach at least six of the seven technological areas identified in the curriculum to Year 9 and 10 students. For students studying technology at the senior level in Years 11 - 13, the subject is optional, and student learning is commonly assessed for National Certificate of Educational Achievement referred to as NCEA qualification using achievement standards. NCEA summative assessment is for formal qualifications and is the focus of all secondary schools and their senior students from Years 11 – 13.

In TiNZC (MoE, 1995), the seven technological areas allowed teachers from a range of trade backgrounds to come under the one learning area of technology. This was intended to allow for a wider technology education experience, which a school could deliver under the umbrella term *technology*. The TiNZC (MoE, 1995) seven technological areas have their origins in technical education under such subject names as, Woodwork, Metalwork, Cooking, Sewing, Home Economics, Typing, and earlier forms of technical subjects.

One of the key reasons for choosing the area of materials technology and materials technology teachers for this study was that materials technology was considered the dominant core component underpinning the seven technological areas.

The New Zealand Curriculums including the TiNZC (MoE, 1995) were reviewed as part of the Curriculum Stocktake. (MoE, 2002) The curriculum stocktake in 2002 concluded that of the seven technology areas able to be taught in schools, some 97% could be classified as materials technology programmes, and 90% Food Technology (MoE, 2002, p.234) It also was noted that most technological products have a base material of either soft or hard materials, and that also all the technology teachers have core technology skills in a variety of materials. It was concluded that students need to have basic materials technology skills and knowledge if they were to develop any understanding of electronics, biotechnology, production and processes, structures and products.

1.2.3 Background to the New Zealand Curriculum

The New Zealand curriculum of the late 1980s and early 1990s was subsequently revised, and the new New Zealand Curriculum version released in 2007. The NZC (MoE, 2007) is spread across eight essential learning areas that must be taught in all schools in New Zealand: *English*; *The Arts*; *Health and Physical Education*; *Learning Languages*; *Mathematics and Statistics*; *Science*; *Social Sciences*, and *Technology*. Each learning area has strands and achievement objectives for each level of learning. The strands are parts of a learning area that must be delivered to fulfil the curriculum delivery. Each strand has achievement objectives that represent the level of achievement at a particular year or level.

1.2.4 Background to the Implementation of Technology Education in New Zealand

The technology curriculum as a separate curriculum was first implemented when New Zealand under went major curriculum reforms in the early 1990s. These reforms were driven by the New Zealand Curriculum Framework (MoE, 1993a), which at time identified seven essential learning areas, in a shift away from traditional subject areas. The learning areas were: *Social Sciences*, *Arts*, *Physical Education*, *Mathematics*, *Languages*, *and Sciences and Technology*. (MoE, 1993a) English was view as generic, and was initially not considered a learning

area. Other learning areas also had to implement their curriculum documents also Jones and Carr (1993) state "the reforms in New Zealand were to develop broad curriculum documents in specific learning areas" (p. 84). Codd, Harker and Nash (1990) point out that "such a broad curriculum will mean a majority of stakeholders will accept the curriculum documents however, it will not satisfy everyone" (p. 90). The curriculum reforms aimed to "produce citizens who have the necessary skills to enhance the country's global competiveness" (McGee, 1997, p.127).

The curriculum documents aimed to present detailed specifications of achievement objectives, content and processes organised into levels of expected standards of achievement, and assessment strategies to check on learning (Jones, 1997). However, there was a growing tension "between central and school-based authorities over the control of the curriculum" (Jones, 2003, p.87). The Ministry of Education used a model in which they contracted out curriculum development over a relatively short time frame, a process which was viewed as 'somewhat mysterious to the classroom teacher' and that in fact alienated the teacher. This model is called a *centre-periphery model* of curriculum development, where the centre (i.e., the Ministry of Education) decides what is 'good' for the periphery (school/community) (Jones, 2003, p.87). However, Jones comments that "given that the broadness of the curriculum statement power in terms of implementation rests with the school and the teachers" (Jones, 2003, p.89).

1.2.5 Assessment of Technology Education

Achievement standards are currently used only in school curriculum subjects for the National Certificate of Education Achievement, NCEA summative assessment is used for formal qualifications and is the focus of all secondary schools and their senior students from Years 11 – 13. For students studying technology at the senior level in Years 11 – 13, the subject is optional, and student learning is assessed in the NCEA. Achievement standards have four levels: *Not Achieved*, *Achieved*, *Merit* and *Excellence*.

Unit standards are nationally agreed learners' achievements, which can be recognised in a number of contexts. Their knowledge and skills are being transferable between qualifications and providers.

The National Qualifications Framework has 10 levels - 1 is the least complex, and 10 the most complex. Levels depend on the complexity of learning. Levels 1-3 are of approximately the same standard as senior secondary education and basic trades training. Levels 4-6 approximate to advanced trades, technical and business qualifications. Levels 7 and above approximate to advanced qualifications of graduate and postgraduate standard. Unit standards are developed by experts in their fields and are used by industry. Unit standards criteria are either *pass* or *fail* in competency of that unit standard.

There are a number of technology courses which are industry linked qualifications which are assessed using Unit Standards. The Unit Standards are not subject-based but formal qualifications mainly catering for individual technical skills courses in school technology faculties such as Carpentry, Plumbing, Furniture Making, Automotive and Engineering, Hospitality and Catering and Child Care.

1.2.6 Achievement standards as a means of assessment

As noted above, student achievement at higher levels is based on achievement standards, which allow students to gain credits towards the NCEA introduced in 2002. Achievement standards are defined expectations in the NZC (MoE, 2007) of what the students know, and able to complete, at a particular of level learning. The NCEA criteria of achievement is intended to allow for a diverse range of evidence for learner outcomes, such as internal assignments/assessments, tests, portfolio work, and traditional external examinations. The internal achievement standards are school based, and external achievement standards are nationally-based and externally assessed. Students gain credit for each achievement standard, and NCEA allows learners to study a course of internal and external achievement standards at Level 1, Level 2 and Level 3, and Level 4 for Scholarship. NCEA is now part of the National Qualifications Framework [NQF] administered by the New Zealand Qualifications' Authority [NZQA], who

manage the entire range of qualifications in New Zealand.

Learners can attain NCEA Level 1 with 80 credits at any level (Level 1, 2, or 3), NCEA Level 2 with 60 Credits at level 2 or above plus 20 credits from any level, and NCEA Level 3 with 60 credits at level 3 or above plus 20 credits from level 2 or above. Because there is the capacity to gain achievement, merit and excellence performance levels at different subject level, learners can obtain certificates of endorsement at achieved, merit and excellence levels for their total number of subject entries for their NCEA qualifications. An example being a student can receive an excellence endorsed certificate if all of their subjects and their standards receive excellence grades. A student with excellence level internal achievement standards and merit level external achievement standards, may end up with a merit endorsement certificate overall.

1.2.7 Unit standards as a means of assessment

Unit Standards were developed by Industry Training Organisations referred to as ITOs' for a wide variety of industry training providers (mainly technical institutes or polytechnics) and schools. In schools unit standards are linked to vocational education, and in school technology departments they are linked to traditional technical education subjects. Unit standards identify one or more competency and performance-based elements, and list relevant performance criteria for these elements. A unit standard is awarded when performance of the criteria has been demonstrated. Unit standards are internally assessed by their ITO providers. There has been some criticism of subjects being fragmented into individual units of learning, with limited links to a curriculum (Jones, 2003) The concerns about unit standards assessment led to the development of achievement standards which are more context-based and holistic in nature.

1.3 The New Zealand Curriculum 2007

The NZC (MoE, 2007) document incorporated a revised technology curriculum, based on classroom based research (Compton and France, 2007). The main

developments were changes to the strands, which are now called *Technological Practice*, *Technological Knowledge* and *The Nature of Technology*. Schools were not required to teach six of the seven technological areas at junior level; however, the schools must deliver on the eight essential learning areas. The technology curriculum is taught as a subject called *technology* at junior levels (i.e., Years 9 and 10), and at senior level the technology curriculum is taught and subject assessed in the technological areas of *Materials Technology* area through subjects classes called, Year 11 *Soft Materials Technology*, Year 12 *Textiles Technology*, Year 12 *Hard Materials*, and Year 13 *Multi Materials*. The technological area of *Information and Computing Technology* has subjects called Year 13 ICT, and the technological area of food technology has subjects called *Food Technology*. The senior level technology subjects allow schools and students to meet their NZC and NCEA requirements, or other forms of assessment for student qualifications (Blewett, 2004, p. 34).

The Ministry of Education made School Board Trustees and senior management responsible for delivering the NZC (MoE, 2007) in their schools. The NZC (MoE, 2007) incorporates the curricula of the eight learning areas noted above and for the learning area of technology; this is broken down into three new strands: *Technological Practice*, *Technological Knowledge* and *Nature of Technology*. The new strands were devised in response to classroom based research by Compton and France (2007) who said that "the previous technological strands did not allow for deeper understandings of technological literacy" (p. 84).

The new strands meant teachers needed professional development that focused on developing their understanding of the new technology curriculum in order to deliver on implementation. A 'teachers support service' provided basic professional development courses on these new curriculum developments. The professional development courses identified a lack of classroom research, and commented that there were minimal resources for teachers in the *Technological Knowledge* strand, and even less in the *Nature of Technology* strand. This was because the components of each strand were incomplete, or had no learning objectives or levels of progression.

Compton and France, (2007, p. 159) observed that "the implementation process of the TiNZC (MoE, 1995) focused mainly on Technological Capability in the [TiNZC] – which was similar to *Technological Practice* in the revised strands. The *Technological Practice* strand was considered easier for teachers to understand when implementing the NZC 2007, as there were only minor changes needed in teachers' pedagogy.

1.4 Rationale for this research

As noted previously, the TiNZC (MoE, 1995) stated aim was the development of students' technological literacy. However, initial support resources did not much help delivers this aim, and teachers were left to work out for themselves what technological literacy might look like, and how it might be achieved in their classrooms. Compton and France (2007) state "all that was really known in technology education has been implemented into schools in New Zealand and overseas as a way of improving technological literacy" (p. 164). Technological literacy was deemed important in that society might benefit from citizens becoming more informed as to the importance and role of technology in society.

Therefore for society to learn about technology then technology education is vital, in that any benefits or indeed consequences of the use of technology, might improve they way we live now and in the future. Leadership in technology education might, for example, help students develop an understanding of sustainable practices, and how we might better manage resources. Such leadership requires technology HoFs or HODs to evidence professional leadership in developing their professional development in their departments, and to help design programmes to scaffold student learning in technology education. Classroom technology teachers also have an important role in developing and implementing the technology curriculum. The overall rationale for this research is then that there needs to be more research and discussion to support technology programme development during the transition periods as schools move from technology programmes based on TiNZC (MoE, 1995) to those based on technology curriculum in NZC (MoE, 2007).

With the NZC (MoE, 2007)required to be fully implemented by 2011, it would be helpful to understand what strategies or processes the HoDs' have used to lead curriculum development of technology education in their schools. The main reason for this study is then to investigate how the TiNZC (MoE, 1995) was delivered and implemented in New Zealand schools, with a view of understanding leadership and processes which might then inform the compulsory implementation of the NZC (MoE, 2007) which is scheduled for 2011 – 2013. Compton and France (2007) comment that "the community cannot sustain another implementation phase without support", p. (172).

This study will link how the leadership of the HoDs' shapes the way the technology curriculum in the materials technology area is delivered by their teachers within their school. What are the school practices which shape the technology curriculum such as the department structure, HoDs' technology education leadership, professional learning communities, assessment, programme design, staff and student perception's of technology, teaching staff's level of understanding of the technology curriculum and their background prior to teaching? The two aims of this research study thesis are to: 1) Explore technology teacher's views on the technology curriculum and technology education, and to 2) Explore role of leadership within the technology department towards in implementing the NZC (MoE, 2007). To investigate; How is Materials Technology Education shaped by teacher leadership within the technology department?

1.5 Research questions

The study involved exploring the views of five secondary school materials technology teachers who teach materials technology. The teachers were asked : How was the TiNZC (MoE, 1995) delivered in their school and how is their department implementing the NZC (MoE, 2007) technology curriculum, And How is their HoD leading and managing the intended curriculum to shape the technology education in their school?

As a current HoF for technology at an Auckland School, I am interested in finding out how the technology curriculum in the materials technology area is delivered by teachers within their department. I also want to find how technology educators' leadership, which in most cases is provided by HoDs, shape the materials technology education delivered to their school students. What are the school practices which shape the technology curriculum such as option lines, timetabling, department structure, HoD's technology education leadership, professional learning communities, assessment, programme design, staff and student perception's of technology, teaching staff's level of understanding of the technology curriculum and their background prior to teaching?

The three aims of this research study thus are to: 1) Explore technology teacher's views on technology and technology education within their department; 2) Explore how the HoD or technology leader shapes the key learning in materials technology area of the technology curriculum; and 3) Explore the implementation of the intended technology curriculum and the practiced curriculum in their department.

The research design used the interpretive research paradigm. Semi-structured interviews were used to collect the data. The ethical issues and quality issues related to the research were matched to this research methodology and methods. HoDs' and materials technology teacher's from five schools participated in the study. The value of this research is to support HoD's in developing the technology education in schools.

1.6 Overview of this thesis

Chapter 2 reviews issues from the literature about educational leadership within secondary schools technology departments. The literature review

Chapter 3 describes the design of the research: the research methodology and the methods. It discusses the ethical and validity issues in the research.

Chapter 4 presents and summarises the data.

Chapter 5 discusses the findings and outlines the conclusion of the study

Chapter 6 Implications

CHAPTER TWO LITERATURE REVIEW

2.0 Overview of Chapter Two

This chapter examines literature relevant to the research aim: How is Materials Technology Education shaped by teacher leadership and management within the technology department? The questions of curriculum implementation, leadership and management, factors that impact on the classroom technology teacher, how the head of department shapes the direction of the staff.

This critique of current evidence and thinking is drawn from the fields of: technology education, technology curriculum and assessment, leadership theories and nature of change in the technology department. This informed the research methodology, and provides valuable reference points for the later analysis and interpretation of the research findings.

2.1 Introduction to the literature review

This chapter establishes the context for this thesis through a review of the literature, and introduces key concepts and discussion points that are further explored during the literature review. This review is divided into three main sections. The first section provides discusses the terms, technology, technology education, materials technology, and the technology curriculum including assessment. The second section of this chapter discusses educational leadership, management of curriculum delivery, leadership in technology education, principals and senior management's role in technology education and the head of department's role within the technology department. The third section discusses the nature and impact of effective departmental leadership for change on teacher's delivery of the technology curriculum. Which would allow for the question: How was the TiNZC (MoE 1995) delivered in their school and how is their department implementing the NZC (MoE, 2007) technology curriculum, and How is their HoD leading and managing the intended curriculum to shape the technology education in their school?

2.2 What is technology?

Technology has historically been an integral part of the development of human society. It has a role in the present and in future societies. Adams, (1993) states that "thanks to technology we can take better care of ourselves than at any time in our history. But we also have technology to thank for unprecedented ability to exploit others and destroy ourselves" (p. 5). Fleming (1989) argues that "understanding the impacts and issues surrounding technology requires that people be technologically literate" (p. 394). Presently, the education of students to become informed citizens about technology is important because of the implications technology has for society and its environment. There is increased awareness that the earth's resources are finite and concerns about the role technology in the use of these resources. An understanding of the way costs and benefits of technology is thus important for all citizens.

It is important therefore to understand 'what is technology' in a study that is focusing on the technology curriculum many stakeholders in education have different perceptions of technology. These perceptions influence students, teachers, senior management, curriculum developers, policy makers and parents which impacts on curriculum delivery in technology departments.

Technology, like technology education and technology literacy, is a frequently used term; its broad and encompassing nature makes it difficult to define in exact and clear terms. Pacey, (1983) for instance, defines technology as artefacts and resources in a sociotechnical system of use. Gardner, (1994, p. 124) agrees, but also suggests that technology is an "independent system of thought, different from science" , whereas (McGinn, 1978, p. 183) defines technology as, "a form of human activity which includes science, art, religion, and sport". More recently and writing in the New Zealand context, and hence very relevant for teachers and students and this study, are the following two definitions. The first, from the TiNZC (MoE, 1995) states:

> Technology is a creative purposeful activity aimed at meeting the needs and opportunities through the development of products, systems, or

> environments. Knowledge, skills, and resources are combined to help solve practical problems. Technological practice takes place within, and is influenced by, social contexts. (MoE, 1995, p. 12).

The above statement was written at an earlier stage of the technology curriculum development. In 2005 curriculum based developments from the past 10 years there were major changes in technology education and the second statement in the NZC (MoE, 2006) draft curriculum version reflects this:

> People use technology to expand their possibilities, intervening in the world through the development of products, systems, and environments. To do this, they apply available intellectual and practical resources. Technology is continually changing. It is influenced by and in turn impacts upon the cultural, ethical, and environmental, political, and economic factors of the day both local and global. (MoE, 2006, p. 23).

Thus the key reason for teachers and their schools to know 'what is technology?', is that to have some broad understanding in concepts of technology will assist in supporting how technological literacy could be better defined and realised to achieve a meaningful technology curriculum in their school community.

2.2.1 Why have technology education?

In order for society to become familiar with concepts of technology people need to be engaged in technology education that teaches them how to recognise the value-ladeness of technology. McCormick, (1992) argues "for the value laden nature of technology and the need to reflect this in technology education" (p. 12). The main reason for technology education is for society to be informed about the benefits and consequences of technology. Jones (2003) states, "technology education will enrich the education of all students "provided that it is not seen as narrow vocational training" (p. 89)

Another reason to have technology education is that it is a subject that is inclusive of and easily identifiable for students. Students study technology use and contextualise their technology practice to a situation based on their own needs and opportunities. Teachers can assist students to link real life experiences to their world view of technology. The link to real life technological experiences based

upon the students world view allows for a deeper inquiry by the student into prior knowledge of aspects in technology education that affects themselves and their community. Students can discuss characteristics of technology and the characteristics or technological outcomes in a philosophical way to make connect with technology education. Such examples include the use of cell phone technology impacting on their lives and others (Compton and France (2007, p. 159).

Technology literacy is an essential component of technology education, and important if we are to have informed citizens that can to contribute to a technologically aware society. Technology literacy involves the ability to examine, critique, and evaluate the value of a technological innovation. Students should be able to identify key features of an innovation and the impact it has on society. Medway, (1989, p. 12) reinforces this view, stating that "citizens need to understand technology so as to be able to predict the likely effects of a system or process, appreciate the restrictions on what particular technologies may achieve and identify problems for which technology might provide solutions" (p. 2). The literature suggests that in order to develop technological literacy, students need to experience and explore a wide range of technologies in a variety of contexts during their school (Compton and Harwood 2003, p.14) This is important for teachers and schools in those real world connections bring inquiry learning into the classrooms which are important aspects in the technology curriculum.

2.2.2 What is technology education?

As noted above, technology education has traditional links with technical education, and the history of technical education in New Zealand dates back to 1890 with metalwork and woodwork for boys and cooking and sewing for girls. However, as researchers and curriculum developers developed more holistic views of technology and thus technology education, more design was introduced in the curriculum 1970s and 1980s, through workshop technology and graphics and design. This had the intention of breaking down gender stereotypes of the traditional technical subject cultures. The curriculum changes from craft to

workshop technology, to design technology, and to technology education is highlighted by (Burns, 1992, p. 72), who noted that, "in 1980, Workshop Technology was included into the Department of Education Curriculum as an integration and development of craft subjects, woodwork, metalwork and other subjects, including Graphics and Design.". Today technology is as stated by the NZC (MoE, 2007, p.15):

Technology is intervention by design; the use of practical and intellectual resources to develop products and systems that expand human possibilities' by addressing needs and realising opportunities.

