HARAKEKE: ENHANCING MAORI STUDENT ENGAGEMENT AND ACHIEVEMENT IN A MAINSTREAM PRIMARY SCHOOL

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Abstract

Ministry of Education research indicates that the inclusion of culture and te reo Maori in teaching can help improve Maori student education. If students can find the links between what is being taught and the relevance to their own lives then information will be easier to retain. Research has also shown that environmental education provides relevant learning that can connect students to their world.

Maori indigenous knowledge (IK) and environmental education (EE) share many commonalities. One such similarity is the relationship between tangata (people) and nature. While the sometimes destructive nature of this relationship has lead to global environmental issues, this study explores the combination of IK and EE to enhance Maori student engagement and achievement in a mainstream primary school.

An intervention unit based on harakeke was designed delivered in a Year 5/6 boys' only class in a suburban mainstream primary school, over a 10 week period. The environmental and socio-cultural significance of harakeke enabled a range of kaupapa (themes) to be included in the unit. This included; eeling and how to make and use a hinaki (eel/fish trap), karakia (prayer) and the relevance when harvesting kai (food) and resources. Each kaupapa also provided the opportunity for students to increase their te reo Maori vocabulary, with the introduction of kaupapa specific words. The Maori kaupapa also enabled the students to view EE from a Maori perspective, including the introduction of rahui - a form of conservation.

The findings indicated that the incorporation of a Maori kaupapa strengthened student engagement, improved student use of te reo Maori, improved the self-esteem and confidence for some students, increased students' awareness of harakeke and the value and versatility of the plant, and increased their awareness from a Maori perspective on sustainable harvesting.

Bringing Maori kaupapa into the classroom allowed the classroom teacher, who was Maori, the opportunity to share her own lived experiences of IK, as these are passed down from generation to generation, and people are born into them. The

familiarity of whanau offered the teacher the opportunity to bring this concept into the classroom and teach values that could flow into all curriculum areas while strengthening relationships between the teacher and student, student and student and teacher and student whanau.

This study has shown that both IK and EE, while each complex in their own right, have the ability to provide a holistic curriculum approach that can lead to engagement and achievement by Maori students in a mainstream school.

Dedication

I dedicate this thesis to my Dad, Harold Crookes (1920 -2000).

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Glossary

Ako.	Reciprocal teaching and learning
Ariki tapairu.	First born of high ranking family male or female
Ariki.	Paramount chief, high chief
Aroha.	Love, concern for, affection, compassion
Aronga.	View, view of the world
Atua.	God
Awhi rito.	Leaves of the harakeke that protect the rito (new leaf)
Awhi.	Help, support, embrace
Haka.	Ceremonial dance
Hangarau.	Curriculum area of Technology
Hangi.	Earth oven
Hapu.	Kinship group, sub tribe
Harakeke.	New Zealand Flax Phormium. Tenax
Hauora.	Curriculum area of Health and Physical Education
Hinaki.	Eel trap
Hinengaro.	Mind, thought, consciousness, intellect
Hongi.	Maori greeting where two people press the tip of the nose together
Hui.	Meeting, gathering
Iwi.	Tribe, extended kinship group
Kai.	Food
Kaikaha.	Harakeke trimmings
Kaimoana.	Seafood
Kaitiakitanga.	Guardianship, environmental management system
Kakahu.	Cloak, garment, dress
Kapa haka.	Different forms of Maori dance
Karakia timatanga.	A starting prayer
Karakia whakamutunga.	Closing prayer
Karakia.	Prayer, chant
Karanga.	To call, summon
Kaumatua.	Elder of community, a knowledgeable person recognised by the community
Kaupapa.	Theme, strategy, philosophy

Kawa.	Protocol, ceremony
Kete.	Basket woven from harakeke
Kia ora.	Hello
Ko mate.	Dead
Kohanga Reo.	Early childhood centre catering from children from birth to six years of age where the main language of instruction is Maori
Korari.	Flower stalk of harakeke
Korero tawhito.	Talk/speech of the sages
Korero.	Talk, speech
Koro.	Elderly man, grandfather
Koroua.	Elderly man
Kotahitanga.	Oneness or unity
Kuia.	Elderly woman, grandmother
Kupu.	Word, vocabulary
Kura Kaupapa Maori.	Maori language immersion schools (kura) where the philosophy and practice reflect Māori Maori cultural values.
Kura.	School
Mahi kainga.	Home work
Mana.	Prestige, authority, honour
Manaakitanga.	Kindness, hospitality
Maoritanga.	Maori culture practises and beliefs
Matariki.	Maori New Year
Matua.	Adult male, parent
Mirimiri.	Massage
Moteatea.	Lament, traditional chant
Muka.	Fibre extracted from specific types of harakeke
Ngahere.	Bush
Ngutu Parera.	Duckbill toy made from harakeke
Oku.	Of mine, belonging to me
Pakeha.	New Zealander of European descent
Para.	Green epidermis scrapped from harakeke leaf
Patai.	Question

Pepeha.	A proverb that associates the speaker with significant land marks of their iwi, for example the mountain and the river
Pipi.	Shell fish, edible (bivalve)
Piupiu.	A type of skirt prepared from harakeke
Poroporoaki.	Lament and farewell
Powhiri.	Traditional welcome ceremony
Pu harakeke.	Harakeke bush
Purakau.	Myth, legend
Purangi.	Net used in eeling
Putaiao.	Curriculum area of Science
Putiputi.	Flower
Rahui.	Form of conservation, ban, prohibit
Rakau.	Stick, tree
Rangatira.	Chief
Rangatiratanga.	Authority
Raranga.	Weaving, plaiting
Rau.	Harakeke leaf
Rito.	Name for the central leaf of the harakeke
Rongoa.	Maori medicine
Rourou.	Food basket woven from harakeke
Taha.	Side
Taiaha.	Long spear-like weapon of hard wood used in the wero, part of the powhiri process
Tangata whenua.	Belonging to the land
Tangata.	Person (either sex), people, mankind kind
Tangihanga.	Funeral
Taonga tuku iho.	Treasures from tipuna
Taonga.	Treasure, accessory, equipment
Tapawha.	Four sides
Tapu.	Sacred, forbidden, taboo
Tauparapra.	Incantation to begin a speech
Taurekareka.	Slave
Te ao Maori.	The world of Maori
Te ao Pakeha.	The world of Pakeha
Tikanga.	Custom, protocol, method, procedure

Tikanga-a-Iwi.	Curriculum area of Social Studies
Tinana.	Body
Tipuna.	Ancestors
Tohunga.	Expert
Tutua.	Ccommoners
Waiata.	Song
Wairua.	Spirit
Wero.	The challenge that forms part of the powhiri process
Whaea.	Mother, aunty, term to address a female older than the speaker
Whakapapa.	Genealogy, cultural identity
Whakatauki.	Sayings, proverbs
Whanau.	Extended family
Whanaungatanga.	Relationship, kinship, sense of family
Whararikí.	Mountain flax (Phormium cookianum)
Whare wananga.	University, higher place of learning
Whare.	House, building
Whariki.	Mat woven from harakeke
Whenua.	Ground, country, land, placenta

Chapter 1: Introduction

1.1 Introduction

This chapter introduces the study. The impetus for the research is briefly described followed by a description of the context of the study leading to the research question. Limitations of the research are then identified and the chapter concludes with the thesis outline.