Teachers and schools need to be aware of the differences between technology and technology education and the relationship between the two (Sade and Coll, 2003, p. 89) This is because, according to the literature, teachers' views of their subject greatly influence how they implement school curricula (Jones & Carr, 1992; Sade and Coll, 2003). Hence, understanding what technology and technology education, or how they are conceptualized by curriculum developers will allow schools and their technology departments to deliver wider and deeper understandings of the technology curriculum in the way intended by curriculum developers.

2.2.3 Different approaches to technology education

There are different approaches to teaching technology education that have influenced the New Zealand curriculum including technology education approaches derived from Australia, United States and the United Kingdom. The approach to technology advocated by the Australian Education Council (AEC) 1993, shows influence of a trend to a more structured, skills-based approach. The Australian approach consisted of: defining the problem, design the solution, make the solution and appraise. Thus much of the literature emanating from Australia tends to view technology as congruent with a design-make-appraise process. In the United States the International Technology Education Association (ITE) (1996) suggests technology is best viewed as a process of defining problems, refining ideas, modelling a solution, and testing the solution. The US approach is

thus was similar to the Australian model, with a slight difference in the design process. The English/Welsh approach in contrast sees technology as a process of knowledge gathering, designing, abilities in producing a product, and evaluation from stakeholders. The English//Welsh approach did had connections with society in its evaluation respect. The TiNZC (MoE, 1995) thus reflects the wider, more socially-oriented approach consistent with the 1990 English/Welsh curriculum. The TiNZC (MoE, 1995) has prioritised the societal implications within technology education by allowing the technology curriculum to be inclusive, and requiring students to be made aware of different views within society in addition to focusing on knowledge and skills.

This societal component is important in that one of the revised strands of the NZC (MoE, 2007) also places significant emphasis on the Nature of Technology strand. This consists of two components: *Characteristics of Technology* and *Characteristics of Technological Outcomes*—both of these components allow for broader and deeper societal understandings than the previous TiNZC. Thus the different approaches may affect overseas trained teachers in New Zealand schools perceptions of technology and technology education. Especially relevant in departments where the HoD has to access professional development for these teachers and also consider their views may shape their departments views towards technology education.

2.2.4 What is the aim of technology education?

According to the literature a key aim of modern technology education is to develop in students a broad technology literacy that will allow them to participate in society as informed citizens. The TiNZC (MoE, 1995). As noted above, the New Zealand technology curriculum of 1995 was organised into three interrelated strands: Technological Knowledge and Understanding (Strand A), Technological Capability (Strand B) and Technology and Society (Strand C). The three interrelated general strands were intended to provide a framework for developing expected learning outcomes, and made a contribution to formulating a balanced curriculum for technology education. The technology curriculum was enacted by

carrying out technological activities within the seven technological areas. In TiNZC (MoE, 1995) the seven technological areas were as stated: materials technology; information and communication technology; electronics and control technology; biotechnology; structures and mechanisms; production and process technology, and food technology. Technological activities arose out of the identification of some human need or opportunity where students would need to use a variety of techniques to determine consumer preferences. In the TiNZC (MoE, 1995, p. 13) technological activities were carried out using broad contexts "such as personal life, the home, the school, recreation, the community, the environment, energy production and supply, business, and industry. Also (Jones & Carr, 1993, p. 3) point out "learning should be encouraged through contexts which are rich in prior knowledge and are of interest to learners" .

According to the TiNZC (MoE, 1995) curriculum, design is an essential component of technological activities and has a fundamental role in technological practice. Design includes the process of design specification and development and the testing of prototypes: "Drawing and graphics, including freehand and technical drawing and the use of computer graphics, are also essential in technological practice to depict and clarify ideas and proposed solutions" TiNZC (MoE, 1995, p. 16). Students need to develop design appreciation of the underlying technological developments such as the design principles of function, aesthetics, efficiency, ergonomics, feedback, and reliability, optimisation, fitness for purpose, user friendliness, diversity, balance and texture.

It is important, therefore, that students experience a range of technological areas and contexts to develop an understanding of technology and technological practice TiNZC (MoE, 1995). (Jones and Carr, 1993, p.89) also argue that the more students can "work in a number of contexts and areas the more likely they are to develop effective knowledge about technology and transfer this knowledge to other contexts and areas", something supported by (Perkins & Salomon, 1989, p. 19)

2.2.5 Curriculum change

Curriculum change is a part of education where new curriculum or developed curriculum is implemented as a means to education policy and their processes towards improving society's education. Curriculum change involves a range of stakeholders namely teacher's, students, the school and the schools departments who deliver the curriculum in the classroom. (McCormick, 1992, p. 56) states "there is a need to develop a sensitive view of curriculum change". Also (Grundy, 1987, p. 231) supports, suggesting "students and teachers are identified as having a primary interest on curriculum change. Curriculum change involves the curriculum developers, the schools, their senior management, HoDs, teachers and students. Educational change impacts on the roles and behaviours of curriculum managers and ultimately teachers. (Dinkha, 2001, p. 18) states in Fullan (1999) suggests in (Moon, Murphy and Raynor, 1989), declared that "educational change is a process of coming to grips with multiple realities of people who are main participants in implementing change. Also Grundy (1987, p. 33-34) noted that teachers have no control on educational policy change.

Fullan (1993) identified four core capacities for building change: personal vision-building, inquiry, mastery, and collaboration. (p. 12). He discusses personal vision meaning examining why we came into teaching. He argued that inquiry means internalising norms, habits, and techniques for continuous learning. Mastery is described by Fullan (1993, p. 13) as necessary for effectiveness, however; it also means for achieving deeper understanding. Collaboration Fullan (1993, p. 14) also suggests "there is a ceiling effect to how much we can learn if we keep to ourselves. Technology teachers may identify with these capacities in their experiences of implementing the TiNZC (MoE, 1995)

The implementation and delivery of the TiNZC (MoE, 1995) was a major change process for teachers at the time. With the curriculum developments from 1995 - 2007 which have been included in the NZC (MoE, 2007) the change process is not as dramatic for teachers of technology in understanding the NZC (MoE, 2007) as teachers have been part of the change process. The direction of the technology

curriculum in the NZC (MoE, 2007) has been supported by classroom research which indicates the change process has been accepted in principle.

2.2.6 Teachers and their subject subcultures

Jones et al (1999) comments that teacher's concepts and practices have shown strong links with the initiation and the socialization of teachers into subject sub-cultural settings (Ball and Goodson, 1985), (p. 157). He suggests that teachers, therefore, have a subjective view of the practice of teaching within their concept of a subject area (Goodson, 1985), (p. 157). Jones et al (1999, p. 157) also argues that "this is often referred to as a subject subculture and leads to consensual view about the nature of the subject, the way it should be taught, the role of the teacher, and what might be expected of the student (Paechter, 1991).

Teachers' perceptions of technology and technology education influenced by the TiNZC (MoE, 1995) implementation have impacted on the classroom environment. As mentioned previously in this chapter the history of technical subjects, curriculum reforms and the importance of having a national technology curriculum have been discussed. Jones (1999, p. 155) discusses:

> that given the lack of a technology subject subculture in New Zealand, other subjects sub-cultural impacts on technological classroom practice becomes very complex. He also states that there were a multitude of subcultures impacting on technology education in a variety of ways, as dependent on the teachers' subject backgrounds, concepts of technology, and their concepts of learning and teaching both within technology and generally.

Teachers in technology have come from a variety of experiences and backgrounds prior to the implementation of the TiNZC (MoE, 1995). They have had to develop their concepts of technology, technology education, and assessment to meet the technology curriculum delivery of their school. Jones (1999, p. 168) describes that the strategies developed by the teachers in their classrooms when implementing technological activities were often positioned within that particular teacher's teaching and subject subculture.

Teachers have had to adapt their subject culture knowledge to their teaching to meet the three strands of the TiNZC (MoE, 1995). However, there were limited implementation resources to support teachers in strategies to teach technology from their previous subject sub- cultures. Technology teachers had to also adapt their concepts of teaching technology and the implementation of the TiNZC (MoE, 1999).

Jones (1999, p. 169) notes that Moreland (1998) reports that reported that although the teachers stated that they needed to learn more about the teaching of technology, they felt they had enough skills and understanding to be teaching technology and could be doing it in the classroom. Also he discusses that Northover (1997) noted that all of the teachers she worked with viewed technology as being applied science, skills and skill development. Teachers went for minimal change and added technology into existing programmes rather than develop new ones.

Teaching strategies developed by teachers in their classrooms when implementing technological activities were often positioned within that particular teacher's teaching and subject subculture. Jones (1999, p. 169). Teachers have needed time to make sense of teaching changes to utilise their teaching subject subcultures to develop their technology education knowledge. These processes may take time and professional development.

2.2.7 Teachers and professional development

(Bell and Gilbert, 1993, p. 2) comment that teachers as a group are concerned about their teaching and continually seek new ways to enhance student learning. Professional development is one way teachers develop their learning for teaching practice. Professional development for the implementation of the TiNZC (MoE, 1999) See 2.3.1. (Bell and Gilbert, 1993, p. 19) state that, "professional development involves changing concepts and beliefs about science education and changing classroom activities. They also suggest that the process of teacher

development can be seen as one in which personal, professional and social development is occurring and one in which development in one aspect cannot unless the other aspects develop also. Support, feedback and reflection were identified by teachers as helping their development (Bell, 1993b, p. 154-214.

2.3 Background to the Technology in the New Zealand Curriculum 1995

From the 1980s through to 1994 research undertaken by various stakeholders, Department of Education, Ministry of Education, Ministerial Taskforce Groups and University of Waikato, resulted in the development of the *Draft Technology in New Zealand Curriculum* (MoE, 1993). This document contained different learning experiences and assessment examples for each of the technological areas. However, these were not included in the final curriculum document, which became mandatory in February 1999.

Although the New Zealand curriculum reforms were influenced to a degree by the curriculum reforms taking place in England and Wales, the final New Zealand technology curriculum reflected responses to New Zealand of the curriculum developers and their view of important local contextual factors and this is reflected in the seven technological areas eventually chosen. For example, the technological area of biotechnology was linked to New Zealand's agricultural history, and a perceived need for schools to give students a technological slant on this traditional topic because of its relevance to the economy. Materials and food technology likewise was related to the New Zealand economy; specifically in the areas of manufacturing, tourism and hospitality.

(Jones, 1997) notes that technology education in New Zealand places emphasis on human needs and societal interactions. Values and constraints then also are important in the process by which a technological outcome is achieved or finalised: "Technology education is about the whole process, not just the construction of the final outcome" (p. 194). The technology curriculum at the time therefore made a major step forward as the requirement to "produce a finished

practical product as a compulsory learning outcome" was not a strict (Jones, 1997, p. 196).

In contrast the England and Wales Curriculum used as a information model for the technology curriculum development emphasises that a finished product as a learning outcome, which McCormick, (1992, p. 60) believes disadvantages learners, as it restricts the development of students modelling skills.

The TiNZC (MoE, 1995) was gazetted in December 1996, but its implementation was delayed for a year due to national elections. Teachers were informed by the Ministry of Education in December 1997 that the Technology Curriculum was to be gazetted at the end of the following year in 1998. Finally in January 1999 the technology curriculum was gazetted by the Ministry of Education, and became a compulsory curriculum learning area with equal status to the other essential learning areas. This was the first time in New Zealand education that technology education had been given the same status as other learning areas. Other learning areas have established curriculum practices and understanding. In fact mathematics and science have well established practices from tradition and historical context in teaching and learning, whereas "technology is a recent curriculum where concepts in understanding a balanced technology education are yet to be fully developed.

"To achieve a balanced approach to technology during this time, students will be required to experience a range of technological areas.

- Years 1–3: four technological areas
- Years 4–6: five technological areas
- Years 7 and 8: six technological areas
- Years 9 and 10: six technological areas TiNZC (MoE, 1995, p. 18).

2.3.1 Implementation of the Technology in the New Zealand Curriculum 1995

The mandated implementation of the TiNZC (MoE, 1995)in 1999 received a mixed reaction from teachers at the time. Many technology departments had talked about the technology curriculum; some departments said it was a step in the right direction, some criticised what they saw as lack of direction, and others tried to ignore it altogether. There seems to be general agreement that in those first initial years from 1995 to prior to the 1999 compulsory implementation that "there was limited support and professional development for implementing the technology curriculum" (Compton and France, 2007, p. 167). Also many teachers felt that they had to "work out for themselves what technological literacy might look like, and how it might be supported in classrooms (Compton and France, 2007, p. 167).

The Ministry of Education provided support material for facilitators who presented the initial professional development 'jumbo days' for the implementation and introduction of the technology curriculum. Professional development resources consisted of photocopied handouts for teachers to work on during their 'professional development days'. Two guide books and a series of videos also were produced by the and were issued to schools so schools implement technology as a subject in their school. The two support books were titled "Towards Teaching Technology- Know How 2. Book One: Guide Book for Facilitators", and "Book Two: Support Material". The videos came boxed in two sets of four titled, Towards Teaching Technology Know How 2 Series One and Series Two. These resources were supplied to school principals, their senior management and the HoD and their technology departments to support the technology curriculum implementation by allowing for whole school professional development on the technology curriculum implementation process. The guide books for facilitators were intended for and outlined the components of the resources set, and then discussed how the set should be used. The book was divided into five sections and these are described briefly below.

The first section of the technology curriculum guide book suggested ways in which facilitators might develop teacher's conceptualization of technology. The importance of a clear written plan for staff development was emphasised, and models for such a plan were provided. The second section offered ideas for conducting an audit of resources that could be used in school technology programmes and for developing a plan to implement technology throughout the whole school. The third section covered classroom implementation, and provided a sample unit for teachers to discuss or trial. The fourth section set out a model that could be used for promoting community awareness of technology education. The final section discussed the resources available to individual teachers for professional development.

These resources were seen as vital tools for implementation of the technology curriculum in schools for all staff, not just technology teachers. How schools went about utilising this resource to benefit their whole school or technology departments' technology curriculum delivery varied from school to school, and with technology departments within schools. Ultimately it was left up to schools themselves to implement technology using the guide books, handout resources, guidance and ongoing following up, to imbed properly the implementation of technology as a subject.

There was still a need for teachers to have more time than the two days of professional development where the guide books were used. Technology teachers still had to continue with their teaching of the existing programmes. Many teachers did not have time to plan a coherent strategy to implement, plan and prepare for the new technology curriculum. Although the resources were useful many teachers had to manage their implementation plan in after school department meetings. Senior management left the implementation of the technology curriculum up to HoDs many of whom considered the initial implementation resources were poor and created tension between their staff, senior management and curriculum developers.

2.3.2 Approaches to implementation of the TiNZC 1995

As might be expected, schools, technology departments and technology teachers employed different approaches to implementing the technology curriculum in 1999. Also noted, schools had to take 'in school' responsibility to plan and prepare for the compulsory implementation process in 1999. The managing the implementation process varied from school to school as the Ministry had no set guidelines. The freedom of choice in implementing the technology curriculum was discussed in the curriculum statement TiNZC (MoE, 1995, p. 8) The curriculum statement describes how each school would need to develop an implementation strategy based upon its own departments "stock take" of its current staff, facilities and students perception of technology. It provided four possible options for implementation: 1) Timetabling the subject. 2) Implementing across the curriculum. 3) A combination of approaches. 4) Fixed-period focus across a year group or school. However; evidence from research and the practice of curriculum implementation of other learning areas suggested the stand alone subject option meaning "timetabling technology as a subject especially in secondary schools". MoE, 1998, p. 36). This would allow for aims and objectives of the TiNZC (MoE, 1995) to be met.

The Ministry approach of providing the formal policy documents for curriculum development and implementation of the curriculum to delegating curriculum implementation responsibilities' to individual schools had the potential to cause problems. "Curriculum vision" can easily become constrained and restricted to the immediate school needs" (Hodson, 1994, p. 334). This is where individual schools interpret curriculum issues differently and adopt their own methods of implementation, which may not be consistent with official policy or meet curriculum implementation needs (Jones & Carr, 1992, p. 67).

(Coll and Taylor, 2007) observe that, Bell, Jones, & Carr, et al (1995) identified a key feature of curriculum development, as in the inevitable tension that arises between stakeholder groups such as: government, industry, curriculum developers, teachers, school authorities, teachers and students (p. 1).

2.4.0 Background to New Zealand Curriculum 2007 - Technology

The aim of TiNZC (MoE, 1995) was to develop students' technological literacy. This literacy was argued as reliant on students "undertaking their own technological practice and critically analysing both this and the practice of others" (Compton & Harwood, 2003, p. 18). Also they stated, technological practice was therefore viewed as the vehicle that enabled students to develop technological literacy (p.19).

Technological literacy was to be achieved through students engaging in units of work that interlinked the three strands of the 1995 curriculum statement - Technological Knowledge and Understanding, Technological Capability and Technology and Society. Research into assessment during the late 1990s up until about 2005 sought to further define technological practice, and/or provide tools to plan for and assess its progression. The 1995 curriculum at the time, prioritised a strong sociological focus as (Compton and France, 2007, p. 167) argue "the key to supporting student technological practice, in order to move technological literacy away from "a 'functional' orientation to a literacy that was 'liberatory' in nature"

The aim of the TiNZC (MoE, 1995) was to develop technological literacy however data collected from curriculum coordinators, the NCEA Technology moderation and the examination processes. (Compton and France, 2007) observed "that the nature of the technological literacy being developed by students was somewhat limited (p. 160) although they mentioned that "students undertaking their own technological practice showed that they had "gained the confidence" and "empowerment" with high levels of self-reflection and were able to critique their own practice against the practice of others' with whom they came into direct contact in their technological practice (p.161).

(Compton and France, 2007, p. 161) argued that the constraint of embedding knowledge and skill development within their technological practice, this overall view of technological literacy was often very narrow. That is, knowledge and skills developed were highly context dependent with students being unable to

transfer understandings into different situations.

> (Compton and France, 2007) stated "Current research is also suggesting that students across all year levels show understandings about technology that are both shallow and constrained by their past technological practice experiences" (p. 162).

The above comment is important in that the stated aim of the TiNZC (MoE, 1995) technology curriculum was to develop technological literacy. The current research identifies the main problem being limited technological literacy and that students are not achieving the intended learning according to the TiNZC (MoE, 1995).

Also important was a key problem, identified in (Compton and France, 2007)

> In particular, they appear to hold few generic technological concepts, and have poorly developed philosophical understandings of technology or technological outcomes (p. 162).

The above comment is important for this research as it implies that technological literacy is not being achieved and it is limited in it embedding. The curriculum development process has been difficult for teachers to implement as they often were confused as to the most up to date version; this is often mentioned in teachers support meetings. Also teachers seemed confused between the assessing of technology with the development of the curriculum which reflected on teachers and their technology departments. Understanding the tensions teachers had to contend with for example curriculum implementation and curriculum development was poorly developed whilst at the same time technology NCEA was introduced.

The learning programmes needed technology staff to be aware of the changing nature of the curriculum, to understand and implement planning to integrate the curriculum changes into their programmes. This is where technology curriculum implementation and curriculum development is important in this research about technology department's delivery of the technology curriculum in the NZC (MoE, 2007).

2.4.1 NZC 2007 Technology Curriculum developments

Compton and France (2007) state "within each strand of the 2007 technology curriculum key components and achievement objectives were developed to describe progression for curriculum levels 1-8. (p. 171) these components are presented in Table 1.

Table 1: Technology Strands and their Components

Technological Practice	**Technological Knowledge**	**Nature of Technology**
Brief Development	Technological Modelling	Characteristics of Technology
Planning for Practice	Technological Products	Characteristics of Technological Outcomes
Outcome Development and Evaluation	Technological Systems	

Source: (Compton and France, 2007, p. 171)

(Compton and France, 2007, p. 172) Described that the changes reflects an awareness that learning in technology often goes across a number of technological areas and contexts, and beyond those named in the TiNZC (MoE, 1995) curriculum. This change also allowed for a wider range of possible learning contexts and inherent knowledge to be explored within technology programmes".

This point is important from the literature is that teacher's previous careers background can impact on their developing a wider knowledge base for understanding technology across a number of different technological areas.

2.4.2 NZC 2007 Curriculum implications for programme design

Compton et al, (2007) noted that shifts that have been made in technology education over the last few years, as represented in the NZC (MoE, 2007) focused on supporting students to develop a deep, broad and critical technological literacy. These changes have implications for programme design and delivery. (Compton and France, 2007, p. 172) state the differences between this literacy and that which was upheld in the TiNZC (MoE, 1995)curriculum will aid teachers as they begin to reflect on these changes in terms of their own teaching practice" (p. 173). The principles of technology programme design will need teachers to develop their understandings of the new developments that happened during the consultation period and the implementation of the NZC (MoE, 2007).

2.4.3 Ministry of Education guidance for the NZC (MoE, 2007)

The Ministry provided guidance in the form of a package of documents and papers developed by the Ministry to support schools and teachers with the implementation of the technology curriculum in NZC (MoE, 2007) These papers were also published on the Ministry's website with the latest information and advice, for school managers, Boards of Trustees, and curriculum leaders in relation to technology education. It outlined how the learning area of technology fits within NZC (MoE, 2007) (Keith, 2007).

The Ministry also provided overall guidance for teaching and learning, including some specific guidelines for schools to consider during the implementation phase of the technology curriculum in NZC (MoE, 2007) during years 2008 and 2009, and for 2010 and beyond. It also provided specific guidance and suggestions for schools offering programmes for students in Years 1 - 6, Years 7 - 8, and Years 9 - 13.

State and state integrated schools were required to provide all students in Years 1-10 with effectively taught programmes of learning in technology as part of a balanced school curriculum in the NZC (MoE, 2007). Decision making about knowledge, skills and competencies in all learning programmes in technology, were to be based on the achievement objectives of the technology curriculum in the NZC (MoE, 2007).

Techlink the teachers support website provided additional resource materials to support teachers in developing programmes and pedagogical strategies focused on the Technological Practice strand only. This is important in that the NZC (MoE, 2007) has three strands, of these strands; only one the Technological Practice strand has learning objectives and levels of attainment. Further research was to be undertaken over the next three years from 2007 - 2010 to provide further resources for teachers focused on the two additional strands: Nature of Technology and Technological Knowledge. The Ministry resources were to be available from 2010 who gave the following recommendations for teachers implementing the NZC (MoE, 2007) technology. When developing your implementation plans over the next three years starting from 2008 - 2010, it is recommended that HoDs considered the following (Keith, 2007).

In 2008–2009:

- Focusing teaching and learning on the Technological Practice strand.
- Only assessing and reporting student achievement in terms of the three Technological Practice achievement objectives.
- Exploring the Nature of Technology and Technological Knowledge strands to provide depth and breadth to students' technological practice.
- Using the five achievement objectives provided under these strands primarily as discussion tools.
- Begin to explore the development of programmes that include all three strands.

From 2010:

- Incorporate all three strands into technology programmes.

- Focusing teaching and learning on all three strands.
- Assessing and reporting on student achievement using all eight achievement objectives.

The Ministry asked teachers to work from the technology curriculum in the NZC (MoE, 2007) Student achievement can be enhanced by effective assessment strategies provided by the guide with the achievement objectives.

The Ministry changed the timeline for implementing the technology fully from 2010 to 2011. This was mainly because when the NZC (MoE, 2007) was introduced in November 2007 and it was deemed unrealistic for teachers to start implementing in 2008 with limited time to plan and prepare. Consequently the timeline was extended for one year, to allow teachers to properly understand the NZC (MoE, 2007) requirements.

Understanding the range of influences and issues related to the curriculum development and implementation of the technology curriculum are issues, which impact on the way technology department's function. The technology departments have had experiences which has put major focus on the role of the HoD to ensure delivery of the technology curriculum.

2.5 Leadership in Technology departments

The NZC (MoE, 2007) has put more focus on middle managers responsibilities' to lead their departments in implementing the NZC 2007. (Busher and Harris, 1999, p, 312) argue "that there is an emphasis within the school development upon the links between leadership and the culture of the department environment". This has led to a move away from the notion of leadership as a series of transactions within a given cultural context towards a view of leadership as transformational, having the potential to change the cultural context in which people work.

HoDs will need to build leadership capacity and manage their technology educations delivery so that the developed NZC (MoE, 2007) can effectively be implemented in their school. The NZC was "designed and interpreted in a three stage process: "as the national curriculum, the school curriculum, and the classroom curriculum" NZC (MoE, 2007). HoD needs to be informed about the national curriculum developments so as to manage the school curriculum delivery. The HoD must keep up to date with the curriculum developments, and implementation strategies to help their department staff. developed professionally to meet the technology curriculum in the NZC (MoE, 2007) delivery for their classrooms. In the case of this study of secondary schools the HoD needs to manage the school technology curriculum for students in Years 9 – 13 ensuring assessment pathways are meeting school achievement goals and students needs.

The National Curriculum was designed and to be reviewed continuously to allow the Ministry to make decisions about "how to give effect to the national curriculum in ways that best address the particular needs, interests, and circumstances of the schools students and community NZC (MoE, 2007, p.28). The national curriculum gave schools the scope, flexibility and authority they need to design the shape of their school curriculum so that teaching and learning is meaningful and beneficial their particular communities of students.

The designed, planned and developed school curriculum allowed teachers' scope to make interpretations in response to the particular needs, interests, and talents of individuals and groups of students in their classes. These are important in that the HoD needs to direct, shape and manage the school direction in consultation with their staff with an understanding about future direction for technology in their school. This aspect of being a leader is where the HoD can potentially utilise teachers within their staff who are themselves up-to-date and professionally developed to help with professional learning within their department. This requires a change process in developing subject leaders to contribute to professional knowledge in sharing their experience with teachers who have different understandings of the technology curriculum and the NZC (MoE, 2007, p. 29).

The change process requires developing subject leaders to acquire new knowledge and skills because they become responsible and accountable, in most cases, not only for their own work but also for that of others in the department. For the aspiring subject leader who wishes to take on the post of responsibility in the future this would mean that they would deliberately volunteer for different forms of delegated responsibility in order to demonstrate to their leadership capacity so that they are capable of taking on greater levels of responsibility. In the case of this study the HoD and the teacher in charge of materials technology need to direct their departments technology programmes.

2.5.1 Technology faculties and materials technology departments

School curriculum organisation has recently changed in some schools from subject departments to learning areas with subjects being part of the learning area. This is evident in the schools that were sent letters to be involved with this study where 11 of the 12 schools invited to be part of this study were operating under the essential learning areas as faculties.

Faculties operate, for example, the learning area of Science is titled the Science Faculty which has Chemistry, Physics, Biology and Environmental Science, Departments' under it. With the learning area of Technology the Technology Faculty has Food Technology, ICT, Graphics and Design and materials technology departments'. Although materials departments have had a traditional subject links to technical education subjects Woodwork, Metalwork, Cooking and Sewing. Materials a Technology department usually involves soft materials and hard materials with separate Food Technology departments. Whether they are or a HoD, this study is focused on the materials technology area.

Technology departments are mainly focused around materials technology area where traditionally most of the technical departments have arisen from. Also there are wider learning programmes linked to the technology faculty which are taught as senior level courses such as Industry Training Organisations referred to as ITO

courses, National Certificate courses offering automotive engineering, furniture making mainly technical courses linked to tertiary providers.(MoE, 2007, p. 38) states; "In Years 1 – 10 schools are required to provide teaching and learning in the entire essential learning areas. Teaching programmes for students in Years 11 – 13 should be based, in the first instance on the appropriate national curriculum statements. The focus of this statement is that for the learning area of technology is required up to Year 10 and for Years 11 – 13 the curriculum should be based upon the technology curriculum. This is important in that the HoD as a middle manager needs to be leading their department a direction that delivers the technology curriculum from Years 9 - 13 in their school. They need to be effective managers, leaders and understand their role as a classroom teacher also.

2.6 Head of Departments leadership and management

(Busher and Harris, 1999, p. 306) argue "one of the fundamental tenets of school effectiveness and school improvement research concerns the powerful impact of leadership". They draw connections between "increased emphasis within school development between leadership and school culture" (p. 306). The link between leadership and the "culture of the organisation" in this study would be the HoD leadership and the culture of the technology department". The key question for the HoD is how the technology curriculum is delivered in their school, department and the classrooms in their technology department. The "culture" within the technology department needs to be identified. However; there is also a need to identify the important leadership style and managerial role that HoD have in school departments, which can determine effectiveness and performance of department staffs leading to improved classroom delivery of the technology curriculum.

Essentially schools that are effective and have the capacity to improve are led by HoD (Busher and Harris, 1999, p. 307) "who make significant and measurable contribution to the effectiveness of their staff.". A point must be made about type of leadership which states "A transformational leadership perspective as (Duignan and Macpherson, 1992, p. 203) explain, "focuses on the moral values and value

laden activities of a leader and how these are disclosed to other colleagues". (Blase and Anderson, 1995, p. 45) argue that "leaders acting in this mode try to use power with, or through other people, rather than exercising control over them". Implicit in this view "is also the notion of shared or developed leadership activity where leadership activity is not the predominantly the preserve of the head of department." (Busher and Harris, 1999, p.311) as is argued by (Glover, Gleeson, Gough, & Johnson, 1998, p. 283) the four dimensions of the HoD which is discussed later in this chapter. This gives an indication of the tensions, role and influences that the HoD must consider to be an effective leader.

2.6.1 Defining the role of the head of department

(Busher and Harris, 1999, p. 308) "Define the department as the unit of collaborative planning and delivery of classroom teaching where teachers discuss what to teacher and where the contexts of instruction overlap. In hierarchical terms the head of department is a middle manager. The HoD is not part of the senior management team, responsible for the overall strategic development of the school, but someone responsible for the operational work of other namely classroom teachers. Teachers will have other responsibilities' such pastoral care and administrative areas to assist in the functioning of the whole school.

In schools these organisational distinctions are not neatly delineated. Many staff will be responsible to both academic and pastoral head of departments for different aspects of their work. HoD will be classroom teachers in their own subject areas. Amongst the complex nature of leadership and accountability head of department are increasingly acknowledged to be key figures. (Busher and Harris, 1999, p. 309) argue "Most recently, attention has turned towards the HOD's leadership role and the relationship between departmental and differential performance of departments. This raises a number of important issues about leadership role of subject leaders in schools and how they deal with the tensions between different functions of their role. (Glover et al., 1998, p. 283) identifies four dimensions of the head of department's work.

The first dimension concerns the way in which HoD translates the perspectives and policies of senior management into practices of individual classrooms. It implies a transactional leadership role, "wherein heads of department make use of power-usually 'power over' others" (Blase & Anderson, 1995, p. 46) "to attempt to secure working agreements with departmental staff about how to achieve school and departmental goals and practices".

The second dimension focuses on how HoDs encourage a group of staff to cohere and develop a group identity. The area or areas, of subject knowledge that the department shares usually defines the boundaries of the group. An important role for the head of department therefore, is "to foster collegiality within the group by shaping and establishing a shared vision" (Busher and Harris, 1999, p. 310). This necessarily implies a leadership style that empowers others and that involves subject leaders using "power with' or power through other people to generate collaborative departmental cultures"(Blase and Anderson, 1995, p. 46) This style of leadership is people- orientated and requires approach that helps other people transform their feelings, attitudes and beliefs. Transformational leaders not only manage structure but they purposefully impact upon the culture in order to change it. Hence the important dimension of the head of the department's work is to shape and manage departmental culture.

The third dimension concerns improving staff and student performance. (Busher and Harris, 1999, p. 312) argue "At one level this implies a transactional leadership role for the HoD in monitoring the attainment of school goals and meeting particular prescribed levels of curriculum performance". On the other hand, as (Glover et al., 1998, p. 284) note, "it suggests an important mentoring, supervisory leadership role in supporting colleagues' development and the development of pupils academically and socially". It draws on the knowledge of the heads of department and their responsibilities' to bring about improvement in practice among their staff.

The final dimension of a head of department's work is a liaison or representative role. "This requires them to be in touch with a variety of teachers and sources of information outside of school and to negotiate, where necessary, on behalf of the

other members of the department" (Busher, 1988, p. 103) One aspect of this dimension is in helping departmental colleagues keep in touch with others in their subject area and with the views and needs of colleagues in other school departments. Part of this dimension, then, is representing the views of departmental colleagues to senior staff and other middle managers within the school (Busher, 1992, p. 128)

(Busher, 1988, p. 104) state "UK research suggests that subject leaders can make a difference to departmental performance in much the same way as head of department contribute to overall school performance (Sammons, Thomas, and Mortimore, 1996, p. 23) argue "This departmental influence has been termed the "realm of knowledge" because of the importance of the subject boundary" Understanding the changing roles that the HoD undertakes in their job influences the way the department functions.

2.7 Assessment in technology education

The two key types of assessment used in technology education are: formative and summative assessment (MoE, 1993a). Formative assessment is formal and informal assessment procedures (eg, the monitoring of children's writing development, anecdotal records, and observations) undertaken by teachers in the classroom during a learning activity. Summative assessment is used for the purpose of describing learning achieved at different times for the purposes of reporting to parents, other teachers, the students themselves, and in a summary form. Summative assessment in New Zealand includes assessment for national qualifications or NCEA which is part of the National Qualifications Framework [NQF] administered by the New Zealand Qualifications Authority [NZQA]. NCEA summative assessment uses standards based criterion where a student's achievement is assessed against a defined set of standards, these standards fit onto the NQF. Standards based assessments are judged by teachers using achievement standards or unit standards. The standards for technology education assess elements of student work by giving an achievement level of not achieved, achieved, merit or excellence in the case of achievement standards or pass and fail

for unit standards. The role of the HoDs is to manage the range of assessment qualifications' delivered in the department in consultation with the providers who are either NZQA or external industry training organisations in the case of unit standards assessment.

2.7.1 NCEA technology implementation

The NCEA was introduced in 2002 starting at Level One – (Year 11). In 2003 Level two was introduced which meant Years 11 and 12 were functioning under NCEA guidelines. In 2003 Level One was introduced. The previous qualifications of School Certificate – (Year 11), Sixth Form Certificate (Year 12) and University Bursary (Year 13) were phased out progressively on the introduction of each NCEA Level. In 2002 when the implementation of the NCEA qualification was compulsory, teachers of technology education programmes found the changes in assessment difficult (Blewett, 2004, p. 25). Many had concentrated their efforts on junior level technology programmes up to Year 10. Students in Year 13 undertaking NCEA level 3 in the context of materials technology are the focus for this study. The introduction of NCEA assessment and the technology curriculum were often confused by teachers as being the same. This was due to the curriculum developers having limited exemplars' of what the technology curriculum looked like at senior school. The HoD had to manage this transition from assessment to curriculum understanding whilst implementing NCEA and the technology curriculum.

2.7.2 Assessment standards review

In 2008 the Ministry, in association with the NZQA, contracted national subject professional associations to carry out a review of all curriculum-related standards so that they could be aligned to NZC (MoE, 2007)

This review addressed any issues of duplication between standards and ensures credit parity. As announced by Minister in December 2008, the reviewed

standards will be implemented over three years with Level 1 introduced in 2011, Level 2 in 2012, and Level 3 in 2013. (MoE, 2008, and NZQA, 2008)

2.8 Influences on student subject selection

With the advent of the NCEA qualification students' subject selections became more complex because of an increase in the range and number of courses available. In the NCEA each of the seven learning areas in the New Zealand Curriculum Framework (MoE, 1993a) have learning pathways up to Level 3 and Level 4 in Year 13. There are also national certificate unit standards courses and industry training organisations subject course available for students at Year 13, NCEA technology at Level 3 has specialist subjects based on the technological areas of materials technology, food technology, electronics and control technology, information and communication technology and biotechnology.

2.8 Chapter summary

The literature review started with giving the overall of what is technology, leading to a discussion about curriculum change, teacher's subject cultures and professional development. Leading to the discussion about the TiNZC (MoE, 1995) implementation and the different implementation approaches of the TiNZC (MoE, 1999). The TiNZC (MoE, 1995) has been referred to and reflected on throughout this review with the aim of establishing a link to the experiences teachers have undertaken. The NZC (MoE, 2007) developments have been discussed to link this to the importance of leading and managing the intended curriculum requirements mandated for 2011 implementation. Assessment in technology education and student subject selection gives an understanding about the HoD's responsibilities in managing a technology department.

The literature allows for a deeper understanding of the issues that HoDs have to manage in their role as department leader. These issues influence the way HoDs shape and direct their department for the NZC (MoE, 2007) implementation scheduled for 2011.

CHAPTER THREE: METHODOLOGY

3.0 Overview of Chapter

This chapter briefly describes the research methodology and research paradigms commonly used in research and the paradigm used in this research thesis. An overview of the research method also is provided. Then the research design for this study is detailed. This includes a description of the participants, and how they were selected. Case study and semi-structured interviews pre-set interview focus questions were used as a prompt with a follow up discussions with the participants. Finally, ethical, as well as quality issues, related to the research are outlined.

3.1 Research methodology

The research methodology aims to inform the reader about the process of inquiry through analysing and describing the methods used to gather the research data. It provides a background upon which methods limitations as well as potential limitations are explained and where interpretations', judgement and predicts are shaped and constructed (Cohen, Manion, and Morrison, 2007, p. 56).

A case study methodology was used in this study because the research will sought different perspectives from participants in the same school. (Bell, 1993, p175) argue that case study method is appropriate where the investigation focuses on a specific phenomenon or situation, which in this case was; what were HoDs experiences from the TiNZC (MoE, 1995) to the NZC (MoE, 2007) in delivering the technology curriculum in their school. Bell notes that interviews are frequently used in case study research. The research provides case studies on six teacher participants from five schools as they discuss what their experiences from the TiNZC (MoE, 1995) to the NZC (MoE, 2007) in delivering the technology curriculum in their school. The need to discover the HoD or leaders in the technology department influences the delivery of the technology curriculum in their school. This has given cause to these research questions, which are

addressed in this thesis. The main questions being; how was the TiNZC (MoE, 1995) delivered in their school, and how is their department implementing the NZC (MoE, 2007) technology curriculum, and how is their HoD leading and managing the intended curriculum to shape the technology education in their school? These questions are:

- What are the experiences with implementing the technology curriculum from 1995 to 2009?
- What are the experiences of technology education leaders?
- How is their Head of Department leading and managing the intended curriculum to shape the technology education in their school?

3.2 Research paradigms

The three paradigms commonly used by educational researchers are, positivist, interpretivist and critical theory (Mutch, 2005a, p. 27) describes the positivist approach as "an organised method for combining deductive logic with precise empirical observations of individual behaviour to determine the problem or cause to predict general patterns of human activity." In contrast, the interpretivist approach involves "the systematic analysis of socially meaningful action through the direct observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their own worlds" (Neuman, 1994, p. 181). Research in this paradigm is concerned with the interpretation, meaning and clarification of knowledge gained in social practices. It relies on the researcher understanding how the participants' meanings or interpretations are immersed in, and inseparable from, their lives. The critical theory approach is a "critical process of inquiry that goes beyond surface illusions to uncover the real structures in the material world in order to help people change conditions and build a better world for themselves"(Mutch, 2005b, p. 34). This paradigm has is origins in the social sciences questioning of the positivist position assumed by the natural sciences. (Lather, 1992)"argues that a feature of the critical theory paradigm is its confrontation with the foundations of knowledge" (p. 87).

This study used the interpretive paradigm because the focus was on gaining an understanding and interpreting teacher's responses of materials technology within their school technology departments.

3.3 Research methods

Research methods refer to the specific techniques and procedures used in the process of data-gathering. This study used pre-interview question focus questions during semi-structured focus interviews. The focus interviews were carried out in the form of face-to-face on site, with six volunteer participants who had previously been sent the paper-based pre-interview focus questions as a prompt, to be explained during the interviews. The pre-organised content was sent as a method of allowing teachers to view the content with the aim of covering a range of topics and also to due to the limited time teachers had for interviewing, allowing for the teachers to direct the interview and write some answers during the contact time with the researcher.