1.2 Impetus for the research

Ko Te Aitanga a Mahaki, Ngai Tai, Ngai Tahu oku iwi. No Waihirere ahau. My tribal affiliations are Te Aitanga a Mahaki (Gisborne), Ngai Tai (Torere-Opotiki) and Ngai Tahu (South Island) and I was raised on a farm in rural Gisborne. My mother is Maori and my father of Rarotongan and Scottish ancestry; I am the 8th of 10 children. I attended a rural primary school and a suburban intermediate and attended an all girls' high school, finishing during the late 1970's. Although I cannot recollect any form of deficit theorising whilst at school, I am now aware of the subtleness in which it permeated throughout my education. I am a product of an education system that promoted a domestic career path for Maori females, however, this career path fell short of my expectations, and I made the choice to change my life prospects.

In 2003 I began study towards Te Korowai Akonga - Bachelor of Teaching (Primary) with Te Wananga o Aotearoa. As a mature student studying at a Maori institution, I experienced education from a new perspective, from a Maori perspective. As part of my teacher training I read literature by a range of Maori authors including Russell Bishop, Angus McFarlane, Rose Pere, Arapera Royal Tangaere, and Ranginui Walker. This literature coupled with the disturbing statistics revealing the low level of achievement of Maori students in mainstream schools was the impetus for this research. While the majority of literature on Maori in education focused on the detrimental effects of colonisation and deficit theorising, which are a reality today, I contemplated how the achievement of Maori students attending mainstream schools could be improved.

I do not claim to be an expert in Maori indigenous knowledge (IK), but was raised with tikanga passed down from my mother's whanau, that have now become part

of my own whanau. One is continually learning whether in real life situations or other means. Tikanga that I have included in this study are those that I am familiar with and have experienced, but I have also read widely to gain a broader perspective of tikanga.

1.3 The context of the study

Historically, education in Aotearoa/New Zealand (A/NZ) has disadvantaged Maori, and government reports such as the 1960 *Report of the Department of Maori Affairs,* also known as the Hunn Report, and the 1962 *Report of the Commission on Education in New Zealand,* also known as the Currie Report, highlighted the problems facing Maori (Bishop & Glynn, 1999; Openshaw, Lee, & Lee, 1993). Surrender of language and culture in the education system culminated in the near extinction of te reo Maori (Maori language) (Walker, 1991). To regain control of educating Maori, revitalising te reo Maori and Maori culture, Maori developed an alternative education system. This alternative education system based on te reo Maori andMaori tikanga (customs), was developed and delivered by Maori. These language immersion schools started with Kohanga Reo (early childhood centres), then progressed to Kura Kaupapa Maori (Maori medium primary and high schools) and Whare Wananga (Maori tertiary institutions). The positive impact of these kura (school) affected the students and whanau (family), as according to Smith (1989, as cited in Bishop & Glynn, 1999) , whanau participation in kura life is paramount in the education of the child in terms of what is learnt and how and who is involved. While student results from these kura are positive (Caygill & Kirkham, 2008), the majority of Maori students still attend mainstream schools. It is these Maori students in mainstream primary schools that are not reaching their potential and at the heart of this study.

The Ministry of Education has recently funded research projects that focused on how to improve Maori student achievement. One such project is *Te Kotahitanga: The Experiences of Year 9 and 10 Maori Students in Mainstream Classrooms,* which began in 2001 as the first phase of a now four-phase project. This research was undertaken by the Maori Education Research Institute at the School of Education, University of Waikato and the Poutama Pounamu Research and Development Centre in Tauranga (R. Bishop, Berryman, Powell, & Teddy, 2007). The researchers spoke with Maori students in Years 9 and 10 (aged 13-14

years) to gain an understanding of their classroom experiences, and Bishop, Berryman, Tiakiwai and Richardson (2003) contended that the teacher - student relationship was the major factor in student performance. Information gathered from a range of sources produced an effective teaching profile that formed the basis of a professional development intervention (R. Bishop, Berryman, Powell et al., 2007). Bishop et al. (2003) referred to research by Smith (1992, 1997) on Maori Medium schools and incorporated effective strategies found to work in these schools into mainstream high schools. This professional development intervention centred on Maori concepts, including manaakitanga, ako and kotahitanga (R Bishop et al., 2003).

As *Te Kotahitanga: The Experiences of Year 9 and 10 Maori Students in Mainstream Classrooms* is set in a mainstream high school and centres on the teacher – student relationship, embedded in Maori concepts, I was interested in how such relationships could be developed from constructing knowledge based on IK and EE in a primary school setting. The majority (80%) of teachers in primary school identified as European/Pakeha and 80% of these teachers are female (Ministry of Education, 2005). A challenge for these European/Pakeha female primary teachers is how to provide the opportunities for Maori students to experience te reo Maori and Maori culture in mainstream classrooms. I saw that one possibility is through EE providing a context, as it has a strong link with Maori culture. A Maori worldview is embedded in the concepts of EE, recognising that Maori IK is intimately associated with knowledge and care for the environment. Tilbury (1995) states that EE provides a holistic curriculum approach, and this approach also applies to IK, with both EE and IK having the ability of being inclusive of all learning areas.

For a number of years my own IK had been developed through the practice of raranga (weaving). I came to see that my knowledge and care for the environment had also developed through the use of a native plant (harakeke) in the art of raranga. Harakeke linked IK and EE and I wondered how this could be used to engage Maori students in learning.

1.4 Harakeke

Harakeke or New Zealand flax (*Phormium tenax)* holds a special place for Maori and was so highly prized that a "Maori chief visiting England in the mid 19th

century remarked to his hosts that they must be very poor. You do not have any harakeke growing here" (Christchurch City Council, n.d.). The rau (leaves) of the harakeke were also given the names associated with whanau (family members), such was the importance associated with this plant.