3.3.1 Interview methods

An interview is a social interaction or a conversation between two or more people. As a research method, an interview can have many purposes, and involve many variations. Regardless of all these variations, the common denominator identified by (Cohen et al., 2007, p. 268) is that it is a 'transaction' that occurs between the interviewer who is seeking information, and the interviewee or interviewees supply information. Research interviews range in formality. (Bell and Opie, 2002, p. 110) A structured interview, also known as a closed end interview, has the primary aim of covering all topics. (Cohen et al, 2007, p. 269) add that it usually has a pre-organised content and procedures, and its course is determined by a prepared schedule. This type of interview does not allow much freedom for the interviewer to make any alteration during the interview.

At the other extreme of the continuum is the unstructured interview. This is completely informal, and its course is more determined by the interviewee. The

unstructured interview is described by some authors as involving open-ended questioning. Unlike the closed situation, the interviewer and the interviewee have more freedom and flexibility to make modifications during the course of the interview.

The decision as to what interview method to use is determined by the fitness for purpose. For this study a semi-structured or interview guide approach was used to offer an informal structured discussion with the participants. The reason why this method was used is because the participant teachers have limited time available to be involved, as their working day is constantly prone to interruptions and day to day activities in their work. Also teachers can identify the questions which best reflect their position to engage in a conversation with the interviewee. Pre-interview focus questions were the basis of the semi - structured interview questions. This allowed for the interview participants to be prepared as to the context and possible questions of the semi-structured interview. For this study the participants were sent pre-interview focus questions which aimed to prepare teachers for possible questions which they would be asked by the researcher. The department could as a group discuss the pre-interview focus questions however the interviewer wanted to retain data from individual teachers. The researcher initially met the teachers as a group or department to outline his study then the teacher who agreed to be part of the study was interviewed.

Group interviewing has the potential for discussions to develop and to yield a wide range of responses can be useful and are useful “where a group of people have been working together for some time or common purpose” (Cohen et al., 2007, p. 267) Group interviews can generate a wider range of responses than individual. In the case of secondary school technology departments participating in this study, the teachers suggested they were comfortable with their own classroom environments, where responses were to be delivered and listened to by the interviewee. However, the HoD and other teachers were interested in contributing to aspects of sharing information. It was decided that the participants would be more comfortable in a one-on-one environment, with an initial discussion with the HoD and other staff to introduce the researcher to the department.

Interview analysis involves the processes of interactive communication, documenting the recorded transcription and interpretation of the interview data, (Statistics New Zealand, 1995, p. 28). For this study analysing the interview data involved recording the interview process on audio tape and transcribing the audio recording. When the interviews were undertaken written notes were made about visual responses such as body language and facial expressions. The pre-interview focus questions were used as a prompt, and answers were written down during discussion with the teachers.

3.3.2 Case study methods

This research used interviews as the main way to collect the data in a case study methodology. The use of case study methods was because "one of its strengths is that they observe effects in real contexts where the contexts are unique and dynamic" (Cohen et al., 2007, p. 187) Their responses were personal and in context with this study which was focussed on the participant teachers' perspectives, conceptions, experiences and actions, it can be considered as qualitative. Case studies are particularly valuable when the study aims at capturing individual differences "in a particular situation, to catch the close-up reality and thick description of participants lived experiences of, thoughts about and feelings for, a situation". (Cohen et al., 2007, p. 187)

At the start of the interviews, the focus questions were used as an initial conversation to start the interview. In the first interview the participant started discussing the focus questions; they then said it was easier just talking about their experiences with the technology curriculum implementation, curriculum development and their role as leaders or managers in delivering the TiNZC (MoE, 1995) to the NZC (MoE, 2007). The subsequent interviews started out the same as the first with each participant preferring to just talk without the hint of the focus questions; consequently each interview had the main focus as the revised research question.

3.4 Research aims and design of this study

The way the materials technology department are lead by their HOD towards implementing the technology curriculum in the NZC (MoE, 2007) there is minimal literature on this topic. However, there are themes surrounding literature relating to curriculum implementation, curriculum development and technology curriculum experiences and influences although some what limited. Therefore this research aims to study the experiences of the teachers involved. Two methods of data collection techniques were used to achieve those aims of the pre-interview focus questions and focus group interviews appendix page. For this study the first aim was the exploration of teachers ideas about how technology education is delivered within their department to gain an understanding of teachers' views on the technology curriculum, curriculum implementation and curriculum development from the TiNZC (MoE, 1995) – NZC (MoE, 2007).The second aim was to investigate how the leadership in the department shapes the way the teachers are working to deliver the technology curriculum.

The pre-interview focus questions were sent to nine participants in total. The interviews of five participants generated more in-depth information on teachers' ideas about how technology education is delivered within their department to gain an understanding of teachers' views on the technology curriculum, curriculum implementation and curriculum development from the TiNZC (MoE, 1995) - NZC (MoE, 2007)**.**

3.4.1 How the participants were selected and who they were

Six schools were selected on the basis they were part of the nine schools who replied to letters sent to their school about participating in this study. There was one single-sex boys' school, two coeducational schools and three single-sex girls' school. They were selected mainly as they were closer to the researcher to access and they showed enthusiasm to be fully involved.

3.4.2 The pre-interview focus questions used in this study

The pre-interview focus questions contained a mix of qualitative and quantitative questions and focused on gathering data on how materials technology teachers deliver their technology education and their understanding of how their department is shaped by this delivery of their technology education in materials technology at their school. The pre-interview focus questions were completed with teacher consent during a technology period at school

The teacher's responses provide useful information about how departments function, and the way this shapes the technology education in their school. This information is important as the NZC (MoE, 2007) is required to be implemented which impacts on 2010 -2011 assessment changes. How leadership within the technology faculty is aware of the changing nature of technology education and its impacts on the professional development of technology teachers.

The interview questions had a question, which aimed to find out about the technology teacher's understanding of the Technology Curriculum in the NZC (MoE, 2007. This question was to focus the teacher specifically on the NZC (MoE, 2007, then the teacher's were given statements on which to comment on with an emphasis on the NZC (MoE, 2007), Technology Education, What is technology? The teacher's perception of their technology department understands delivery of Years 9 – 13 programmes. Other prompts looked at the HoD support of the teacher, the HoD and or lead teachers direction of technology in their the department, how they underpin their technology curriculum knowledge with professional development which links to the teaching backgrounds of the department staffs and how the teachers backgrounds influences the students understanding of technology.

This section was had three Questions 2, 3, and 4 focused on the leadership within the Materials Technology department. Question 5 asked the teachers to make comment on topics about their HoD, or the HoD commenting on their role as HoD. Question 6 and 7 asked about qualities of a good leader and if their HoD

encourages" shared understandings of technology. Question 8 asked the participants to respond to points such as NCEA implementation, how the leadership provides direction and change in delivering the NZC 2007, curriculum leadership, how the HOD establishes "team environment" in the department, the final prompt asks if the senior management at their school is supportive of the technology department. Question 9 asks about change processes, new understandings and establishing a professional learning community.

3.4.3 Implementing the pre semi structured questionnaire

The pre interview questions were posted to the participants with the outline of the study. The participants themselves wrote answers to questions when the interview took place the teachers handed over their written responses, this and was undertaken at the participating schools. The pre semi structured questionnaire was administered in a timetabled technology education period arranged between the researcher and the classroom teacher.

The HoD was not present while the teacher was completing their questions, only the researcher who gave a brief outline to the teacher about what the study was about. The teachers were given the option of not answering the questions. If they did complete the question they were asked if they wanted to be part of the interview. After the teacher completed their questions the researcher gave a brief explanation as to what would happen in the interview. All teachers completed the questions and continued to participate in the interview.

3.4.4 Analysing the pre- interview data

Analysing the data collected from the questions needed some preliminary planning. (Delamont, 1992, p. 213) mentions "proper analytic procedures of data" is an important part of reliability and validity. The researcher needed to consider the questionnaire format, information gained from the responses, and a analysing format. This needed to easily summarise the information to reduce the data into a manageable state. The data analysis strategy used in this study presented the

quantitative data in graph and table form. The qualitative data was analysed into common themes from both the audio recording transcripts and questionnaire written responses.

3.4.5 The teacher's pre interview focus questions

The semi-structured interviews involved six participants from each school who had completed the pre-interview focus questions, and who had agreed to be involved with the interview. The six participants were selected at random from the respondents about the research.

3.4.6 Implementing the interview

The pre-interview focus questions originated from specific teacher responses at teacher professional development meetings about the NZC (MoE, 2007) requirements. The questions used during the interviews were focussed on the pre-interview focus questions with the opportunity for the teachers to talk. The questions were open ended to elicit more discussion from the participants and less talking from the researcher. Specific responses from the researcher purposely encouraged discussion from all participants in the research. The participants were reminded about the purpose of the study.

The pre-interview focus questions allowed an effective way of probing students' perceptions and understanding of technology. The teacher' own technology classroom environment was used for the interviews to allow for the teacher to be "comfortable" to talk about technology in this study. The focus group was administered around a classroom table with the audio tape recorder on for about fifty minutes. Teachers were told about the researcher being a technology teacher and that their views were required not what the researcher thought. The researcher could be classed as an "insider" as he is in a similar teaching position as them. Access to these teachers is seen as part of the participant's prior technology teaching history with them.

3.5 Nature of the research

The research data collection methods were conducted at five schools covering six teachers. A period of three terms was used to collect all the data from the five schools. The initial plan was to collect this data in one term from six teachers from six different schools. However, four of the six participant teachers had to re arrange interview times due, to the "unexpected school meetings". One teacher from Highway School for Girls took part in the pre-interview focus questions and interview but had to withdraw from the study due to a personal reason. The researcher did not validate, her interview and she was sent the original audio tape. A teacher in charge of materials technology from *Rockford College* volunteered to replace this teacher. This meant two teachers from *Rockford College* were interviewed with their approval. The content of the interviews focused on the issues central to the research question, which initially started as "How is Materials Technology Education shaped by teacher leadership and management within the technology department? The accounts and descriptions of events or situations from the participant teachers form the main source of data for this research. However, whilst the initial research question was asked during the semi-structured interviews the participants' themselves wanted found it easier to talk about their experiences towards the question "How was the TiNZC (MoE, 1995) delivered in their school and how is their department implementing the NZC (MoE, 2007) technology curriculum. How is their HoD leading and managing the intended curriculum to shape the technology education in their school?

3.6 The sample

The schools involved in this research were from different deciles, different sized school and single sex or co educational. The table below present a summary of data.

Summaries of interview data

3.6.1 Table 1 Information of participant schools

School	Decile	Gender	Roll	Periods	Number of subjects	Year Level Technology taught
Central City School	3	Boys	250	5 Periods a day	6 options structure	Year 9 – 12
Valley Girls High School	10	Girls	1470	6 periods a day	5 options structure	Year 9 – 13
Mountain Girls High School	10	Girls	1900	6 periods a day	5 options/ 6 if approved	Year 9 – 13
Highway School for Girls	10	Girls	1900	5 Periods a day	6 options structure	Year 9 – 13
Rockford College	8	Co Ed	2100	5 Periods a day	6 options structure	Year 9 – 12
Seaview High School	2	Co Ed	1890	5 Periods a day	6 options structure	Year 9 – 11

* Highway School for Girls withdrew from the research after the focus questions and interview had taken place.

- A decile rating is the indicator used to measure the extent to which schools draw pupils from low socio-economic communities. A decile is a 10% grouping. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities. Decile 10 schools are the 10% of schools with the lowest proportion of these students. A school's Decile does not indicate the overall socio-economic mix of the school. Each state and state integrated school is ranked into a decile on the basis of the indicator. The indicator is based on Census data for households with school-aged children in each school's catchment area. Ministry of Education http://www.minedu.govt.nz/NZEducation/EducationPolicies/Schools/SchoolOperations/Resourcing/ResourcingHandbook/Chapter1/DecileRatings.aspx
- The number of period's each student study per day and the option structure indicates the amount of time per week students have to study the learning areas.
- The technology delivery indicates what year level materials technology from the technology curriculum is delivered in their school.

Note: School names are pseudonyms' not the actual school names.

3.6.2 Table 2 Technology delivery in participant schools

School	Year 9	Year 10	Year 11	Year 12	Year 13
Central City School	Half year Tech/Art	Optional Full year Technology	Full year Technology – N/US	Full year Technology – US	Full year Technology - US
Valley Girls High School	Two Terms Electronics/Materials	Optional Full year Technology	Full year Technology - N	Full year Technology - N	Full year Technology - N
Mountain Girls High School	Two Terms ICT/Materials	Optional Full year Technology	Full year Technology - N	Full year Technology - N	Full year Technology - N
Highway School for Girls	Four terms ICT/Materials/Graphics	Optional Full year Technology	Full year Technology - N	Full year Technology - N	Full year Technology - N
Rockford College	Four terms Food/ ICT/Materials/Graphics	Optional Full year Technology	Full year Technology – N/US	Full year Technology – N/US	Full year Technology – N/US
Seaview High School	Four terms ICT/Materials/Graphics	Optional Full year Technology	Full year Technology – N/US	Full year Technology – N/US	Full year Technology – N/US

*N = National Certificate of Educational Achievement is based upon the technology curriculum.
**US = Unit Standards are external industry training providers.
Graphics and Design is incorporated into junior technology programmes. The subjects are then offered as two separate subjects at senior level.

3.6.3 Table 3 Information of school departments – staff and their focus

School	Participant	Position	Background	Department focus for their students
Central City School	Colin	HOF	Mechanical engineering	Trades and industry for their students.
Valley Girls High School	Veronica	HOF	Masters in Science	University focus in the sciences or technology
Mountain Girls High School	Mary	HOF	Product Design Degree	University in design schools or creative tertiary study
Highway School for Girls	Heather	HOD	Fashion Design	Creative domains and in the science domains of tertiary study
Rockford College	Rodney	HOF	Mechanical engineering	Pathways predominantly at polytechnics and industry focused.
	Raymond	HOD	Fitter turner	
Seaview High School	Simon	HOD	Fitter turner	Pathways predominantly at polytechnics and industry focused

3.7 Validity and reliability in research.

Reliability and validity determines the quality and integrity of research. Without them the research may be invalid in answering the research argument. Reliability is basically concerned with demonstrating that if the research was carried out on a similar group of respondents in a similar context then similar results would be found Validity is based on the view that a particular instrument measures or describes what it is supposed to measure or describe (Cohen, 2007, p. 106).

3.7.1 How reliability and validity is achieved

Validity in the pre-interview focus question design was achieved through construct validity which is how well our thoughts and intentions match that of our participants**.** This research achieved validity by designing the questions based on previous studies conducted by (Burns, 1992, p. 75). The questions asked teacher to reflect on their technology curriculum, technology education and department experiences. Care was taken to ensure teachers understood the purpose of this study and to keep them focussed on this study.

Reliability in the pre-interview focus questions was achieved by the researcher piloting the questions with similar teachers who were not involved with this study. The respondents were approached because of their similar, technology experiences. Another effective way of ensuring the reliability and validity of the questions is to use another method of data collection. This is termed triangulation or a multi-methods approach (Cohen, 2007, p. 152) The other method used in this study was face-to-face semi structured interviews.

3.7.2 How reliability and validity is achieved in semi-structured interviews

Reliability in semi-structured interviews is dependent on quality communication between the interviewer and interviewee (Cohen, 2007, p. 123). It is important that the interviewee understands the intent and form of the question without the interviewer coercing an expected response. The data needs to be transcribed and

reported. The transcripts can be given to the interviewee to check for accuracy to ensure the transcribed data are exactly what the interviewee wished to say. In this research study the questions were also put to a group of three interviewees and the ongoing discussion confirmed that each one of the participants knew what the questions were about.

(Cohen, 2007, p. 123) state validity in interviews is enlarged by minimising bias. Bias can come in the following forms: poor interviewer skills, unclear questions, and the limitation of using one research method. In this study the interview questions were pre planned and using prior knowledge gained from the participants completed questionnaires. Therefore interview skills strong and more than one research method enhanced validity.

A form of adding to validity was used by the researcher by allowing all interviewees to make changes on their original transcripts. All interviewees were sent a copy of the interview transcript to allow them the opportunity to view and make any changes if they wanted to. The participants were informed that they had the right to discuss with the researcher, statements they made during the interview or alternatively any relevant issues during the researchers presence in their department.

3.8 Ethical Issues

Ethical issues must be considered when conducting research which involves teacher's. Research and researchers have a responsibility to avoid any potential harm to participants. Ethical issues relate to access to participants, informed consent, confidentiality, potential harm to participants, participants right to decline, arrangements for participants to receive information, and use of information (Cohen, 2007, p. 54) In this research study the pre-interview focus questions and semi structured interviews required ethical considerations.

3.8.1 Ethical implications of pre-interview focus questions

The use of a pre-interview focus questions and gaining informed consent from the participants needed detailed ethical procedures such as letters to participants, their teacher in charge, and the classroom teacher's head of department and principal In the case of one school a letter was sent to the Board of Trustees to inform them about the pre-interview focus questions.

3.8.2 Ethical issues of focus group interviews

The ethical issues in this research related to the informed consent, confidentiality and the consequences of the research. Informed consent means the participants in the focus group interviews were truthfully informed about the research before participation and that they were informed that they could withdraw from the research of their own freewill without coercion. Privacy is maintained in the research report through the use of pseudonyms. Participants knew how the research interview data would be used in advance. The teacher participants, other classroom teachers, HoD and Principals were all aware of the semi structured questionnaire and interview process. Transcribed data were verified with the participants to check for any inaccuracies and misinterpretations. Ethical appeals for this research were for the participants to contact my supervisor based on a fair appeal to the Faculty of Human research ethics committee.

3.9 Chapter summary

In summary this chapter discussed the interpretive paradigm, pre interview focus questions and semi structured interviews, in relation to the conduct of this research. The pre interview questions were designed and implemented as a first phase for eliciting responses from teacher. These responses were then used from the selected participants for semi structured interviews. The interview allowed for a more in-depth level of detail to support information gained from the pre-interview questions. Both methods were appropriate for generating data in this research. The ethical dimensions and quality of this research were maintained through strategies related to maintaining validity and reliability. The next chapter presents the research findings for this thesis.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 Overview of the research findings

This chapter presents the results of the five participant secondary schools in the Auckland area based on the question "How was the TiNZC (MoE, 1995) delivered in their school and how is their department implementing the NZC (MoE, 2007) technology curriculum. How is their HoD leading and managing the intended curriculum to shape the technology education in their school? The participant teachers and the sample schools are described then the research findings are organised into the cross-school themes that answer the above questions using interview quotes to support the findings.

4.2 The teacher participants

Twelve participants from nine schools agreed to participate in the study, and of these six participants were chosen from five schools, since they were convenient in terms of accessibly, and represented a cross-section of different schools from a range of decile ratings and single sex or coeducational schools. The nine participants returned the pre interview questionnaire. Five of the respondents were HoDs and one respondent was the teacher in charge for the materials technology learning programmes. Because the focus in the study was on materials technology area of the technology curriculum many of the respondents were HoDs who were teachers of ICT technological area, Food Technology Area, Graphics and Design teachers. The teachers who had responsibility and taught in the materials technology area were preferred, and their understanding, their responsibility to deliver the technology curriculum and how the leadership within the department allowed for teachers to implement the requirements of the NZC (MoE, 2007) and towards delivering the technology curriculum. (Cowie, Hipkins, and Boyd, 2009) suggest "teachers who have been supported in a professional learning environment [tend to] focus on pedagogy as an important part of the implementation process" (p. 29). The head of department or teacher in charge thus needs to create an environment within their technology department where their staffs contribute to "a more robust curriculum within the wider technology community of the nature of

and importance of technology education" (Compton and France, 2007, p. 163)
The interviews were conducted in the five schools, and further data were collected from observations made by the researcher during school visits; for example, timetable structure, staff attitudes to the technology curriculum and whether the teachers considered that technology education was succeeding in producing students with technological literacy. The participant schools are described below (all school names are pseudonyms) and their characteristics then the participant teachers profiled to highlight their backgrounds and present their perceptions of technology as they discuss their department's delivery of materials technology within the NZC (MoE, 2007). The participants describe how technology is delivered in their school, the way they lead their department and what issues this has on the technology education in their school.