New Zealand flaxes belong to the family Phormiaceae and are different from the European linen flax (*Linum usitatissimum),* though their fibre is similar (Scheele & Walls, 1994). There are two species of flax in A/NZ with *Phormium tenax* (lowland or swamp) referred to as harakeke by Maori and *Phormium cookianum* (coastal, mountain flax) referred to as whaririki by Maori (Pendergrast, 1998). Within *P. tenax* there are a variety of different cultivars, with the fibre obtainable from some varieties becoming the focus of international trade that started in 1818 (Atkinson, 1922).

Historically, raranga (weaving) was surrounded by strict tikanga (customs) with many of these tikanga still practised today. Tikanga included cultivation, harvesting, and disposal of harakeke kaikaha (trimmings). Puketapu-Hetet (as cited in Patterson, 1992, p. 24) states "The ancient Polynesian belief is that the artist is a vehicle through whom the gods create". With harakeke as the focus for teaching and learning, opportunities could be provided to incorporate te reo Maori and IK and provide students with a cultural perspective of EE.

1.5 Research question

This research seeks to investigate if infusing Maori indigenous knowledge within the context of EE could have a positive effect on Maori students' engagement and achievement in mainstream primary schools. The research question that guided this study was:

> Can the use of Maori indigenous knowledge (IK) and environmental education (EE) through harakeke enhance Maori student engagement and achievement in a mainstream primary school classroom?

1.6 The limitations of the study

The study was limited to one class at one urban mainstream primary school in A/NZ. The sample class and their teacher in this research were selected by the Principal of the school, as this class had certain characteristics, and these act to

limit the scope of the study. The sample, a boys' only class also limited the topic areas to be covered, as these were selected according to topic areas considered to be of high interest to boys. .

1.7 Thesis outline

Chapter 2 reviews literature on Maori education in A/NZ past and present, which includes a focus on government initiatives in Maori education, and a review of ideas about indigenous knowledge and environmental education. Chapter 3 describes the methodology and methods incorporated during this study. Chapter 4 presents the findings of this research. Chapter 5 provides a discussion of the major themes identified in the findings, and draws some conclusions and implications of this research.

Chapter 2: Literature Review

2.1 Introduction

This chapter provides a review of literature on the issue of the engagement and achievement of Maori students in schools in Aotearoa/New Zealand (A/NZ) and the potential of the use of indigenous knowledge (IK) and environmental education (EE) to address this issue. The first section presents a brief historical perspective on Maori society, with a focus on education, which is followed by an overview of current government education initiatives and strategies for teaching and learning of Maori students in schools. This is then followed by an examination of Maori indigenous knowledge (IK), and environmental education (EE) with an emphasis on their potential for enhancing Maori student engagement and achievement.

2.2 Educating Maori students

Socioeconomically, Maori are over-represented in a number of undesirable areas from unskilled labour to unemployment. In the 1998 edition of *New Zealand Now Maori,* there is an explicit correlation made between low levels of education and unemployment of Maori (Statistics New Zealand, 1998). In addition, research commissioned by the New Zealand Treasury into the deterioration of "Maori relative income levels" also indicates a definite link between education attainment and income level, with the higher the level of education attained, the higher the income level attained (Maani, 2004, p. 101). Within the education sector, recent data show the following:

- Maori out-number non-Maori in non-retention of 16 year olds at school,
- Early leaving exemption rates are 3.4% higher for Maori than non-Maori,
- Only 14.8% of Maori leave school with a qualification to attend university, compared with 36.3% for non-Maori (Ministry of Education, 2008a).

In addition, data in *Mathematics: Trends in Year 5 mathematics achievement 1994 to 2006* confirm that, although Maori student levels indicated an improvement over that period, Maori are still over-represented in the lower achieving groups, more so than Asian, Pasifika, Pakeha and others (grouping of other ethnicities) (Caygill & Kirkham, 2008). This lower level of academic status is also reflected in the *2006 Census,* which reports that a large proportion of Maori are employed in the less qualified jobs such as manufacturing and construction, and only 28,974 Maori compared to 345,354 non - Maori are employed as professionals (Statistics New Zealand, 2007). Although the median income for Maori aged 15 years or over in the 2006 year was $20,900, 48% of this group earn an annual income less than $20,000 and only 10.2 % of this group earn more than $50,000 (Statistics New Zealand, 2007) . With less money, there are fewer luxuries and for some Maori, education is deemed a luxury item (Ball & Wilson, 2002; Cunningham, Stevenson, & Tassell, 2005).

Although a low income affects all family members, children are the worst affected. A longitudinal study by Ball and Wilson (2002) in A/NZ, that focused on children born into families that were receiving a government benefit as their main source of income, tracked the children born in 1993 until 2000 and studied the effects of frequent and long term exposure to low income within the child's family. Results indicate that long term exposure to low income during the early years of childhood had a detrimental effect on the educational potential of the child (Ball & Wilson, 2002). A report by Cunningham, Stevenson and Tassell in 2005 also confirms that parental income was related to educational attainment of children; the higher the income, the better the educational achievement, the lower the income, the lower the educational achievement (Cunningham et al., 2005). These statistics and research depict the current setting in A/NZ, but before continuing our examination of Maori education we start with a brief look at the past.

2.2.1. Historical perspective of Maori society

Much of the earlier history of A/NZ was written by non-Maori, providing an ethnocentric view of Maori society. An ethnocentric view generally places cultures other than that of the viewer at a lesser status. In the 1990's, during the Maori cultural renaissance, the historical evidence of the education system for

Maori was reviewed by both Maori and non-Maori researchers, which resulted in revised literature that reflected more culturally-appropriate views about historical Maori education. Openshaw, Lee and Lee (1993) list three main reasons to doubt the legitimacy of the early educational records, of which two are briefly described here. Firstly, some of the ethnographers collected all their information from one specific region of the country, which gave a view that this represented all of A/NZ, whereas in fact each iwi operated in different ways depending on a range of factors such as environment or population. Indeed the term Maori, which is now commonly used to describe all indigenous people of A/NZ, is relatively new, as Maori formerly identified themselves according to their iwi name, for example, Tuhoe people referred to their tikanga (customs) as being Tuhoetanga and themselves as belonging to Tuhoetanga as opposed to Maoritanga (Durie, 1998; King, 2003). Secondly, a large portion of the information gathered from Maori informants may have been detrimentally influenced by the conflict regarding racial domination happening and informants may have intentionally provided inaccurate information. As such, Stokes (1985, p. 6) states that "occasionally there was a deliberate distortion of responses made by Maori informants (logical to Maori) but not perceived or understood by the researcher", noting the differences in cultures. Ethnographic fieldwork was one method of overcoming this misunderstanding.