The semi structured interviews and cross-case analysis study notes from the six participants identified common themes related to implementation of TiNZC (MoE, 1995) towards NZC (MoE, 2007) curriculum documents, leadership, managing a department, perceptions of technology, assessment methods in technology and school delivery of technology education.

4.3 The sample schools

4.3.1 Central City School

Central City School has an extensive mix of students drawn from many diverse cultural backgrounds consisting mostly of Māori, Pacific Island, and others from a variety of different cultural backgrounds. Because of its special character as a religious school, the school time is allocated for religious studies, and special programmes are provided to assist students with English as a second language. It also caters for students' cultural needs by encouraging cultural activities, that allow each member of their community to be included as part of the school. *Central City School* is undergoing a period of exciting change intended to increase student numbers.

The technology department at *Central City School* for Year 7 - 12 students comprises four teachers with backgrounds in home economics, design and craft. One teacher teaches solely in the intermediate school – three teachers in the senior school who teach ICT, Multi-Materials Technology and Graphics and Design from the Year 9 -13 secondary school. Two teachers teach Multi-Materials Technology, Graphics and Design areas of the senior school. The HoF has responsibility for the technology curriculum in the NZC (MoE, 2007) delivery, working alongside a second year teacher. The materials technology department works co operatively to deliver the technology curriculum in *Central City School*. The HoF is a teacher who coordinates, organises, manages and plans the technology education working with the whole school. He is responsible for middle management administration, the perception and future direction of technology education. The second year teacher has responsibility for curriculum delivery in his classroom working with HoF. Both teachers felt that they were delivering a curriculum suited to their students needs. Participant teacher names are pseudonyms used to maintain participants' anonymity.

4.3.2 Valley Girls' High School

Valley Girls' High School has an extensive mix of students drawn from many diverse cultural backgrounds, but is mainly New Zealand European. The senior management of the school are very supportive of the technology faculty. The school has excellent technology facilities with specialist Biotechnology, Food Technology, Soft Materials and Multi-Materials rooms, each room containing state of the art equipment and ICT facilities. The technology faculty also has a computer suite, and a colour photocopying centre; the latter frequently used by students, most of whom have personal laptops. The school does not offer Graphics and Design, and operates a faculty structure based upon the seven learning areas of the New Zealand Curriculum, English, Science, Mathematics, Social Sciences, Health and Physical Education, Arts and Technology. The HoF has been teaching at this school for 17 years.

The technology faculty has seven teachers including the HoF; all teach different subject areas, and are up to date on technology education developments with staff

experienced as curriculum developers for the NZC (MoE, 2007), NZQA Level 1 – 3 markers, presenters at Technology Education New Zealand conferences, two staff have done further tertiary study in technology education. Their faculty has the technology curriculum as a principle focus, with continued promotion of technology education within the school. The HoF recently won a prestigious national award for distinguished teaching service in technology education. The HoF had responsibilities' ranging from staff training to technology curriculum management and NZC (MoE, 2007) implementation. Their faculty has an active staff's professional development programme, allowing generous study time allowance, paying tuition fees for tertiary study, and conferences attendance. Staff are supported by senior management in these roles and this has allowed the faculty to establish a professional learning community to share technology curriculum developments. The materials technology faculty has two teachers including the HoF, and provides programmes in Soft materials/Multi-Materials, ICT technology, mainly for junior technology programmes at Years 9 and Year 10. *Valley Girls' High School* does not offer Graphics and Design. Another teacher teaches soft materials however; she declined to participate in this study.

The HoF offered to participate in this research, and asked other staff in her faculty. However, they chose not to participate, but agreed to be involved in professional learning community with the HOF during the year, and to share learning from this research. Participant teacher names are pseudonyms used to maintain participants' anonymity.

4.3.3 Mountain Girls' High School

Mountain Girls' High School has an extensive mix of students drawn from many diverse cultural backgrounds, but were mainly New Zealand European. The technology facilities are first class, and the department offers Multi-Materials and Soft Materials up to the senior level. The Faculty of Technology has a generous budget, and modern facilities including state of the art ICT and Art facilities. The technology staffs work collaboratively within the Food Technology and ICT Technology areas, delivering the technology curriculum NZC (MoE, 2007).

The technology faculty has six teachers including the HoF; all teach different subject areas, and are up to date on technology education developments with staff experienced as curriculum developers for the NZC (MoE, 2007), NZQA Technology Level 1 – 3 markers, presenters at Technology Education New Zealand TENZ conferences, and two staff have done further tertiary study in technology education.

There is an academic focus for this technology faculty where the aim is for their students to gain university pathways predominantly in design schools such as Architecture, Product Design, Landscape Architecture and other areas of creative tertiary study. *Mountain Girls' High School* facilities consist of Art and Graphics Design rooms, three workshops with multi materials specialist equipment, two state of the art ICT design rooms with Computer Aided Design capabilities. Mary was instrumental in the design of the facilities and with senior management support has purchased modern equipment such as computer numerical controlled machines - CNC, electric furnaces and laser cutting scanners.

The technology faculty of *Mountain Girls' High School* has six teachers including the HoF with backgrounds in Product Design; Graphic Design; Architecture; Art Sculpture, ICT Web Designer, Civil Engineering and Fitter welding who teach in the Graphics and Design, Food Technology, Materials Technology, ICT Technology and Textiles technology learning areas in the school.

The HoF has responsibility for the implementation of the NZC (MoE, 2007) by working with her teachers to co-operatively deliver the technology curriculum in *Mountain Girls' High School*. The materials technology faculty has three teachers including the HoF, and provides programmes in Soft Materials/Multi-materials; ICT technology for their year's 9 – 13 students. The HoF is a teacher who co-ordinates, organises, manages and plans the technology education working within the whole school. She is responsible for middle-management administration, the perception and future direction of technology education. The two materials teachers have learning programme responsibilities' to deliver and manage their classroom teaching with their HoF.

4.3.4 Rockford College

Rockford College has a diverse range of cultures within the school community predominantly New Zealand European. The school has a strong focus on academic and behavioural standards within the school with many senior students aiming for tertiary study. The technology facilities received generous funding from the government and local industry to build and renovate the technology facilities.

The new building accommodates building technology, carpentry, workshop engineering, electronics, theatre technology, and automotive engineering capability in the new facilities that can cater for multi materials, soft materials and Graphics senior classes. The ICT capabilities are high quality and easily accessible for technology teachers to deliver the NZC (MoE, 2007).

The technology faculty of *Rockford College* has nine teachers including the HoF with backgrounds in Civil Engineering, Fitter Turning, Carpentry, Home Economics, Plumber and Fashion Design all teach different subject areas and are up to date on technology education developments with two staffs being materials developers for the NZC (MoE, 2007, NZQA Technology Level 1 – 3 markers, been presenters at Technology Education New Zealand conferences and the same two staff have undertaken tertiary study in Technology Education.

The HoF has responsibility for the technology curriculum in the NZC (MoE, 2007) delivery working along side his teachers in charge of technology areas and classroom teachers to co operatively deliver the technology curriculum in *Rockford High School*. He is responsible for middle-management administration, the perception and future direction of technology education. His teachers in charge are responsible for technology areas, industry training organisation courses, graphics and design courses and to co ordinate with classroom teachers of specific technology courses. The two teachers in charge are experienced teachers of materials technology and food technology who have taught senior Year 13 subjects. The teachers have learning programme responsibilities' to deliver and manage their classroom teaching with their HoF. *Rockford College* also have staffs with limited understanding and engagement in the Technology curriculum preferring to focus on

industry qualifications which are unit standards assessed. The staffs who are not teaching the technology curriculum are trained in specialist trades or industry training organisations. *Rockford College* also have a number of overseas trained teachers who have yet to be professionally developed in the technology curriculum and NCEA assessment. The focus for this technology faculty was to encourage their students into a wide range of career pathways predominantly aimed at polytechnics and industry trade focused courses with high academic expectations.

The HoF offered he participate in this research in conjunction with the teacher of materials technology. Both of these teachers were interviewed for this research. His other staff members choose chose not to participate in the research. Participant teacher names are pseudonyms used to maintain participants' anonymity.

4.3.5 Seaview High School

Seaview High School has a diverse range of cultures within the school community predominantly New Zealand European. The school has recently had a major change in its senior management who have put a major focus on academic and pastoral standards to improve on student achievement. The Ministry approved a name change for the school and there has been a major building renovation during the last 18 months which has seen the school operates various classes in non- specialised rooms while new classrooms have been built. Major focus has been put into wireless ICT capabilities and improving the support services for the students. The technology staff work collaboratively within the technology areas, delivering the technology curriculum NZC (MoE, 2007).

The Technology Faculty has five teachers including the HoF; all teach different subject areas and come from different subject backgrounds such as Fitter Turning, Carpentry, Home Economics, Sewing and Electrical Draughtsman. The staffs have not been active in keeping up to date on technology education developments for the NZC (MoE, 2007).

The HoF has responsibility for the implementation of the NZC (MoE, 2007) by working collaboratively with his teachers to deliver the curriculum at Seaview High

School. The Materials Technology Department have three teachers including the HoD providing programmes in materials technology, industry training courses, graphics and design and ICT technology for their students. The HoD is a teacher who co ordinates, organises, manages and plans the technology education working within the whole school. He is responsible for middle-management administration, the perception and future direction of technology education.

The other two materials technology teachers have learning programme responsibilities to deliver technology education and industrial courses in their classroom in co operation with the HoD. *Seaview High School* has recently built a state of the art separate building trade facility for carpentry, engineering and automotive industry with funding from Government and industry providers close to the school. This facility is part of the technology department but is also used for community education as a tertiary course trades provider.

The HoD offered to participate in this research and asked other staff in his department they chose not to participate, but agreed to share learning from this research. Participant teacher names are pseudonyms used to maintain participants' anonymity.

4.4 Results and responses from the interviews

The common themes and differences across all five schools interview responses are described below. The cross school responses and results are presented in five sections 4.4.1 - 4.4.4, to answer the overall research question.

4.4.1 How was the technology curriculum TiNZC (MoE, 1995) delivered in their school

Responses related to 4:4.1 present the findings in 4.4.2 Co-ordinating the transition when introducing the TiNZC (MoE, 1995). 4.4.3 Delivery of the TiNZC (MoE, 1995). 4.4.4 Facilities of the technology departments when the TiNZC (MoE, 1995 was introduced.

4.4.2 Coordinating

The transition from the introduction of the TiNZC (MoE, 1995) to the compulsory implementation in 1999 required all schools to coordinate their existing Year 9 – 12 workshop technology courses based upon the *Forms 1-4 Workshop Craft Syllabus for Schools* (DoE, 1986) into delivering the technological areas in the technology curriculum TiNZC (MoE, 1995). All of the schools coordinated their technology areas to incorporate their previous "technical subjects" aspects of woodwork, graphics, textiles, sewing, cooking, computing, electronics and engineering into the technological areas of the TiNZC, (MoE, 1995). Coordinating of prior subjects at the time of the TiNZC, (MoE, 1995) implementation was done in different ways by all the schools.

Mary from *Mountain Girls' High School* states "when we brought in the TiNZC, (MoE, 1995) we were able to present to management the perception of technology as a cohesive subject" "Where as prior to the TiNZC (MoE, 1995) it was "Textiles and Cooking only with no "Woodwork, Metalwork or and Technical subjects".

The integrated cohesive approach by *Valley Girls' High School* and *Mountain Girls' High School* to implementing the TiNZC (MoE, 1995) with limited or no prior "technical subjects" influences indicated that the implementation of the TiNZC (MoE, 1995) easier for the teachers to share a direction for the technology curriculum. These contrasts with the three schools who had limited interest, understanding in the TiNZC (MoE, 1995) as their previous "technical course" were deemed successful as they were achieving success at senior level.

Rodney from *Rockford High School* states "teachers wanted to stay with what they already knew" and "prior to the TiNZC 1995 our workshop technology programmes were successful in school certificate". When the TiNZC was implemented at senior level Raymond from *Rockford High School,*

Simon from *Seaview College,* and Colin from *Central City School* commented that their school's "kept the same programmes of woodwork, metalwork, textiles and renamed them technology". These schools coordinated their programmes to suit the

teacher's needs at senior level which influenced the way their junior programmes were delivered in the technological areas.

For example in materials technology Rodney commented " *Rockford College's* technology has been woodwork and metal work since the 1995 has been implemented and up until recently it still was at senior level". He also states "we could try teaching technology at junior level but we couldn't attract the student's" Similar to Seaview High School views were Simon fro Seaview College said: "we do engineering, woodwork and Graphics in Year 9 and Year 10 under the name technology".

Central City High and Valley Girls High also had to coordinate technology in their intermediate school's for example, Colin commented "the students did technology at intermediate in Years 7 and Year 8 in woodwork, metalwork, cooking and sewing in the 1990's up to as late as 2002 then from 2003 onwards we do materials technology and food technology." Colin also observed that until he had coordinated and concentrated what technology learning programmes he needed at Central City High School for Year 9 and Year 10. He then could work down to work with the intermediate. In Colin's view he preferred to "work with the senior teachers first." This was because "I didn't understand myself what direction technology was taking" and wasn't confident of coordinating the intermediate and high school at the same time.

Where as Veronica states "I am the HoD for year 1 – 13 to oversee the junior school as well as how the teachers integrate technology into their units" from food, electronics soft and hard materials. When the TiNZC (MoE, 1995) was implemented she states "I had no building to implement technology education, no prior history of any "technical subjects" not even home economics in the school". She enthusiastically designed her learning programmes to implement all three strands in the TiNZC (MoE, 1995) with a major focus on the Technology in Society strand, which interested her as she was from a science background as she states. "I was interested in the societal strand of TiNZC (MoE, 1995) and I made sure our school understood the importance of this". The implementation of the TiNZC (MoE, 1995) required schools to deliver four of the six technological areas. All of

the schools implemented their junior technology courses to reflect technological areas to suit their staffing at the time (See Table 4).

4.4.3 Delivery

All schools delivered a version of the technology curriculum suited to their students, and this impacted on the way their technology was implemented. The schools that chose a more "trades based" or "technical focus," tended to have programmes which reflected a more "hands on approach" using trades based unit standards as their assessment. Where as those schools that had an academic focus preferred use the technology curriculum and NCEA. For example, Colin from *Central City School* commented "We are constantly struggling to find technology teachers who are interested in the Technology Curriculum. As we are tradesmen and our boys prefer to do hands on [work]". Colin went on to observe that "the students want to be doing hands on work not lots of writing," and "it seems he feels that the technology curriculum is too academic for my students".

In contrast, Veronica from *Valley Girls' High School* felt that part of the curriculum delivery meant education students, parents and the community needed to what technology actually is: "It's [about] improving the community perception and the student perception of the subject and also making sure that my staff understand that the academic benchmark is the key focus to show the girls that this subject has a high standard of academia."

This may have been gender-based, since Mary from *Mountain Girls' High School* "felt much that same, seeing trades-based technology as not relevant for the girls in her school", "We don't have students interested in pursuing the trades' or industry courses such as building, welding, fitting and turning or plumbing as a future. Most of our girls and most certainly all of their parents view that what our students in their minds want to do when they leave school is go to university".

Table 4 Technological Areas delivered by participant schools at Years 9 - 10

School	Year Level	Technological area	Timetabled time
1- Central City School	7	*Materials	Six weeks
	8	*Materials/Food	Six weeks
	9	*Materials/ Structures Mechanisms	Ten weeks
	10	*Materials/ Electronics	Two terms
Number of technological areas			**4**
2- Valley Girls High School	7	Materials/ICT	Two terms
	8	Materials/ICT	Two terms
	9	Materials/Electronics Structures/ ICT	Two terms
	10	Biotechnology/Materials	One year
Number of technological areas [TiNZC]			**5**
3- Mountain Girls High School	9	ICT/ Materials/Food	Term each area
	10	ICT/Materials/Food	One year
Number of technological areas			**3**
4- Rockford College	9	*Materials/Food/ICT	One Term
	10	*Materials/Food/ICT	One year
Number of technological areas			**3**
5- Seaview High School	9	*Materials	12 weeks
	10	*Materials/Food/	One year
Number of technological areas		**2**	

Table 4 Summaries of interview data 4.4.3 Delivery

* Woodwork or engineering or technical skills under the name of Materials Technology.

Schools were required to teach four of the six technological areas by Year 10 based upon the TiNZC (MoE, 1995)

4.4.4 Facilities'

All schools have had changes to their technology facilities since TiNZC (MoE, 1995) especially in the investment of ICT capabilities for the school. *Central City School*, *Rockford College* and *Seaview High School* had existing technology facilities that had building refurbishments or upgrades over periods of time. Those schools also implemented technology based upon "industry" or "technical focus" tended to have facilities which reflected traditional woodwork, metalwork and automotive engineering.

When the TiNZC (MoE, 1995) was introduced *Mountain Girls High School* and *Valley Girls High* had dated existing cooking and sewing rooms. They had new purpose built technology facilities built for their technology department based upon their own vision of technology as "design" or "academic". Mary from *Mountain Girls High School* comments "my vision was to make a design school within technology" Where as Veronica from *Valley Girls' High School* states "I was originally a science and biology teacher and academic rigor was an important focus wanted as HoD technology" *Valley Girls' High School* was the only school to have biotechnology facilities and a state of the art electronic copy centre.

Central City School and *Valley Girls' High School* facilities had to cater for Year 7 and Year 8 students which were separate from the senior school. Every school had major ICT focus which also allowed the technology department to cooperate more with ICT technology within their department. In 1995 ICT use was limited within the technology curriculum with other technological areas. All schools have updated ICT capability which is also used for Graphics and Design in the schools who teach this. All schools have easy vehicle access to their buildings which was important for the delivery of supplies. *Central City School* does not have soft materials facilities or equipment. *Valley Girls' High School* does not offer Graphics and Technology so does not have graphics equipment although all their students use wireless laptops to present their work graphic form. *Mountain Girls' High School* facilities incorporate art equipment such as electric ceramics kiln, painting and clay sculpture rooms which also reflect their teacher's backgrounds.

Seaview High School has in 2010 built an industry standard trade's facility for carpentry, engineering and automotive with government funding and industry providers within close proximity to the school. This building is used by the school, community education and tertiary providers.

4.5. How is their department implementing the NZC 2007 technology curriculum

Responses related to 4:5 are presented in the findings in 4.5.1 Professional development 4.5.2 Planning.

4.5.1 Professional development

All of the participant teachers responded being involved with professional development in the TiNZC (MoE, 1995) implementation, NCEA implementation, HoD leadership, subject specific cluster meetings and the NZC (MoE, 2007) implementation. Some teachers had undertaken tertiary study, been moderators or assessors of NCEA technology for NZQA, and been involved with curriculum associations, and presented papers at conferences. This indicates a commitment to successfully integrating technology as a learning area. All of the teachers considered the professional development they received on the implementation of the TiNZC (MoE, 1995) were insufficient to support teachers in developing a coherent understanding of "what is technology? Colin from *Central City School* s for example states "None of the subject advisors could answer our question of what was technology?" Rodney from *Rockford College* also comments "No one knew what technology was?" The school support services facilitators who delivered the professional development also were teachers, and their perceptions of what technology was, also they based on their background. Raymond from *Rockford College* said "soft materials teachers were trying to explain to hard materials teachers what technology was," and Simon from *Seaview High School* states "How could we explain to students what technology is" "When we as teachers didn't understand what technology was?" All of the teachers agreed in that they received more professional development in the assessment of NCEA

Technology than in technology education. Rodney from *Rockford College* comments "the professional development was limited to focusing on student exemplars of NCEA". Basically technology assessment at senior level was the driver for technology education and the technology curriculum had not developed teaching for junior levels because of this focus. Raymond from *Rockford College* comments "NCEA and the TiNZC was introduced around the same time and teachers considered the two to be the same" However, all of the teachers have been active in participating professional development from cluster meetings, specific technology assessment courses and more recently on technology curriculum strategies for classroom learning especially since the introduction of the NZC (MoE, 2007). And there were some teachers in all the schools who had been undertaking tertiary study at postgraduate level, presented at conferences and been participants in classroom based curriculum research to benefit technology education. Some of these teachers are not HoD's, but noticed had significant input into their technology department's direction.