Openshaw et al. (1993) states that there were researchers who did conduct ethnographic fieldwork to overcome ethnocentrism: during the 1930's the educationalist William Dale was one such researcher. Dale's pre-European educational research revealed that early Maori society had a class system, with access to different levels of knowledge being dependent on status at birth, and the different levels of education were thought to be comparable to the standard western education system preschool, primary, high school and university (Openshaw et al., 1993). Similarly, Hemara (2000) states that whakapapa (birth right), or observations of the child displaying apparent skills (memory and observation were highly prized as there was no written documentation for referencing (Sorrenson, 1986)) gave the child access to greater knowledge. Walker (2004) gives a more detailed description of the social rankings within hapu and iwi; rangatira (chiefs), tutua (commoners) and taurekareka (slaves). The ariki was the top echelon of the rangatira, with this status given to the first-born

male of the senior line, with first-born females to the senior line given the title ariki tapairu. As to the status of females of all social rankings Dale's research evidenced that their role was not the same as European society of the time, in fact he states that they had "considerable liberty" and women of high rank had "political influence" (Openshaw et al., p. 23). However, Dale does conclude that a woman's role was subservient to the male and with age females were excluded from higher education. In contrast, Rose Pere proffers that in pre-European Maori society there was no distinction between the sexes, and supports this by stating that clothing of the time was similar for both males and females (inferring no difference in social standing), and that insults to women including rape were severely punished (as cited in Openshaw et al., 1993).

Before A/NZ was colonised, the education system within Maori society was orally-based. Whare wananga were places of learning, and these were not always buildings but could be a place, for example, at a beach or in the ngahere (bush) or cave. Dale likens the whare wananga to a "primitive university" (Openshaw et al., 1993, p. 23). In *Maori Pedagogies* Hemara (2000) lists three main teaching strategies employed within the whare wananga, the traditional place of learning for Maori pre-European schooling systems. The first strategy was reported by Best (1992) and is based on the element of surprise, including faux-anger to induce students into remembering information; a second reported by Metge (1983) was based on learning in action, and the third strategy was an apprenticeship to an expert or elder (usually with a familial relationship) (as cited in Hemara, 2000). As with the seasons and timing in nature, timing also applied to learning, which was surrounded by strict tikanga and kawa (protocol). Knowledge in Maoridom had distinct levels, the first level regarded as tapu (sacred) and only disseminated to a select few, and general knowledge that, according to Marsden and Henare (1992, p. 10), was for the use of the "general public and became part of the culture's traditions and customs". With no written histories, colonisers were unable to evidence the scientific legitimacy of Maori knowledge, or as stated by Bishop and Glynn (1999, p. 16), "with no full literature and only arts and crafts", the culture was perceived as simple and not worthy of including in the educational curriculum. As with any culture, there are levels of knowledge, and though the knowledge taught in the whare wananga was not available for the lower ranked members of society general knowledge was

transferred by means of the whanau (family). Marsden and Henare (1992) state that general knowledge established by observations and cause and effect in the environment was passed down from one generation to the next. But what formed the corpus of general knowledge for Maori was to change with the arrival of immigrant settlers.

2.2.2 Settlement and the Treaty of Waitangi

King (2003) puts the major influx of settlers into A/NZ arriving during the 1840's. The smaller groups of settlers that had arrived earlier had been driven by commerce. Commercial activity took advantage of A/NZ's rich resources, driven by external forces such as Europeans escaping overpopulation, hunger, and for the Scots, escaping economic depression (King, 2003). The signing of the Treaty of Waitangi was seen as a mutual partnership between Maori and the English in governing the land and peoples of A/NZ. However, since the Treaty was written in both English and Maori both parties had different interpretations of the document. Bishop and Glynn (1999) state that Maori saw this document as a means of power sharing and decision-making for A/NZ, however, after the signing of the Treaty of Waitangi, steps to hasten the process of assimilation of Maori into the Pakeha system were begun. Colonisation had a detrimental effect on the Maori race with James Cook estimating the population in 1769-70 at 100,000 (King, 2003), and this plummeting to approximately 40,000 by ?? as a result of wars and epidemics (Statistics New Zealand, 1998). Although Maori lost their dominance in the area of population, they saw advantages in the new technology that came with the settlers, such as the written word.

2.2.3 Education post settlement

With colonisation came the written word, and this was, as noted by Tapine (1999), driven by the missionaries spreading the gospel. The first schools were set up by three missionary groups, the Church Missionary Society, the Wesleyans and the Roman Catholics, with Maori language as the medium for instruction. Hemara (2000) proffers that Maori saw the value of literacy and were therefore able to record their history in writing. However, the written accounts of whakapapa that were normally memorised and entrusted to a select few (as this knowledge was considered highly tapu) in some cases were buried with the person, ensuring this knowledge remained safe but at the same time lost to future generations (Hemara,

2000). Whakapapa was not information available to all members of the whanau and therefore not always shared. In contrast, in today's society, whakapapa is a pre-requisite to establishing one's rights to ancestral lands, iwi education grants and proof of one's identity.

By 1858 there was a decline in the number of Maori attending missionary schools due to the North Island Land Wars that forced many of the missionary schools to close (Openshaw et al., 1993). In 1867 the Native Schools Bill was discussed in parliament, with the aim to create a national schooling system for Maori within Maori villages. These schools were not only for Maori but open to all; however at that time most Europeans attended the public schools. The intention of the native schools was very clear, these schools were the grounds in which assimilation and civilisation of Maori was to take place, schools became a form of social control and Maori had to request schooling for their area and also provide resources, in particular the land for the school (Openshaw et al., 1993). Bishop and Glynn (1999) state that the educational focus in the native schools was on health, hygiene and manual dexterity, with limited and basic academic subjects being taught, therefore limiting future employment opportunities within professional areas. However, in contrast Barrington (as cited in Openshaw et al., 1993) states that some Maori saw education as a means to gain social and economic parity with the Pakeha. These settlers brought a host of new technology, and Maori saw the value in possessing this technology within everyday life. This knowledge had made Britain great and "produced large ships" and "powerful weapons" (Walker, 1991, p. 3) The education system was based on English systems, and although Maori language had been previously acceptable, it was banned in all schools. It should be noted that this was at the request of some Maori as well, as they saw the power in education, and they felt language was pivotal to gaining a good education ultimately enhancing life chances and "access to power sharing" (Openshaw et al., 1993, p. 43). To enforce the ruling of not speaking Maori in schools, corporal punishment was meted out. Walker states that schooling at this time demanded "cultural surrender, suppressing Maori language and identity" (Walker, 1991, p. 5).

In contrast, John Thornton, the principal of Te Aute College, believed in educating Maori students to take their place in academia and professions such as

doctors and lawyers (Openshaw et al., 1993). Two such students were Sir Apirana Ngata and Sir Peter Buck, both becoming members of parliament and strong leaders for the Maori people. Sir Apirana Ngata was the first Maori to complete a degree at a A/NZ university and was knighted in 1927, while Sir Peter Buck was the first Maori to graduate from Otago University and was knighted in 1946 (King, 2003; Openshaw et al., 1993; Sorrenson, 1986). However, ultimately the control on knowledge was regained by the politically-driven educationalists and Te Aute College was persuaded to replace its academic curriculum with agricultural training (Openshaw et al., 1993). According to the *Appendices to the Journals of the House of Representatives* 1933, the sentiments of the 1929 Director of Education, T.B. Strong, were that Maori boys should be educated for the job of farmer and the Maori girls educated for the job of a farmer's wife, which led to Hukarere School for Maori girls, changing their focus from academic subjects to more domestic skills, enabling the girls to become "good wives and mothers" (as cited in Openshaw et al., p. 62). As a result of this line of thinking, Walker (1991) states that this reinforced the low teacher expectations for Maori students. Schools were not places of equal opportunity, with implicit career paths already set for Maori.

Yet another disadvantage facing Maori in this education system was the individualistic aspect of learning. The western schooling structure promoted the individual: individual competition, and individual achievement, which "enhanced the life chances of European children", but did nothing for Maori children (Bishop & Glynn, 1999, p. 36). Furthermore, Bishop and Glynn (1999) suggest that Maori learn in more social conditions with whanau being the focal point, thus promoting the achievement of the group, not the individual.

This alienation was continued with a range of classroom texts that represented Maori culture in a demeaning light (Bell, 2005). *Washday at the Pa* was one such school bulletin that was produced by the Education Department in 1964 as a resource for teaching the topic 'How Families Live' in social studies, that only promoted Maori stereotyping (Openshaw, 2004, p. 32). The bulletin was eventually recalled and destroyed, with government officials playing down the incident, but as Openshaw (2004) observed, this was not to be the last incident of this nature. Bishop and Glynn (1999) state the impact of these text books

promoted marginalisation of the Maori culture, with a similar series of text books titled *Our Nation's Story* produced from 1926 until the 1950's.

According to Dale (2001), two A/NZ government reports published in the 1960's brought attention to the disparity between Maori and non-Maori in the education system: the *Report of the Department of Maori Affairs* (Hunn Report), followed by the *Report of the Commission on Education in New Zealand* (Currie Commission). The first report recommended social reforms for Maori (Meredith, 2008). Based on statistical information, Hunn concluded that Maori were a "depressed ethnic minority", and that education would provide economic and social advancement for them (Openshaw et al., 1993, p. 72). Hunn further recommended that financial assistance to attend secondary school and university be offered to Maori via the establishment of the Maori Education Foundation (Openshaw et al., 1993). Walker (2004) states that the Hunn report exemplified a "statistical blackout" of Maori in higher levels of education and inferred that lack of parental support was to blame (p. 203). Researchers sought to explain the reasons for the disparity and Lovegrove (1966 as cited in Bishop & Glynn, 1999) attested that the deprived nature of the Maori home conditions was probably the cause, reaching this conclusion after testing Maori and European children of similar ages for scholastic achievement based on predetermined factors such as intelligence, home background, and attitude to school. Bishop and Glynn (1999) interpret this research as Maori suffering a disease which was the result of a "deficient cultural background" and cite research by Harker and St George (1980 as cited in Bishop & Glynn, 1999, pp. 38-39) as trying to critique the foundations of such ideas, but the idea of Maori being a deficient culture had become, and remains, entrenched in the common knowledge of the dominant culture. This deprivation is seen to have direct links to income level and what money is available to spend on education, as previously mentioned in section 2.2, and it should be noted that such deprivation could apply to any ethnic group.

Following the publication of the Hunn Report, the Currie Report highlighted similar problems for Maori. The Currie Report was published in 1962 and basically did a stock-take of the education system at that time, and as with the Hunn Report, brought awareness that few Maori had professional employment and a large number were employed in unskilled occupations (Openshaw et al.,

1993). Further to this, many Maori were leaving school with no qualifications and in 1955, 95.9% of Maori students left school without School Certificate (Openshaw et al., 1993). The Currie Report stated that the reason for Maori lack of educational achievement was that "Too many live in large families in inadequately sized and even primitive houses, lacking privacy, quiet, and even light for study", yet the same report stated that Maori pupils are regarded as "the greatest reservoir of unused talent in the population" (Openshaw et al., 1993, p. 74). The result of the Currie Report was decentralisation of Maori schools, transferring from central (Education Department) to local board control (Openshaw et al., 1993). The Maori schools were mainly based in rural A/NZ and offered a fertile ground for cultural survival. Once the transfer to local board control had taken place, Maori became more aware of their culture and language being undermined (Openshaw et al., 1993).

To incorporate more Maori culture into the education system, Maori programmes such as Taha Maori were introduced into schools, but were seen by Maori as Pakeha-controlled programmes. Bishop and Glynn (1999) posit that the Taha Maori programme was designed to meet the objectives of the Pakeha majority and not those of the Maori people. With the continued growing awareness of racial marginalisation, Maori sought to develop an alternative education system. Some of the challenges Maori students encountered in their education included language and cultural practises.

2.2.4 Language revitalisation

In the early 1980's the Maori language was seen as being on the verge of extinction, but in 1987 te reo Maori became an official language of A/NZ (Bishop & Glynn, 1999; Durie, 1995) . Hui (meetings) were held throughout the country to discuss and find possible solutions to the problem of the decline of the language. Kohanga Reo (language nests) were seen as a solution to start language training from a preschool level, not only involving the child, but the wider whanau (family) (Bishop & Glynn, 1999; Durie, 1995). Whanau were committed to being part of the Kohanga Reo infrastructure by being committee members and encouraged to attend the centres with their children to also participate in learning. It should be noted that whanau did not just include immediate family only, but also extended family. This involvement gave Maori parents greater control over

their children's education and the opportunity to learn te reo Maori and tikanga. Walker (1991) states that the Kohanga Reo was a positive step in Maori taking control of their education as Maori determined the curriculum and cultural procedures in Kohanga Reo. This had a positive effect on students' self-confidence and self-esteem, as evidenced in Irwin's 1990 report on the Kohanga Reo movement (as cited in Bishop & Glynn, 1999) . Such was the success of the Kohanga Reo movement that within five years 513 Kohanga Reo had been opened throughout A/NZ, and Bishop and Glynn (1999, pp. 74-75) state that by 1998 the Ministry of Education reported 613 Kohanga Reo were in operation .