4.5.2 Planning

Planning for technology for all schools involved how they integrated the technology curriculum into their units of work from Year 9 – 13 and assessment of NCEA Technology. Two schools had implemented three strands of the TiNZC (MoE, 1995) in 1995 across their programmes, where as the other three focused their efforts on technological capability and technological knowledge strands. This is reflected in the participants current planning for the NZC (MoE,2007). *Mountain Girls High School* and *Valley Girls' High School's* planning incorporated all three strands where as at *Central City School* Colin comments "there are limited resources available for the technological knowledge and Nature of Technology strands". *Seaview College*, *Central City School* and *Rockford College* displayed planning for two strands of the technology curriculum. Colin comments "The current NCEA assessment Level One technology assessed only two of the three strands. All schools planned assessment in both achievement standards and unit standards to meet qualification requirements for NCEA and other qualifications'. Planning for technology education for all schools focused on

the technology curriculum objective levels of the student cohorts they receive from intermediate schools. In the case of the two schools with Year 7 and Year 8 students the HoD has input into their delivery to prepare them for Year 9. All schools planned a technology education delivery based upon their "own school needs" to meet national guidelines. This planning was dependant upon the professional development that staff had and their HOD direction. For example two schools *Valley Girls' High School* and *Mountain View High School* had staff that had undertaken tertiary study, been makers of NCEA and also been part of curriculum development. These teachers added updated and accurate information about curriculum development which benefited their schools technology education planning.

4.6. Explore technology teacher's views on the technology curriculum and technology education

The responses to 4.6 were mainly about 4.6.1

4.6.1 Perceptions of Technology 1995 - 2007

All schools agreed the perception of technology has changed since the TiNZC (MoE, 1995) introduction and its perception in the year 2009, has all teachers unanimous in stating "technology needs to be future focused" suggests Mary from *Mountain Girls High School.* Also the varying perceptions of the TiNZC (MoE, 1995) influenced the development and implementation affecting teacher's acceptance of technology. Simon from *Seaview High School* states, "There are different perceptions of technology which made it problematic for my staff to have confidence to teach it". Teacher's with negative perceptions of technology tended to avoid teaching technology. Colin from *Central City School*, Rodney from *Rockford College* and Simon from *Seaview High School* had staff who considered technology was "too academic and not hands on," and "used too much jargon" they opted to teach traditional unit standards from ITOs. Improving the perception of technology amongst senior management, parents, HoDs, other teacher's, students and other technology teacher's was a major focus for all

teachers in this research. Veronica from *Valley Girls High School* comments, "it's improving community perception, the student perception of the subject and also making sure that my staff improve their perception to understand technology". Technology education and technology assessment have different roles, however' they both influence the perception of technology. For example, the perception of technology by senior management tended to be influenced by results of assessment. Mary from *Mountain Girls High School* comments, "Senior management are supportive of technology because our results are good and our Polynesian students are achieving success". Technology assessment also tended to affect other teacher's perception of technology. *Central City School*, *Rockford College* and *Seaview High School* stated that teachers in their schools were surprised technology was a university approved subject. Mary from *Mountain Girls High School* comments "it is hard for senior management and other teachers to understand what the nature of our subject is, however, we can identify with science, maths, English and even geography teacher's subject base, were surprised technology is a university approved subject".

Two schools viewed the perception of technology in their school as an academic subject and their parents viewed technology as a step towards university entrance. Three schools viewed the perception of technology in their school as a preparation towards industry. These two perceptions of technology are indicative of this study, although a improved perception is important for HoD's. Colin from *Central City School* states "Many technology HoD's, teacher's and students will not consider technology as a viable subject in their school if the teacher's advisory, senior management and the Ministry of Education don't help to improve the perception of technology".

4.7 Exploring role of leadership within the technology department towards in implementing the NZC 2007

Responses to 4.7 mainly referred to 4.7.1

4.7.1 How did they become the leader?

How the HoD or HoF was selected for their position was an issue that was discussed in the interviews. *Central City School, Mountain Girls High School* and *Valley Girls High Schools* have been HoD's at their schools since the early 1990's. Veronica from *Valley Girls High School* was selected from her teaching background of science, and by an internal recommendation of her principal. Her selection came with the responsibility of having a major input into the design of their facilities and selecting staff. The same situation happened at *Mountain View Girls High School* where Mary was appointed internally, and had input into the design of their facilities. Both of these HoFs have a major focus on their staff being highly trained through professional development. Colin at *Central City High School* has made the progression from teacher to HoDs over his 22 year teaching career, "We have a small department in materials technology of two teachers and most of them leave". Rodney at *Rockford College* was selected from overseas 10 years ago, and has been up-skilling himself in understanding the New Zealand education system. He appointed Raymond at *Rockford College* as a teacher in charge as he had skills and knowledge that Rodney at *Rockford College* wanted to utilise for their school. Simon from *Seaview High School* is a young teacher who was selected as a new HoD and wants to become a principal in the near future. The exploration of how they became a leader was discussed as the experienced HoFs had been through the development of technology education, and the recently HoF's are gaining the benefits of their work. All of the participants agreed that the recent teacher support service professional development started in 2008 was important for the future of technology. They also considered that the Ministry of Education's "support for development of technology HoD's has been very disappointing".

4.8. How is their Head of Department leading and managing the intended curriculum?

Responses in the interviews to 4.8 are answered in 4.8.1 – 4.8.5

4.8.1 Job description of the HoD

The job description of a HoD or HoF varied in all schools. *Valley Girls High School* and *Mountain View Girls High* organised their school into faculties of learning areas for example the Technology Faculty incorporates, *Graphics and Design, Food, Textiles, Materials, ICT* rooms and subjects. Their HoF was responsible for all the learning areas with the Teacher in charge also given responsibilities in specific areas or learning programmes. The HoF's operate as middle managers in being coordinator of all areas of technology.

Where as *Central City School* and *Seaview High School* have HoD for subject areas for example HoD of Graphics, HoD of Food and HoD of Textiles they report back to a deputy principal. *Rockford College* operate with HoF and HoD's for example their HoF is a Technology teacher and he meets with the HoD of Food Technology. *Valley Girls High School* and *Central City College* as HoF and HoD are also responsible for a primary school technology education. Veronica from *Valley Girls High School* states "I am head of Faculty from Year 1 – 13 overseeing junior school as well as how they integrate technology into their units to complement the senior school". All of the HoF's / HoD's had been involved with professional development specifically aimed at HoFs' HoD's and their job description. All participants including Raymond from *Rockford College* had a formal job description which was agreed to in their appraisal with their appraiser they were also remunerated for their responsibilities' which they all agreed was an incentive but not their priority. All participants considered they had confident teaching experience but had varied levels of confidence in the technology curriculum. All of the schools felt that their job implementing the technology curriculum TiNZC (1999, MoE) in their school had been constrained, and made more stressful by the poor resource implementation, curriculum support and training given by the Ministry of Education. Colin from *Central City School* comments "I was in a position of responsibility as HoF reliant on delivering the technology curriculum that was poorly introduced and resourced". All schools agreed that recruiting "technology curriculum" trained teachers has been difficult as some existing teachers, new teachers, and overseas trained teachers, have

limited understanding of the technology curriculum and NCEA. This has put more emphasis on the HoFs job as being a "teacher of teachers". Rodney from *Rockford College* comments: "have staff with different perceptions of technology that are not up-to-date. We also have staff who are keen but lack confidence, and we have other staff who have limited or no interest in the technology curriculum" Rodney called them "technical teachers" not technology teachers."

4.8.2 Communication

The entire HoD's considered communication as important role of their formal job description which all schools defined two types of communication, professional relationships and the informal "personal relationships". The professional relationships related to staff communication between technology areas, senior management, students and the school community to create an environment of constructive relationships or professional dialogue. Professional dialogue communication was identified as when teachers shared conversations willingly and engaged in communicating shared views about technology education. Often each teacher's perception of technology was challenged but the conversations created "openness the work together" said Mary from *Mountain Girls High School.*

All schools mentioned that communication to their community of practice was of the essence for their department in engaging and developing improved technology perceptions. *Valley Girls High School* and *Mountain Girls High School* created a profile in their schools by communicating to their parents, BOT and their own school teachers in other departments by having open days and formal presentations. *Rockford College* HoF Rodney said, "we had an open day for parents to present the technology faculty and some of my staff were keen some refused to participate". The HoF wanted to improve the communication and profile for parents to understand what technology was. *Seaview College* had staffs with negative attitudes and they had had a number of new HoD's in technology over the recent years. Their communication with stakeholders was limited and their negative attitudes required senior management intervention. Communication

with senior management at *Seaview College* was also strained from previous senior management's decisions to employ staff with no or limited engagement in the technology curriculum. The current HoD has engaged in communicating a shared view to management and his current staff.

The personal relationships relate to the "informal interpersonal staff relationships and attitudes". All schools mentioned that they had staff' with varying attitudes, and perceptions towards technology education and the technology curriculum. Colin from *Central City School*, Rodney from *Rockford College* and Simon from *Seaview College* had some staff who were only interested in "technical" or "trades" and their attitudes and lack of communication with teachers involved with the technology curriculum created as Rodney from *Rockford College* comments "the preference in teaching NCEA achievement standards or unit standards has created a us versus them situation" when discussing the technology curriculum in the NZC (MoE 2007). The informal relationships' the HoF had with colleagues in creating a collegial working environment amongst department staff and also being responsible for managing communication towards of staff was a "managing daily process". All schools mentioned that as HoF they have had to learn "how to communicate" the difficult conversations with their staffs. Such as being proactive towards the technology curriculum NZC (MoE, 2007) and shifting negative attitudes of the perception of technology towards positive dialogue about curriculum developments..

4.8.3 Leadership

Leadership was discussed by all schools as directing their staff towards being successful departments in technology. Also leadership was referred to as the type of leadership style the HoF considered they displayed. All schools HoF's considered that they had a distributed leadership type style for running their department meaning sharing responsibilities' or beings leaders in their area. Interestingly the schools did not consider themselves as leaders in the technology curriculum, but managers of curriculum delivery. The leadership was seen by all schools as "leading their department because they were appointed to the position

of responsibility and they were also responsible for representing their technology, department at senior management level. Colin from *Central City School* comments: "How could I be a leader of technology when I didn't understand what it was," and Veronica from *Valley Girls High School* considered she had a distributed leadership style which she considered allowed for staff to develop their own leadership capacity. She comments: As a "HoF it is important How you lead in technology" suggesting her leadership style is "collaborative" making sure everyone in the department are valued and part of the team with responsibility to contribute and share resources and opinions together we all improve" with a "shared vision," where she discusses with key staff what that vision is to "ensure all staff are heading in the right direction or shared direction". Leadership in technology was not considered by all schools as being the curriculum leader as the curriculum this was continuously being developed and defined by the Ministry of Education. Leadership in technology was determined by the success in assessment and being up-to-date with curriculum developments through professional development.

4.8.4 Management

Management was differentiated by all participant schools from leadership or leading. Managing was defined by all participant schools as "managing the departments' day to day business" and the administrative functions or requirements of their school. Managing staff relationships and being responsible for curriculum delivery in their school was defined by the participant schools as "middle management". All schools considered their middle management as responsible for the technology curriculum. Simon at *Seaview High School* states "people management is important for an effective department". All HoFs agree *Mountain Girls High School* and *Valley Girls High School* considered that they were managers, coordinators and in positions of responsibility to display leadership direction. *Central City School* and *Rockford College* considered they were in a position of leadership responsibility and saw themselves as "having the most experience" and "can make decisions to allow others to follow". *Seaview High School* had prior issues with previous middle managers, senior management

and staff competency have impacted on Simon. Simon was a new HoD responsible for managing the department and to provide leadership in directing the department towards the new senior management's educational goals.

4.8.5 Senior management

There were similar and different perceptions of senior management from all participant schools. All participants considered that their senior management needed to provide more proactive support in these such as option structure timetabling, junior level technology and improving the perception of technology. *Valley Girls High School* and *Mountain Girls High School* have senior management who have been actively involved in professional development with their staffs through professional learning communities. *Rockford College's* senior management support Rodney and Raymond in developing technology in their school by one of the senior management being at the department's fortnightly meetings. *Central City School's* senior management, decided to change the senior school subject pathways be with academic or vocational. Colin from *Central City School* states "Graphics is in the academic pathway and technology is in vocational" consequently he feels "students prefer to study Graphics with technology student numbers being reduced because of this decision" *Seaview High School* senior management are new to the school and are been positive in their commitment towards technology. Simon from *Seaview High School* notes "our school preference is to focus on industrial training organisations unit standards than NCEA as their preferred senior assessment regime.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This study set out to explore the views of five secondary school materials technology teachers who teach materials technology. The teachers were asked How was the TiNZC (MoE, 1995) delivered in their school, how is their department implementing the NZC (MoE, 2007) technology curriculum, and how is their HoD leading and managing the intended curriculum to shape the technology education in their school?

This chapter summarises the key findings from the research. And conclude its relevance to the literature review presented in chapter two. The literature review discussed issues related to the background and implementation of the TiNZC (MoE, 1995) the curriculum developments and implementation of the NZC 2007, its and the role of the HoDs leadership and management.

5.2 Subject subculture

The research findings here suggest then that in these schools, technology was viewed on the basis of subject subculture. This is similar to work by (Sade and Coll, 2007, p. 98) who report that Solomon Islands curriculum developers and in-service technology teachers viewed 'technology' in terms of technical subjects, because of they themselves came from a trade's background. (Blewett, 2006, p. 38) also observed in the Curriculum Stocktake McGee et al. (2001, p. 54) that fifty-two percent of secondary teachers surveyed placed the emphasis of their teaching on practical skills, and fifty six percent of secondary teacher's mostly assessed practical skills when assessing learning in technology. Recent work in New Zealand (Jones et al, 2009) suggests a similar situation applies in NZ secondary many schools Blewett, (2006) found that teacher's were still struggling with the TiNZC (MoE, 1995) eight years after being introduced into schools. Responses in this research indicate they struggled to implement the TiNZC (MoE, 1995) mainly due to a lack of resources and MOE support. The participant

schools addressed this by designing their school-based curriculum to suit their staff's and student's needs'. The main change for these schools was that the TiNZC (MoE, 1995) was much broader in its intent and requirements. The school's in this research that took a proactive and with a shared collaborative intent seemed to have positive responses to technology. This finding is important in that previous research had not identified specific examples of what school's had done to deliver the TiNZC in their school context.

5.3 Teacher's response to change

The teacher's responses in this research to the introduction of the TiNZC suggest that they were frustrated and not receptive to implementing the new curriculum. This is supported by Sade and Coll who argue that teacher's response to change was an important dimension in the development and implementation of any new curriculum. Blewett et al (2003) states teacher change is a complex, social and cultural process. Also Fullan and Hargraves et al (1992) and Day et al (1999) agree that changing core dimensions of teaching is arduous and complex. Research in New Zealand by (Bell & Gilbert, 1996; Fullan, 1982; Fullan and Hargeaves, 1992; Jones and Carr, 1993 have researched teacher responses to educational change. Technology teachers have had to Blewett et al implement an assessment change, simultaneous with a new curriculum TiNZC. The main response to change for the teachers in this research was professional development for TiNZC , the NZC 2007 and the assessment regimes .

5.4 Professional development

Some schools in this research had teachers who preferred to teach technology using their previous subject cultures. Moreland and Jones (2003) suggested that inappropriate adherence to subject subculture can be addressed by appropriate teacher professional development. McGee et al. (2001) in the curriculum Stocktake (2002) reported that secondary teachers needed more professional development in the TiNZC (MoE) 1995.

Curriculum professional development programmes for the TiNZC 1995 had been provided by the Ministry of Education since 1994 (Jones, 2003). The initial professional development provided by the MoE to introduce the TiNZC was one day for each term for two terms. All schools in this research had undertaken some form of curriculum professional development on the TiNZC during the initial implementation phase of the 1999's. The responses suggests that they have developed a better understanding what is technology, technology education and why professional development is important for the development of the NZC 2007. To date professional development for technology curriculum, technology education and assessment is now provided to schools and their teachers by school support services responsible to the Ministry of Education.

Several researchers in New Zealand have provided research developments in technology curriculum by et al Compton 2001, Compton & Harwood, 2003, Compton & Francis, 2007 supported by resources from the MoE's teacher support services have contributed to expanding teacher's knowledge bases through professional development. Teachers in this research had made the attitude shift in moving away from their previous subject culture to teaching technology. The reasons should be attributed to the recent quality of the professional development and resources produced to support technology in the NZC 2007. Bell & Gilbert et al (1993) Teacher's as a group are concerned about their teaching and continually seek new ways to enhance student learning. Often at their own initiative, in their own time, at their expense and with a commitment to professional development, they attend teacher-only days, subject association meetings and conferences, inservice courses, study for university qualifications, talk with other teachers or read professional articles to get new ideas for teaching. (p.2) The teacher's in this study exemplified their commitment to developing their technology education knowledge by continued professional development in their own time outside of teaching. Bell & Gilbert et al suggest it is "common for teachers to find themselves teaching the same way they always have, perhaps utilising some of the new materials but adapting them to fit traditional patterns" Briscoe et al (1991) (p. 2, 1993). Teachers in this study have had to make changes to their teaching philosophy and in some instances teaching practice to engage in the technology curriculum. Thus the teacher's in this study commitment to professional

development have seen actual benefits in the school, the department and ultimately the student's they educate. Teachers in this study who attended professional development considered that they were more positive and confident about their teaching of the technology curriculum. Bell & Gilbert et al (1993) suggested that the main reasons for teachers continuing to change their practice despite the uncomfortable feelings associated with changing, were that they felt better about themselves as teacher's and that they had better learning outcomes in the classroom, (p. 84-161, 1993b). This research suggests that schools are becoming more confident in the technology curriculum in the NZC 2007 through professional development and teacher's changing attitudes towards their technology teaching pedagogy.

5,5 Leadership

Smith et al. (2008) agrees with the importance of professional development but says leadership is the key; in other words, professional development can only go so far and may be diluted by lack of leadership in schools after professional development activities are completed. Fullan (2002) et al suggested leadership within a school is a key influence on teacher response to educational change. Blewett & Cowie 2007 et al McGee (1997) argued leadership can be provided by the principal and their senior management, by heads of department, and by classroom teachers, although principal support for change is important contributor to teacher commitment to implementation.

All schools in this research have the support of their principal although one school's principal has recently made decisions unsupported by the HOD that will affect the future of technology in their school. Mc Laughlin & Talbert et al (2001) also support the view that in secondary schools heads of departments, as curriculum leaders, play a key role in leading change relating to teaching and learning. However, in this research the HOD's did not support the view they were curriculum leaders as the curriculum was still being developed and that they the HOD's were more keeping up to date with curriculum development's. Curriculum leadership and compared to their leadership were viewed differently by the

HOD's in this research. The respondents' made it clear they considered that they were managing their schools technology delivery not leading the curriculum. The HOD's considered that the national curriculum development was not their main priority and that their job was to interpret the national curriculum to manage their staff's abilities to deliver their school curriculum in different technological areas or subjects. Busher & Harris. Et al (2000) mention that research suggests there is variation between schools in teaching and assessing the curriculum, particularly between different subject areas, with some of these variations involving the differential leadership of department leaders. Busher and Harris et al. (1999) also suggest subject leader tend to recognise the department rather than the school as the central and immediate unit of organisation. The HOD's in this research accept that they lead their department in their school and manage their department's operational work of their teacher's. This affects the teaching and learning in the classroom. Blewett & Cowie et al (2007) agree that HoD's as leaders needs to be able to

- Work with department members, both as individuals and as a group, to develop a shared vision
- Foster knowledge creation as well as knowledge sharing
- Monitor and manage ongoing change et al Fullan (2002)

The HoD's in this study have paid attention to their role as leaders and managers; they have been through major curriculum change with the TiNZC. They have also seen the development of the curriculum in the NZC 2007 through ongoing professional development suggesting confidence in the direction of technology in the near future. The HOD's future focus is now on implementation of the NZC 2007. More research is needed to support leadership in technology education in developing future HODs so that they can learn how manage the day to day responsibilities', how to work with people and work within a team. HoD's need to how to develop teacher's knowledge and classroom delivery all of which assists the H o D's to lead into the future. Finally Timperly et al 2004 argues that to lead change, a head of department needs to establish a professional learning community with a focus on learning and a shared vision of what students can achieve. Two schools in this research have started this process and their

departments are starting to become more engaged with technology.