On completing Kohanga Reo, students had few options where their education in te reo Maori could be continued. In response, Kura Kaupapa Maori (KKM) schools were established from level Year 0 to Year 13 based on the same principles as Kohanga Reo, with te reo Maori being the main language of instruction (Bishop & Glynn, 1999). As with Kohanga Reo, parents had to meet certain requirements and become members of the KKM infrastructure. This commitment resulted in the whanau becoming active participants in their child's education. Parents were involved in the decision-making regarding curriculum, administration, pedagogy and learning outcomes. Students were required to meet the high academic expectations of not only their teachers but also their parents. Gaining placement in some KKM has now become difficult, with a rigorous selection process (Mahutonga, M., personal communication, September 13, 2008). The tikanga and kawa of the local iwi is dominant and these institutions serve an important role in revitalising the local language and culture. Tikanga is not only observed on special occasions but is a lived daily reality for students attending KKM.

These institutions are able to teach Maori knowledge that is delivered in te reo Maori, alleviating problems associated when translating one language into another language. With a translation process, there is the possibility that all or parts of the true meaning are lost when viewed through the eyes of another culture. According to McKinley (1995), writing Maori into a Pakeha-based knowledge system buys into the theory that Western knowledge is superior to indigenous knowledge, and in effect does not offer Maori any form of autonomy in the subject matter being delivered. In 1992 the Ministry of Education introduced a Maori medium curriculum which had "to maintain the objectives" of the strands

from the English science curriculum document (McKinley, 1995, p. 84). The difference with the putaiao (science) curriculum document was that Maori were able to create different pedagogies, knowledge and information systems to achieve the set outcomes. This gave Maori control over decision-making protocols on language and pedagogical developments within a Maori context (Bishop & Glynn, 1999), however McKinley (1995) states that this control was limited as only Maori knowledge considered to fit with Western terms of science were included in the Putaiao document.

As well as revitalising the language, these institutions were operated within a Maori framework. Knowledge was delivered in the dominant culture of Maori, by Maori teachers in a Maori context, giving Maori students self-confidence. KKM results are evidenced throughout the TIMMS report of 1999 – 2001, with Maori students from KKM having a stronger sense of identity with regard to being a scientist, as opposed to Maori students from mainstream schools lacking confidence (Ministry of Education, 2002). In *Ka Hikitia - Managing for Success: The Maori Education Strategy 2008-2012,* there is a strong focus on Maori students reaching their potential with an emphasis on Maori culture and language (Ministry of Education, 2008b). Bishop (1999) offers that the problem of cultural domination in the classroom is based on the fact that experiences of Maori children are denied and that the students have to adjust to the teacher's culture and perceptions. One possible way to adjust the teacher's cultural perceptions to that of the Maori student is the inclusion of te reo Maori in mainstream schools. The inclusion of te reo Maori in mainstream schools delivers a different message to Maori students. According to May and Aikman (2003), it provides legitimisation of not only the language but also the culture. In addition, Durie (1998) states that the impact of te reo Maori and culture in state primary and secondary schools reached a larger number of Maori students, and cites the bilingual programme introduced at a Wellington secondary school by Turoa Royal in 1980, where Maori students had success in examinations and improved personal confidence.

2.2.5 Maori education initiatives

The Ministry of Education is the government's lead advisor on the New Zealand education system. The *Statement of Intent* identifies how the Ministry will

contribute to and deliver the government's themes and priorities in education for the years 2008-2013 (Ministry of Education, 2008c). The aims of the Ministry are to equip all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st century by focusing on five key areas at national level: economic transformation, national identity, families, young and old, sustainable development, and school plus, and five key areas in the education sector; develop strong learning foundations (early childhood and primary schools), participation, engagement and achievement of all young people in education, quality Maori language education is available for learners, education institutes produce knowledgeable effective citizens to drive A/NZ, education agencies work together to achieve educational outcomes (Ministry of Education, 2008c). These latter areas are further discussed in another Ministry publication *Ka Hikitia – Managing for Success: Maori Education Strategy 2008-2012 (Ministry of Education, 2008b)*. Information for the Statement of Intent is gathered from a variety of sources including research and indicator information from the *New Zealand Curriculum, Nga Haeata Matauranga; Annual Report on Maori Education 2006/07*, the *State of Education in New Zealand* report 2007 and the *Best Evidence Synthesis Iterations* (Ministry of Education, 2008c). The government sets the goals and priorities and provides the resources but schools are the means of achieving these goals (Ministry of Education, 2003).

2.2.5.1 Ka Hikitia

Ka Hikitia – Managing for Success is the Maori Education Strategy for 2008 – 2012 and sets out the Ministry of Education's strategic approach to achieving educational success for and with Maori over the next five years (Ministry of Education, 2008b). The foundations for this document were laid in 1998 with discussions between the Ministry of Education and Maori, and in 1999 the first Maori Education Strategy was published. Between 1999 and 2005 improvements in Maori achievement were noted, with new initiatives introduced as well as research projects. During this time, the Ministry of Education developed relationships with Maori and formed partnerships with iwi. In 2006 the Maori Education Strategy was revamped and in 2008 the final version of *Ka Hikitia – Managing for Success: The Maori Education Strategy 2008 – 2012* was released.

A major focus of *Ka Hikitia – Managing for Success* is "Maori enjoying education success as Maori" (Ministry of Education, 2008b). The 'Maori potential approach' of *Ka Hikitia – Managing for Success* has three key underlying principles:

- Maori Potential: all Maori learners have unlimited potential
- Cultural Advantage: all Maori have cultural advantage by virtue of who they are – being Maori is an asset; not a problem
- Inherent Capability: all Maori are inherently capable of achieving success

(Ministry of Education, 2008b, p. 19)

These underlying principles are in contrast to the historical deficit theorising - being Maori was a disadvantage (Stokes, 1985) - but being Maori is now, according to *Ka Hikitia – Managing for Success*, that point of difference that gives a Maori student the edge on non-Maori students. Research by Bishop and Glynn (1999) indicates that culture does count; culture affords the student to feel valued and research indicates that "students are more likely to achieve when they see themselves, their whanau, hapu and iwi reflected in the teaching content and environment and are able to be Maori in all learning contexts" (Ministry of Education, 2008b, p. 20)

Ka Hikitia: Managing for Success is explicit in how Maori achievement may be achieved, and focuses on students from pre-school level to tertiary level, with preschool and years 1 and 2 and years 9 and 10 being of significant importance. While this study is situated in a year 5/6 class, aspects of *Ka Hikitia: Managing for Success* were taken into consideration when designing the intervention and include; culture counts, productive partnerships and Maori language. The next initiative to be discussed is *Te Tere Auraki* with a focus on Year 9 and 10 Maori students in mainstream secondary schools.

2.2.5.2 Te Tere Auraki – Maori in Mainstream

Te Tere Auraki is a combination of projects (Te Kotahitanga, Te Kauhua, Te Mana Korero and Maori Secondary Teacher Workload) that focus on improving both teaching and learning for Maori in English medium schools with the focus on

Years 9 and 10. The projects target three specific areas of education: teaching practice; relationships between schools, whanau and the community; and quality providers (Ministry of Education, 2009a). The first research project to be reviewed is Te Kotahitanga.