5.6 Perceptions of technology

Treagust and Rennie et al (1993) described teacher's perceptions of technology education, the technology curriculum including student learning, resources and assessment all impact on the implementation. Teachers in this research have had to understand what is technology, what is technology education and why the need to have the technology curriculum in order to develop their perception of technology. Improved perceptions of technology have allowed deeper understandings of classroom strategies for improved technology delivery in the schools of this study. The response teacher's perceptions of technology were continuously being developed in conjunction with curriculum developments to enable the H o D's and their departments to teach the aims the technology curriculum in the NZC 2007. This is for student's to develop a broad technological literacy that will equip them to participate in society as informed citizens (MoE, p. 32). Teachers in this research described their perception of technology in response to how they delivered the TiNZC (MoE, 1995) in their school. Only two schools in this research had applied learning to all three strands of the TiNZC (MoE, 1995) and the other four schools had delivered only two strands Technological Knowledge and Technological Capability with poor attention paid to the third strand Technology and Society. The teacher's responses to perceptions of technology were limited when considering the TiNZC. (MoE, 1995) The teacher's perceptions had also been influenced by the introduction of NCEA assessment regime in 1999. The technology professional development had focused on the NCEA assessment instead of technology curriculum. Although there are links between assessment and curriculum the teacher's in this research had identified that assessment had become the driver of the technology education. Consequently technology perceptions were more about assessment in technology. In this research all of the teacher's interviewed stated their assessment position of either NCEA or Unit standards. The NCEA teachers considered they had a "wider and more accurate" perception of technology. The unit standards had considered their view to be about industry and that the TiNZC (MoE) was unimportant to

their perception of technology. Unit standards teacher's had negative perceptions of technology, technology education and curriculum change. There were staffs in three schools who did not want to be engaged in technology curriculum. The HOD's have had to manage their technology departments teaching programmes to accommodate these teachers. As a consequence technology perceptions of technology in this study are varied however, the HOD's have had to manage the change process with the NZC (MoE, 2007) to improve the perceptions of technology. The recent NZC (MoE, 2007) curriculum developments professional development had been attended by the teachers in this research which had also influenced their perceptions of technology. The NZC (MoE, 2007) had three new strands which had not been fully developed, three schools in this research had participated in the classroom research to support the new strands in the NZC (MoE, 2007) These schools had been positive about the technology curriculum due to keeping up to date with developments. Jones & Carr et al (1993) research of teachers in response to implementation of a technology curriculum suggest account must be taken of the subjective realities of the teacher. Curriculum and teacher development need to grow from these existing conditions.

5.7 Curriculum Development

Sade & Coll et al (p. 88, 2007) suggested in their research that there are a number of factors that influence the development and implementation of the technology curricula. Perceptions of technology, concepts of technology, teacher's existing subject cultures, teachers and students responses to technology influenced the development of the development curriculum. Teachers in this research have contributed to the development of the curriculum by submitting feedback to curriculum developers their views. HoD's in this research express their departments perceptions Jones et al (2003) suggested that consultation with a wider community of teachers, tertiary sector, industry and enterprise (Jones & Carr 1993a) is vital for the development of the technology curriculum. Jones et al (2003) Teachers in this research have been involved with consultation about curriculum developments which has contributed to the revised NZC (MoE, 2007). Consultation with industry was the key driver behind the unit standards

assessment regime which was before the TiNZC (MoE, 1995) was introduced. Paechter et al (1993) identified raising the subject status has mixed issues such as increased academic aspects have to be emphasised at the expense of possible previous relevance and appeal to the less able. Technology achieved university approved subject status in 2005 (MoE, 2005). Three schools in this study identified the academic rigor of technology and the subject achieving the university approved status as key reasons for their students selecting technology. As a consequence of technology achieving this status the curriculum has had to develop progression of learning and assessment criteria to meet level 8 of the NZC (MoE, 2007) Murphy's et al (1993) research about gender differences in science suggesting that practical work can play a crucial role in combating gender differences. He argues that classroom strategies need to take into account of boy's and girl's preferred learning styles of working and interests as well as providing opportunities for them to reflect critically on them. There were suggestions from respondents that the technology curriculum academia suited girls and that boys preferred more "hands on" application of technology. The different schools in this research highlighted gender differences in programme design an example of this being three schools taught hard materials with traditional links to woodwork and the two girls schools only offered textiles or food technology. However; all schools agreed that they could deliver the NZC (MoE, 2007) to suit their department and students needs. Students in the two researched girl's school showed no interest hard materials.

5.8 Assessment

Jones, Hawe and Mather et al (1994) suggested learning, teaching, assessment and evaluation draw on the professional experiences and understandings of teachers. The responses in this research said it was important for them to know what to assess and how to assess so that they evaluate student progression. Also Jones, Hawe and Mather et al (1994) comment that there is very little research in assessment the area of assessment in technology. Blewett et al (2003) has researched the implementation of National Certificate of Educational Achievement were she looked at teachers responses and factors that influence the

responses of teachers. The implementation of NCEA did influence the HOD's, and teachers in this study as they considered that the curriculum development was driven by assessment. Responses indicate various reasons both negative and positive as to the success of NCEA implementation however; they all agreed that NCEA was across all subjects and important for their students. Unit standards were mentioned in responses as not being as important academically for students and three schools had teachers who preferred to teach unit standards. HoD's have had to work through assessment strategies in developing learning programmes that prepare their students. The HoD's in this study have predominantly endorsed NCEA as a means of assessment with greater subject resources support provided for teachers to ensure their students achieve academic success. Also the quality of classroom support for teachers in delivering the NZC (MoE, 2007) has improved substantially over the previous year.s

How the HoD successfully incorporates the NCEA technology assessment and teaching strategies for progression into learning the technology curriculum to provide a more thorough and deeper technology education is the constant challenge for HoDs, technology departments the teachers and for the benefit of the students.

CHAPTER SIX: CONCLUSIONS AND IMPLICATIONS

6.1 Introduction

Chapter five presented discussion of the findings of this thesis about how technology departments' experiences of implementing the NZC and technology curriculum, and how this was lead and managed in their school.

The purpose of this chapter is to present research conclusions based on the discussion presented in chapter five. A number of conclusions and associated implications emerged from this study:

- the effects of previous subject sub-culture on delivery of technology in the NZC (MoE, 2007),
- the importance of management skills in the department;
- the need to foster leadership responsibilities' at all levels of management;
- the need for substantive and organised professional development in as a team for the department to deliver, the intended NZC 2007 curriculum
- assessment regimes need to align to benefit technology education; and
- HoDs have varied experiences of implementing the technology curriculum.

Each of these is now discussed in turn.

6.2 Implications of previous subject sub-cultures

Some teachers in this study have shown preference for teaching technology their previous subject sub-culture in a form of ITO instead of NCEA technology, which has impacted on their perception of technology within their department. These teachers harbour reservations about technology education, in essence preferring to continue to teach their previous subject under an ITO regime. Teachers that taught to their previous subject subcultures have concerns about the loss of the

hands on skills that they believe are important. They consider that raising the academic status of technology has as suggested by Paechter (1993, p. 393) "brought about fundamental changes in the nature of the subject. The academic focus has come at the expense of practical objectives". The fact that technology gained university approval in 2003 and with this status came differences in the way teachers perceive the direction of the NZC for their senior students.

Jones et al. (1999) observe that different views of technology influence what occurs in the classroom, even if teachers are working from a common curriculum document. An implication of this is that teachers need support from their colleges to create a shared learning process to them to be involved in technology education. The whole technology department needs to examine the intentions and expectations of the NZC (MoE, 2007), with the aim of planning for a technology curriculum that will meet students' future needs. The HoDs with the assistance of their teachers need to examine staff skills, with the aim to develop technology education. Previous subject subcultures should be utilised to expand the technology curriculum, so that students can select subjects that can give them pathways for the future. Such these teachers need to know that their skills are valuable, in offering students a wider experience of materials technology; however, these skills need to link to the three strands of the NZC.

6.3 The importance of management skills

Managing the business of day-to-day administration, curriculum delivery and department functionality was deemed of high importance by the HoDs in the participant schools in this work. The HoDs are responsible for the delivery of the TiNZC and NZC and considered that they were more 'managers' of curriculum implementation. The HoDs did not consider that they were leaders in curriculum development, as they considered this was the responsibility of curriculum developers, and the MoE. There were clear statements from the HoDs that they felt they were not leaders in the curriculum, but managers of the curriculum for their department and school.

Coordinating, organisation, guiding, assessment management and communication are job description performance criteria for the HoDs in this study. How they managed was a skill that needed support, in the form of substantial and meaningful professional development.

The HoDs who took a 'wait and see' approach to the implementation of the TiNZC found managing the change process difficult, as their department tended to lack knowledge of the curriculum updates. The participant teachers looked to their HoD to provide them with regular updates and new curriculum developments. Thus quality managing has implications for departmental development, staff confidence, and perception of technology. The HoDs who engaged with the NZC and managed this process with a shared professional learning community such as *Mountain Girls High School* and *Valley Girls High School*, did see technology education flourish in their school. The management skills of the HoDs and working as a professional learning community seem to have helped some schools in this study. There thus needs to be more opportunities for HoDs of schools to meet and discuss concepts of being a good HoD, to benefit technology education.

6.4 Leadership responsibilities' at all levels

Senior management and leaders need to recognise the importance of creating leadership responsibilities within departments to share knowledge and expertise as a way of effective departments. HoDs need to do more than just develop skills and knowledge in teaching the technology curriculum. There needs to be a discussion about defining HoD leadership and management, in order to develop capacity in areas such as confidence to act as leaders, the ability to lead a department as a team, collaborative work by mentoring other teachers, managing the business, acting as a conduit of communication between senior management and the teachers in the classroom.

Teacher leadership can be seen as an expansion of the role of the classroom teacher, and in this study classroom teachers who had a good understanding of

technology saw themselves as curriculum leaders.

Developing a professional learning community to share conversations and encourage collaboration within departments to build leadership responsibilities' should then be a key focus of HoDs.

6.5 Substantive and organised professional development

Any professional development needs to be in depth and of a quality to improve teachers practice. The Curriculum Stocktake reported by McGee et al. (2002), noted that the majority of teachers had been involved with some form of professional development. However; (Bell & Gilbert, 1993) comment that it is common for teachers to find themselves teaching the same way as they always have; perhaps utilising some new materials but adapting them to fit traditional teaching approaches. Professional development needs to be substantive and organised, so that HoDs and technology teachers can have confidence in their ability to make changes to their teaching practice. Teachers and HoDs need to be convinced about the importance of professional development - its benefits within their teaching practice, and pedagogical content knowledge. Muijus and Harris (2003) note professional development for teacher leadership needs to do more than focus on the development of skills and knowledge in teaching.

There has been limited professional development in middle management roles for HoDs of technology as the focus tends to be on curriculum, assessment and strategies for student learning. There needs to be more focus on supporting HoDs in mentoring, coaching in how to lead their teachers as individuals and as a group, to implement change (Blewett & Cowie, 2007). If aspiring HoDs are not supported in learning the managerial skills and responsibilities' of being a HoD then senior management, schools, students and the intended curriculum may well suffer.

6.6 Assessment regimes need to align

NZQA and the Ministry have started to align the assessment regimes of unit standards and achievement standards. This process will take a number of years and will put more focus on engaging the students in the technology curriculum. The teachers will also need to focus on teaching technology education and ensuring the students reach the curriculum levels required to ensure students develop a broad technological literacy. Assessment change will need to be managed at senior level and developed at junior level to support teaching not drive the classroom delivery.

6.7 HoDs have varied experiences

There are experienced, new and future HoDs who are at various positions in their teaching careers in their department. The current HoDs should be utilised to bring their varied experiences to professional development for future HoDs . This experience is an untapped resource with valuable knowledge for technology teachers.

6.8 Recommendations

This study investigated the experiences of HoDs when implementing the TINZC and preparing for the NZC in their school. Their experiences have shaped the direction of technology education in their department and school. The recommendations for future study would be:

- Examine the workload of HoDs
- Understanding the complexity of the HoDs roles;
- More research need to done on experiences HoDs have in their school;
- Further examination of classroom research into implementing the NZC; and
- The successful implementation of the NZC.

6.9 Summary and Conclusions

This research was carried out in 2008 and 2009 when schools were required to plan for implementing the NZC (MoE, 2007) by 2011. The TiNZC (MoE, 1995) had been updated with new developments which were aimed to support the technology curriculum implementation in the NZC (MoE, 2007). The HoDs in this study suggested that they had found the implementation and delivery of the TiNZC (MoE, 1995) a difficult process as teachers were unsure of what was technology and technology education? The HoDs had to manage the change process from a curriculum that had traditionally been seen as "technical subject" or "craft", towards technology curriculum developments in the NZC (MoE, 2007). Also during this period of change, NCEA was introduced in 1999.

The HoDs in this study have had to develop an understanding of technology education to shape their departments towards delivering the intent of the NZC (MoE, 2007) and be able to meet the 2011 implementation date. How they did this was the intent of this study and for other HoD's to learn from their experiences to understand: How is materials technology education shaped by teacher leadership within the technology department?

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THE UNIVERSITY OF WAIKATO
CENTRE FOR SCIENCE AND TECHNOLOGY EDUCATION RESARCH ETHICS COMMITTEE

APPLICATION FOR ETHICAL APPROVAL OF
SUPERVISED GRADUATE/POSTGRADUATE RESEARCH PROJECTS

Name of applicant: Anthony Jerrard Hawkins

Contact address: 97 Stapleford Crescent
Browns Bay
Auckland

Contact phone number: Home: (09) 4789252

Email address: *ajh49@waikato.ac.nz*

Program of study: Master of Education (3-paper thesis)
,
Department/centre/unit: Centre for Science and Technology Education Research

Principal supervisor: Anne Hume

Current Qualifications: Post Graduate in Technology Education

Current Employment: Auckland Girls Grammar School

Title of project:

How is Materials Technology Education shaped by teacher leadership within the technology department?

The study involves ascertaining and exploring the views of six secondary school materials technology teachers who teach materials technology. The teachers will be asked about how materials technology education has been shaped by the leadership of their head of department, shaped by other teaching colleagues within the department and by the teachers themselves.

Interest in topic:

As a current Head of Faculty for Technology at Auckland Girls Grammar School, I am interested in finding out how the Technology Curriculum in the materials technology area is delivered by teachers within their department. I also want to find how technology educators' leadership, which in most cases is provided by Head of Departments, shape the

materials technology education delivered to their school students. What are the school practices which shape the technology curriculum such as option lines, timetabling, Department structure , HOD's technology education leadership, professional learning communities, assessment, programme design, staff and student perception's of technology, teaching staff's level of understanding of the technology curriculum and their background prior to teaching? The three aims of this research study are to: 1) Explore technology teacher's views on technology and technology education. 2) Explore how the technology leader shapes the key learning in materials technology area of the Technology Curriculum. 3) Investigate how the leadership and/or technology educator within the technology department shapes the pedagogy of the technology education within the school.

1. Details of the Project

a) Research question:

How is Materials Technology Education shaped by teacher leadership within the technology department?

b) Justification

Technology Education in its various forms has been implemented into schools in New Zealand and overseas as a way of improving technological literacy. So that societies will benefit from citizens becoming more informed as to the importance and role of Technology Therefore for society to learn about Technology and its future implications the leadership in Technology Education is vital. For New Zealand schools to fully comprehend the potential of a technology curriculum they must realize not just in schools but for society in general. This will require schools to provide a level of professional leadership, knowledge and understanding of the implications of the technology curriculum being implemented in their school. Also for schools to design programmes to scaffold their students learning in Technology Education.

c) Procedure for recruiting participants and obtaining informed consent

I intend to interview 6 teachers of State High Schools in my research project, letters of invitation (See appendices A - E) will be sent to six HOD's/ teachers via their principals (selected based on gender, urban and rural) inviting them to participate in the research

project. In the letter, I will emphasize that there is no compulsion to participate. In the event that the invitees decline to participate, I will keep on inviting others until I have six participants. I shall request the participants to sign a consent form (Appendices A - E) before they can participate in the research project.

d) Procedures in which research participants will be involved

The research will also conduct semi-structured interviews with individual teachers. A semi-structured interview guide will be developed for the study and will be focused on the research question of **How is Materials Technology Education shaped by teacher leadership within the technology department?**

e) Procedures for handling information and materials produced in the course of the research

Semi structured interviews will be conducted with individual teachers and will be tape-recorded. The use of tape-recording is considered best for my research project, as the raw data remains for later reference. Also it should enable me to 'naturally' take part in the conversation during the interview. I will also need to take interview notes or head notes as a useful supplement to recording non-verbal expressions of the participants and as a source of back-up notes (Mutch, 2005; Bell, 1999; Burns, 2000). The information collated will be transcribed as soon as possible following the collection of data. The tapes will be stored in a secure location at my home. The transcribed data will be stored on my computer hard drive and one back up copy will be made and stored in a safe location at CSTER (Centre of Science and Technology Education Research). All data will be kept securely until the thesis has been submitted and marked then the raw data will be destroyed. I will be also collecting and analyzing documentation that the technology department uses to inform their technology staff. This will include the learning programmes, department schemes department meetings, course booklets, and school prospectus and options timetable. This information will be kept in a secure location in my home. The interview transcripts will be returned to the participants so that they have an opportunity to confirm their accuracy. In addition, I will offer them the opportunity of including further reflections if they wish. Furthermore, at this stage in the process participants will have their final opportunity to withdraw from the study.

2. Ethical Issues

The following procedures will be adopted to ensure ethical conduct of my research project;

a) Access to participants

Secondary school in Auckland are administered by their respective Board of Trustees, the Principal and their teaching staff thus I shall seek permission from the Principal, Head of Faculty and teaching staff responsible to carry out my research with the selected teachers. Also these teachers are in a professional development support network which will allow access to teachers in a professional development capacity. I shall then inform the participants and arrange a mutually acceptable time and venue for the semi-structured interviews such as during professional development times of the technology department and at mutually agreed school times.

b) Informed consent

In the invitation letter I shall inform the participant about the research project well ahead of time and shall ask him/her to sign a consent form indicating his/her voluntary participation in the research project.

c) Confidentiality

Again all information gathered will be treated as confidential, as stipulated by the code of ethics of the University of Waikato, no real names will be used, and the other person besides the participant to have access to the data will be my supervisor. The data will be stored with Centre of Science and Technology Education Research and at my home in electronic form.

d) Potential harm to participants

In undertaking this research project, I shall attempt to eliminate or minimise any potential harm to the participants. I shall ensure that all participants remain professionally safe during the project. Maintaining confidentiality of participants will be an overarching concern given that the data may conflict with department views, may also highlight competency issues and issues between staffs within the department. There may be existing difference

of views on the Technology curriculum between teachers, HOD and senior management which may be a potential issue within the school.

e) Participants' right to decline to participate and right to withdraw:

The participants will be informed through the invitation letter (See appendices A - E), of their right to withdraw. In the invitation letter, the participants have the right to withdraw at any point in the research process, up to the point that they confirm the accuracy of the interviewed transcript and the analytical process begins.