2.2.5.3 Te Kotahitanga

Te Kotahitanga was started in 2001 with a small-scale study that consisted of interviewing Maori students to find out what was affecting their educational performance. When funding was received in 2002 from the Research Division of the Ministry of Education, the long-term second stage was started. The second stage consisted of three phases, the first phase analysed the student narratives, the second phase developed an effective teaching profile which was transformed into a professional development programme and was implemented in four schools with only four teachers participating, and the third phase measured the changes in student achievement (R. Bishop, Berryman, Cavanagh, & Teddy, 2007).

This research is based in high schools and focuses on the teacher-student relationship. This focus was determined from the analysis of student interviews. The initial study interviewed approximately 30 teachers and 60 Maori students in years 9 and 10 (ages 12 to 15) from a range of educational institutions. Four major findings came from the analysis of this data: the research approach allowed participants to easily express their experiences clearly and concisely; principals, teachers, parents and students all had different views on what were the issues affecting their achievement in education; structural issues were affecting achievement in education; and finally, there were issues relating to the classroom environment.

During the 2008 conference of Te Kotahitanga held at the University of Waikato, I observed that one theme was constant, the professional development programme was more effective with a whole school approach. When a whole school approach was not employed, teachers who were part of the professional development programme found students became confused when teachers that were not part of the professional development programme gave information or acted in a manner that was contradictory to the programme. It was explained that some teachers did not want to become part of the professional development

programme and were resistant to change, and this also applied to some of the students. However, the teachers that were part of the programme were highly motivated and celebrated the success of the programme. A powerful aspect of the conference were the joint presentations made by students and teachers involved in this programme. Both parties spoke honestly of their experiences and while the teachers in particular believed in the programme, they did recognise the fact that it was not beneficial to all students.

2.2.5.4 Te Kauhua

The second initiative is Te Kauhua. This research focuses on professional development for teachers working with Maori students in mainstream schools. Funding for 2001 – 2003 was utilised for teachers to improve Maori student achievement, together with working with Maori whanau. Cunningham, Stevenson, & Tassell (2005) define two types of whanau, those that share a common ancestor and those that have no common ancestor but share a common kaupapa (interest). This second type is referred to as class whanau within this study, can be used in the classroom setting, and provides teachers with a basis on which to build relationships in a culturally appropriate manner.

In the Te Kauhua study, there were four major stakeholders: principals, teachers, students and their whanau. The major focus was on the teachers and the professional development prescribed to increase Maori student achievement. An in-school facilitator was trained and then worked with the teachers within the school. The school was also a member of a cluster within the region offering collegial support and mentoring. As each school was unique, professional development was designed specifically for each school. This approach supported the kaupapa Maori theory, with Maori researchers researching Maori issues with support of non-Maori professionals, with tikanga incorporated in formal and informal settings between researchers and stakeholders where possible. In the 2004 *Evaluation of the Te Kauhua Maori mainstream pilot project: Report to the Ministry of Education* some of the key findings are as follows; a range of models, elements and strategies were used across the clusters; data gathered highlighted the importance of constructive learning partnerships between teachers and adult members of the school community; individual schools and teachers became more effective at meeting Maori students' learning needs; and the final key finding

relates to the debate on what educational achievement for Maori students really is. One of the recommendations for future research related to the importance of whanau in raising Maori student achievement and ways of doing this needed to be explored.

2.2.5.5 Te Mana Korero

Te Mana Korero is a professional development programme for teachers that concentrates on quality teaching practices with a goal to improving Maori students' learning. This programme utilises evidence on what works for Maori students from Te Kotahitanga and Te Kauhua (Ministry of Education, 2009b). This professional development package consists of three DVDs, plus supporting documentation that list activities for staff pre and post DVD viewing. The DVDs include high profile Maori researchers, Professor Mason Durie and Professor Russell Bishop. The DVDs are based on research on the influences on children's achievement in A/NZ and are underpinned by Maori concepts (Ministry of Education, 2007c, 2009a). The first DVD focuses on ako with research from Alton-Lee (2003) and Biddulph, Biddulph and Biddulph (2003) that focuses on effective teaching and learning, and explores the diversity of learners, examines how teachers can make a difference incorporating evidence-based pedagogy, and examines the teacher's influence on students, their whanau and the community to build partnerships enabling effective educational outcomes for the student (Ministry of Education, 2007c, 2009a). The subsequent DVDs build on the first with the second DVD titled Culture Counts – validating and valuing culture, and the third DVD focusing on the importance of building and sustaining productive partnerships. These initiatives have focused on the professional development for teachers and the majority have been situated in mainstream high schools. However, the above projects have commonalities regarding the importance of; relationships within the classroom – teacher/student and teacher/student whanau; and the inclusion of Maori culture, recognising experiences of Maori students, and the inclusion of te reo Maori. The inclusion of these components in the above initiatives has resulted in positive effects on Maori student achievement and have significance for the intervention created for this study. As this intervention is also within a A/NZ classroom, what follows is a discussion on the Maori perspective within the *New Zealand Curriculum* documents.

2.2.5.6 Maori perspectives in the curriculum document

A brief examination of the *New Zealand Curriculum Framework 1993* identified that although te reo Maori kupu (words) were noted within this document, the inference regarding the inclusion of te reo Maori and tikanga Maori is dependent on the school providing opportunities for students to "acquire some knowledge of Maori language and culture" (Ministry of Education, 2007b, p. 7). In general, this document relies heavily on the school's ability to provide opportunities via the class teacher for Maori students to learn about their culture and language.

In the current *New Zealand Curriculum* document, the Treaty of Waitangi is recognised and reference is also made to te reo Maori and Maori tikanga being included in teaching throughout the document (Ministry of Education, 2007b). However, the inference remains subtle and unless a teacher has strong management support within the school or capabilities in te reo Maori and tikanga Maori, a teacher may have problems incorporating these aspects within the curriculum.

2.2.6 Summary of Maori education to date in Aotearoa/New Zealand

Historically Maori were the dominant culture within A/NZ, however as a result of a multitude of factors, including mass immigration of European settlers, became the minority culture. While Maori had an established educational system pre-European settlement, this became redundant with the establishment of a national English-based schooling system. It was within this English education system that te reo Maori, initially acceptable in class, was banned, which resulted in the near extinction of te reo Maori.