I: Indicate what activities you require participants to do in my study:

My data-collection method is to individually interview six current Heads of Department, and/or teachers with responsibilities' and/or teachers in Auckland on their views using a semi-structured interview. The Heads of Departments are to be interviewed because they are viewed as curriculum leaders and/or have leadership responsibilities' Also they are to be interviewed on how they are shaping the direction of the Technology Curriculum in the materials technology area. Teachers rather than HODs are to be interviewed for reasons such as, the HOD is not a teacher of materials technology eg ICT teacher or Graphics only teacher, the school is small which has only one teacher, the department may consist of part time technology staff, the materials technology teachers may be teaching materials technology skills in a different assessment criteria such as Unit standards or Industry Training organisations or the teacher maybe in a large department but is the only one teaching the technology curriculum at senior level. The interview will be centred on the research question of "**How is the Technology Curriculum in the materials area shaped by the leadership and the teachers of the department?**

II: Indicate how much participants' time will be required:

The following are the estimated time each participant will be required to participate in this research project;

1: One face to face interview with individual……1 hr (maximum)

2: Reviewing the transcribed interview with individual……1 hr (maximum)

Estimated total hours per participant 2 hours maximum.

At the most each participants will spend about 2 hours on this research project thus 2 hours X 6 participants = 12 hours of total participant time.

f) Arrangements for participants to receive information

An information letter shall be sent to each participant by post containing all the relevant information regarding the research project as soon as they are selected to participate and a consent form to sign so that they agree to participate and give their consent to take part in the research. The participants will receive a summary at the end of the study.

g) Use of the information

Any information shared will be solely used for the academic purposes of this research and publication which may stem from this research or conference paper/delivery.

h) Conflicts of interest

The information gathered will be solely for academic purpose of completing my research project and will not be used for my personal gains or for assessment of the participants' job performances. Research will not be conducted at my own school.

i) Procedure for resolution of disputes

It is essential that I inform my participants of their right to contact me the researcher, or my supervisor if they have concerns about how my research is conducted. The consent letter will have my contact details and the contact details of my supervisor at University of Waikato.

j) Other ethical concerns relevant to the research

Anonymity: Every step shall be taken to ensure that the identities of the participants and the schools are not publicly revealed and that any sample of the teachers' voices gathered will be (anonymously) analyzed for academic purposes only and remain anonymous. The interview data collected from participants will not be attributed to any specific participant but will be analyzed using identification codes to ensure anonymity. Raw interview data and recordings will be securely kept and destroyed as soon as my final research reports are submitted. Only transcripts will be retained for record purposes and will be securely stored. Also I need to guarantee the teachers who will be participating in the study that

their identity and that of their school will not be revealed in the final research report or anytime during the process of data interpretation, transcription or analysis. The use of pseudonyms will be used in the interview to ensure anonymity for participants.

In addition to the above, the research project will also conform to the University of Waikato Human Research Ethics Regulations (2008)

k) Other considerations

The researcher has had a professional relationship with the participants and is viewed as a technology teacher within the same professional learning community. Issues may arise when teachers may consider their professionalism and competency are viewed as being critiqued by a colleague and friend. The researcher will avoid this by clarifying that their responses are for the purpose of this research and they will receive the interview transcripts to clarify their answers. The relationship between teaching colleagues and friends of the researcher will be alleviated by professional conduct such as a reminder the participant that the interview recording conditions apply to any conversation when the tape recorder is on.

3. Legal Issues

a) Copyright

It is viewed that my proposal will not create any copyright issues. Should any copyright issues arise from this document, and then permission will be requested. If no permission is received any documentation will be returned.

b) Ownership of data or materials produced

The data provided by the participants will belong to the participants. The materials produced from the project is solely for academic purposes, ownership of the analysed data or materials produced belongs to the myself research The data will be stored with Centre of Science and Technology Education Research and at my home in electronic form on my computer hard drive. Upon handing in of the final thesis data will be destroyed.

c) Places in which the research will be conducted

Auckland Secondary schools community and at teacher professional development meetings held at Teams Solutions school support services based at University Auckland.

d) Has application in whole or part previously been declined or approved by another ethics committee?

This is a new application which has not been to any committee.

e) For research to be undertaken at other facilities under the control of another ethics committee, has an application been made to that committee?

No

h) Further conditions

None

4. Research Timetable

TIME LINE

August – 2008	Proposal submitted to ethics committee.
August - November – 2008	Consolidate literature review and research design
February – 2009	Invitation letter sent to 10 secondary Schools principals and their Head of Faculty/ Department and teachers. The Principal and their participating teachers' are to indicate whether they are willing to be involved with the study.
February /March - 2009	Participants selected out of the principal's responses. Consent form signed by participants before they participate in the interview..
March/ April - 2009	Submitted Literature review and research method chapters.
March April – 2009	Interviewing & Data collection
July– 2009	Transcription of interview data.
July – September 2009	Data analysis and interpretation
October – 2009 January 2010	Final write up of research report
February 2010	Report submitted

4B: Expected date of completion of data collection.

The provisional date for completion of data collection is proposed on 30th July 2009.

5. Applicant Agreement

I agree

a) to ensure that the above-mentioned procedures concerning the ethical conduct of this project will be followed by all those involved in the collection and handling of data.

b) in the event of this application being approved, the researcher agrees to inform the CSTER Ethics Committee of any change subsequently proposed.

c) to submit for approval any amendments made to the research procedures outlined in this application which affect the ethical appraisal of the project.

Signature of applicant: ..... Date: .....

d) that this application has been developed with my supervision and has my support. I have checked that all the information requested in the checklist below is included

e) I agree to support the student to follow the above mentioned procedures concerning the ethical conduct of this project.

Signature of supervisor: …… Date: ……..

6. Check list

Before sending this form to the CSTER Ethics Committee Administrator please ensure that you have completed the following and attached these as appendices:

☐ Letter(s) to: participants, e.g. children, caregivers, principal, BOT, teachers.

☐ Information sheet, introductory letter for each type of participant

☐ Consent form(s) for each type of participant

☐ Questionnaire/survey questions/interview questions

☐ Reference list

☐ *Every page of your ethics application form has been numbered*

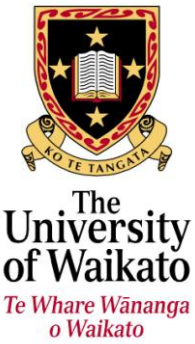
Appendix A:

Letter to Principal

Centre for Science
and Technology
Education Research

The University of Waikato
Private Bag 3105
Hamilton, New Zealand

Ph: 64-7-838 4035 (Centre direct line)
Fax: 64-7-838 4272
Email: cster@waikato.ac.nz



Dear Principal

I am currently completing a Masters Education Thesis at the University of Waikato which involves a research study of technology teachers within your school's materials technology areas. I would like access to your Head of Department and/ or your technology teachers on this research study.

The research study has a focus research question which is:

How is Materials Technology Education shaped by teacher leadership within the technology department?

The three aims of this research study are to: 1) Explore technology teacher's views on technology and technology education. 2) Explore how the Head of Department and/ or technology leader shapes the key learning in materials technology area of the Technology Curriculum. 3) Investigate how the leadership and/or technology leader within the technology department shapes the pedagogy of the technology education within the school.

The research study will involve the materials technology teachers in a face-to-face semi structured interview individually at a selected school meeting the researcher for one hour during a school term. An initial discussion will take place outlining the research and their involvement. The semi structured interview will take place to explore their ideas in more depth. The individual teachers will be informed about the follow up process which will involve reporting back to the teacher in the form of the transcript notes from the semi structured interview. The reporting back will take 1 hour at the individual teacher's school.

With your consent, I will work with your technology teachers who are currently teaching materials technology. The school, technology department, teachers and students will benefit from this study through a greater understanding of their core practices for effective pedagogy and learning in the delivery of the Technology Curriculum and technology education in their school.

Ethical guidelines will be followed throughout the research study. The identity of the school and the participating teachers will be kept confidential where anonymity is assured. The data collected will not be made available to any third party. It will be made clear to the teachers that their involvement is voluntary. There will be no compulsion on the individual teacher to complete the face to face

interview. Those teachers who choose to take part in the interview may decline to answer specific questions and they may withdraw their participation at any time.

If you have any questions please contact me in the first instance on 027 3135039. In the event of any further queries please contact my supervisor: Dr Anne Hume of the School of Education at the University of Waikato (Phone 07 856 2889 Extension 7880) Email address ahume@waikato.ac.nz). Or if they have any queries they can approach the director of Centre of Science, Technology and Educational Research which is Dr Chris Eames. Phone (07 838 4466 Extension 4357)

A consent form is enclosed for the Principal, Head of Department and teachers to sign and return to Anthony Hawkins at your convenience. Please return to me in the attached envelope.

PRINCIPALS INFORMED CONSENT FORM

Principals Name: _____School_____

Principals Signature: **_____Date _____2009**

a) I agree / disagree (Circle One) to technology staff participating in the study titled:

How is Materials Technology Education shaped by teacher leadership within the technology department?

b) The following technology staff can participate in the above study: (Circle One)

Head of Department only **Materials technology teacher only** **Both**

The technology staff member/s involved with the proposed research study can participate in:

c) An individual interview. Agree / Disagree

d) Reviewing the transcript of the interview. Agree / Disagree

Yours faithfully

Anthony Hawkins

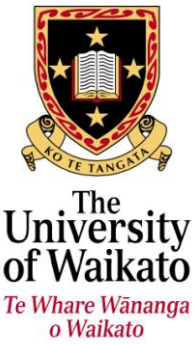
Appendix B:

Letter to the Head of Department

Centre for Science
and Technology
Education Research

The University of Waikato
Private Bag 3105
Hamilton, New Zealand

Ph: 64-7-838 4035 (Centre direct line)
Fax: 64-7-838 4272
Email: cster@waikato.ac.nz



Dear Head of Department

I am currently completing a Masters Education Thesis at the University of Waikato which involves a research study of technology teachers within your school's materials technology areas. I would like to work with you the Head of Department and /or teachers of materials technology within your department.

The research study has a focus research question which is:

How is Materials Technology Education shaped by teacher leadership within the technology department?

The three aims of this research study are to: 1) Explore technology you or your teacher's views on technology and technology education. 2) Explore how the Head of Department and/ or technology leader shapes the key learning in materials technology area of the Technology Curriculum. 3) Investigate how the leadership and/or technology educator within the technology department shapes the pedagogy of the technology education within the school.

The research study will involve the materials technology teachers in a face-to-face semi structured interview individually at a selected school meeting the researcher for one hour during a school term. An initial discussion will take place outlining the research and their involvement. The semi structured interview will take place to explore their ideas in more depth. The individual teachers will be informed about the follow up process which will involve reporting back to the teacher in the form of the transcript notes from the semi structured interview. The reporting back will take 1 hour at the individual teacher's school.

With your consent, I will work with you the Head of Department and or any technology teacher who is currently teaching materials technology. The school, technology department, teachers and students will benefit from this study through a greater understanding of their core practices for effective pedagogy and learning in the delivery of the Technology Curriculum and technology education in their school.

Ethical guidelines will be followed throughout the research study. The identity of the school and the participating teachers will be kept confidential where

anonymity is assured. The data collected will not be made available to any third party. It will be made clear to the teachers that their involvement is voluntary. There will be no compulsion on the individual teacher to complete the face to face interview. Those teachers who choose to take part in the interview may decline to answer specific questions and they may withdraw their participation at any time.

If you have any questions please contact me in the first instance on 027 3135039. In the event of any further queries please contact my supervisor: Dr Anne Hume of the School of Education at the University of Waikato (Phone 07 856 2889 Extension 7880) Email address ahume@waikato.ac.nz). Or if they have any queries they can approach the director of Centre of Science, Technology and Educational Research which is Dr Chris Eames. Phone (07 838 4466 Extension 4357)

A consent form is enclosed for the teacher of materials technology to sign and return to Anthony Hawkins at your convenience. Please return to me in the attached envelope.

HEAD OF DEPARTMENT INFORMED CONSENT FORM

HOD Name: _____School_____

HOD Signature: **_____Date _____2009**

a) I agree / disagree (Circle One) to technology staff participating in the study titled:

How is Materials Technology Education shaped by teacher leadership within the technology department?

b) The following technology staff can participate in the above study: (Circle One)

Head of Department only **Materials technology teacher only** **Both**

The technology staff member/s involved with the proposed research study can participate in:

c) An individual interview. Agree / Disagree

d) Reviewing the transcript of the interview. Agree / Disagree

Yours faithfully

Anthony Hawkins

Appendix C:

Letter to the materials technology teachers

Centre for Science
and Technology
Education Research

The University of Waikato
Private Bag 3105
Hamilton, New Zealand

Ph: 64-7-838 4035 (Centre direct line)
Fax: 64-7-838 4272
Email: cster@waikato.ac.nz

Dear Teacher

I am currently completing a Masters Education Thesis at the University of Waikato which involves a research study of technology teachers within your school's materials technology areas. I would like to work with you and/or other materials technology teacher's within your department.

The research study has a focus research question which is:

How is Materials Technology Education shaped by teacher leadership within the technology department?

The three aims of this research study are to: 1) Explore technology teacher's views on technology and technology education. 2) Explore how the Head of Department and/ or technology leader shapes the key learning in materials technology area of the Technology Curriculum. 3) Investigate how the leadership and/or technology educator within the technology department shapes the pedagogy of the technology education within the school.

The research study will involve the materials technology teachers in a face-to-face semi structured interview individually at a selected school meeting the researcher for one hour during a school term. An initial discussion will take place outlining the research and their involvement. The semi structured interview will take place to explore their ideas in more depth. The individual teachers will be informed about the follow up process which will involve reporting back to the teacher in the form of the transcript notes from the semi structured interview. The reporting back will take 1 hour at the individual teacher's school.

With your consent, I will work with you and /or other technology teachers who are currently teaching materials technology. The school, technology department, teachers and students will benefit from this study through a greater understanding of their core practices for effective pedagogy and learning in the delivery of the Technology Curriculum and technology education in their school.

Ethical guidelines will be followed throughout the research study. The identity of the school and the participating teachers will be kept confidential where anonymity is assured. The data collected will not be made available to any third

party. It will be made clear to the teachers that their involvement is voluntary. There will be no compulsion on the individual teacher to complete the face to face interview. Those teachers who choose to take part in the interview may decline to answer specific questions and they may withdraw their participation at any time.

If you have any questions please contact me in the first instance on 027 3135039. In the event of any further queries please contact my supervisor: Dr Anne Hume of the School of Education at the University of Waikato (Phone 07 856 2889 Extension 7880) Email address ahume@waikato.ac.nz). Or if they have any queries they can approach the director of Centre of Science, Technology and Educational Research which is Dr Chris Eames. Phone (07 838 4466 Extension 4357)

A consent form is enclosed for the teacher of materials technology to sign and return to Anthony Hawkins at your convenience. Please return to me in the attached envelope.

TEACHER INFORMED CONSENT FORM

Teachers Name: _____School_____

Teachers Signature: **_____Date _____2009**

a) I agree / disagree (Circle One) to participating in the study titled:

How is Materials Technology Education shaped by teacher leadership within the technology department?

The technology staff involved with the proposed research study can participate in:

b) An individual interview. Agree / Disagree

c) Reviewing the transcript of the interview. Agree / Disagree

Yours faithfully

Anthony Hawkins

Appendix D: Invitation to participate in a semi structured interview

Invitation to take part in semi structured Interviews.

Separate letters sent to schools.

Dear teacher.

We invite you to be part of the **How is Materials Technology Education shaped by teacher leadership within the technology department?**

The three aims of this research study are to: 1) Explore technology teacher's views on technology and technology education. 2) Explore how the Head of Department and/ or technology leader shapes the key learning in materials technology area of the Technology Curriculum. 3) Investigate how the leadership and/or technology educator within the technology department shapes the pedagogy of the technology education within the school.
.

Each interview will consist of the individual teacher by themselves who are teaching the technology curriculum in the materials area. The discussion will last no more than one hour. It will focus on your experiences of teaching materials technology, the Technology Curriculum and your department leadership practices. We are interested in **your** views of department leadership and your materials technology core learning practices.

Your identity will remain confidential to the researcher. You will not be identified in any way other than a code number or pseudonym in data records or reports of research findings. You may decline to answer questions and withdraw from the interview at any stage.

If you have any questions please contact me in the first instance on 027 3135039. In the event of any further queries please contact my supervisor: Dr Anne Hume of the School of Education at the University of Waikato (Phone 07 856 2889 Extension 7880) Email address ahume@waikato.ac.nz). Or if they have any queries they can approach the director of Centre of Science, Technology and Educational Research which is Dr Chris Eames. Phone (07 838 4466 Extension 4357)

Yours faithfully

Anthony Hawkins

Appendix E: Semi structured pre interview focus questions

PART ONE: Initial Semi structured interview questions that the interviewer may discuss within the interview timeframe.

QUESTION 1: This following statements aims to find out something about your understanding of the Technology Curriculum in the New Zealand Curriculum 2007. Please comment on the following statements.

- **The Technology Curriculum is a requirement to be developed and implemented for students in years 1 – 13.**

- **The Technology Curriculum learning programmes are to be provided to all students' in years 1 – 10.**

- **Effectively taught learning programmes of Technology Education for years 9 – 10 require teachers and students to know "What is Technology".**

- **The aim of the Technology Curriculum is for students to develop a broad technological literacy.**

- **The three strands of the Technology Curriculum are effectively being taught in our department.**

- **The Department has a good understanding of technology education in the New Zealand Curriculum 2007.**

- **Having Technology education programmes from years 9 - 13 reflects the departments commitment to the Technology curriculum.**

- **The Department provides wider opportunities for students to accumulate credits from both achievement standards and unit standards where both academic and vocational learning are acknowledged.**

- **The Head of Department has supported teachers to develop new understandings about technology and ways of implementing the assessment.**

- **The Head of Department leads the direction the department takes in Technology Education.**

- **The teacher driving Technology Education can be some one other than the Head of Department. .**

- **Underpinning the knowledge of the Technology Curriculum with professional development is important for the department.**

- **The teaching backgrounds of department staff influences students understanding of the Technology Curriculum. .**

Leadership within the area of Materials Technology

QUESTION 2: Is the leader of the technology department also the driver for the learning in Technology Education?

QUESTION 3: How does the Technology Leader shape the key learning in Materials Technology at your school?.

QUESTION 4: What is the leadership style of your HOD Technology?

QUESTION 5: Comment on the below topics.

- **The HOD has worked with department staff, both as individuals and as a group to develop a shared vision.**
- **The HOD fosters knowledge creation as well as knowledge sharing.**
- **The HOD monitors and manages ongoing change.**
- **Teachers in our department have gained knowledge, support and time to professionally develop their practical understandings of curriculum changes.**
- **Comment on the four basic roles that a Head of Department needs to attend to:**

a)Managing the business

b) Working with people

c) Guiding the curriculum

d) Leading towards the future

QUESTION 6: The qualities of a good leader in the technology department should be.

QUESTION 7: The HOD encourages shared understanding of teaching and learning in technology.

QUESTION 8: Give your response to the following points.

a) The implementation of NCEA for Technology Departments has posed a challenge for leaders and teachers in all learning areas. What were the challenges that your department faced and what was your department's response

b) Leadership in the technology curriculum is about providing both direction and means to accomplish change? How has the leadership in your department accomplished the changes to deliver the New Zealand Curriculum?

c) The curriculum leadership within our department has influenced the confidence and way technology is taught and assessed within the school.

d) The range of Technology subjects delivered in your school are?

e) The senior management is supportive of the needs of our department Technology department.

f) The HOD establishes a team culture.

QUESTION 9:

The change process of developing a department requires teachers to construct new understandings and develop new pedagogical and professional practices. To lead the change, a head of department needs to establish a professional learning community and a shared vision of what students can achieve. What changes have happened within your department?

Appendix F: References List for ethics:

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