Most educational institutes promoted manual jobs for Maori male and a life of domesticity for Maori females. The focus on manual labour was reflected in several governmental reports; with the Hunn Report describing Maori as a depressed ethnic minority and the Currie Report highlighting the lack of Maori acquiring educational qualifications. Many Maori left school with no formal qualifications. During the 1980's, to counter the near loss of te reo Maori, Kohanga Reo were established throughout the country. The language nests provided preschool care with te reo Maori being the main language of instruction and the revitalisation of tikanga. KKM schools where te reo Maori is the main

language of instruction were developed to tertiary level. Students that attended the Maori immersion education facilities became participants in the revitalisation of both language and culture. The majority of Maori students, however, attend mainstream education institutions and it is within these institutions the achievement levels for Maori students are below par.

While successive governments have researched why Maori students are underachieving in mainstream schools, the current initiatives have identified that language, culture and productive partnerships are an important part of Maori education and recognise that opportunities to learn about Maori culture and te reo Maori are beneficial to Maori students in mainstream schools. While the government initiatives included in this review use strong, confident language that creates positive momentum, the momentum is lost within the curriculum document. The language in the curriculum document infers that no real importance is attached to the inclusion of te reo Maori or Maori culture. Maori students attending mainstream schools are reliant on the schools to provide opportunities to experience and learn te reo Maori and tikanga Maori. However, this is dependent on the school's management supporting the inclusion of te reo Maori and IK, and also teacher knowledge of te reo Maori and IK. If the latter is limited, support networks are required to ensure quality learning opportunities for the students.

Research has identified the importance of relationships in a Maori child's education, as well as the centrality of whanau, and these ideas hold potential for improving Maori student educational outcomes. The next section discusses whanau and relationships as the core of Maori society, and how this could inform future Maori student education.

2.3 Whanau as a basis for Maori education

The whanau forms the core of Maori society, or as described by Mead the "basic building block of the whole social system" (Mead, 2003, p. 212). According to Metge (1995, p. 16), the whanau concept has resisted "direct and indirect assimilation" into the dominant pattern of the parent-child family since 1840. One of the original meanings for whanau referred to people related by birth, a family of varying size, however, during the 1980's, with the revitalisation of the Maori

language, the word whanau was brought back into common use (Metge, 1990). According to Firth (as cited in Mead, 2003), the traditional whanau consisted of three generations: children, parents and grandparents ranging in numbers up to 90 people. The whanau provided a holistic ground for learning with all members of the whanau involved in the child's education; the elders teaching whakapapa and tribal histories by waiata (song) and purakau (story) and the parents teaching practical skills (Kent & Besley, 1990). Durie (as cited in Ministry of Education, 1999b) describes this holistic framework as hauora in terms of Maori concepts; taha tinana – physical well-being, taha hinengaro – mental and emotional well-being, taha whanau - social well-being, and taha wairua – spiritual well-being, and uses the symbol of a whare with each taha representing a side of the whare. Within the whanau all these needs were met by various members of the whanau, not only providing a wealth of educators but also a strong support network as Metge (1995, p. 16) states the "strength and stability comes from forming part of the larger whole".

The whanau concept is significant in this study for it is used as a metaphor for the harakeke bush, with the central shoot being new growth, the rito (child), protected on either side by matua (parents) and they are in turn protected on either side by their parents (Metge, 1995). Metge (1995) further makes the parallel between the life cycles of people and harakeke as growth, dying and regeneration and both flourishing with loving care.

The use of the word whanau has evolved and may not only represent members' descendant from a common tipuna (ancestor), but may represent a group that shares a common interest such as a sports group or a classroom (Cunningham et al., 2005; Metge, 1995).

2.3.1 The classroom whanau

The concept of the classroom whanau considers that the teacher and students form a group according to, and governed by, the principles within Maori culture, and allows Durie's hauora tapawha model (Ministry of Education, 1999b) to be incorporated in daily school life. Membership in the class whanau would be governed by whanau rules, which may include kotahitanga (oneness or unity), which means members learning to know each other, provide loyalty and support,

and accept responsibility for each other's actions (Metge, 1995). This allows the group to function as one and achievement would be based on the group completing the task and not on the individual completing the task in isolation. Or, as noted by Macfarlane (2004) in his observations of the Ngati-Whakaue Enrichment Class at Ngongotaha Primary School in Rotorua, "students were held accountable to the larger group" (p. 62). According to Durie (1998), the whanau method is one of the keys in the success of KKM and identifies four elements: 1) knowledge belongs to the group, 2) pedagogy – manaakitanga (caring), 3) aroha, discipline – whanau models of respect and 4) curriculum – reflects realities of children. Even though the classroom whanau operates as a group, the teacher must also establish a positive relationship with each student. As Pere (1982) posits, the information gained by the teacher about the student enables planning to assist the student to learn at their own level of understanding, readiness and interest.

2.3.2 Teacher and student whanau relationship

Another relationship that fits within the concept of whanau for education is that of the teacher with the student's whanau. Establishing a positive relationship with the student's whanau can include benefits such as increased student self-esteem, and the potential for the parents to have a positive impact on their student's education (Macfarlane, 2004). These positive benefits are similar to those achieved by parental involvement in the KKM infrastructure. For some whanau however, their own memories of their experiences at school may have left them feeling uncomfortable in returning as a parent and not knowing how to interact with the teacher, or how to support their child in the learning process. As a Maori researcher, Mcfarlane (2004) gained parental acceptance when he was able to make whakapapa connections with parents, which paved the way for a more reciprocal relationship during the course of his research in the Ngati-Whakaue enrichment class at Ngongotaha School.

2.3.3 Teacher Expectations

As previously mentioned, career prospects for Maori have in the past been confined to manual and domestic work, which perpetuated low teacher expectations. Low teacher expectations of Maori students have been well documented (R Bishop et al., 2003; Dale, 2001; Rubie-Davies, Hattie, &

Hamilton, 2006). A year-long study of primary teachers and students in the Auckland area revealed that Maori students were adversely affected by low teacher expectations and by the end of the year the students in the study had improved in their academic performance less than other ethnic groups of Pakeha, Asian, and Pacific Islands (Rubie-Davies et al., 2006).

2.3.4. Possible learning processes for Maori students

Research available on how Maori students learn has been minimal but the following literature, though not culture specific, provides general information relating to learning processes. These may be applicable to Maori students and were considered as part of the intervention.

With the advancement in technology researchers are now able to monitor brain activity while cognitive activity is happening, picking up magnetic fields produced by electrical currents within the brain, enabling the mapping of how learning takes place (Fogarty, 2005). Briefly put, information enters through the senses and the brain then determines if the information is emotionally important, and if this is the case, short term memory is created with repeated access creating long-term memory. The more one accesses these memories "the stronger they become and are more easily remembered" (Fogarty, 2005, p. 39). Fogarty (2005) lists four major influences in memory; creation, attention, meaning and relevance. Clark and Mayer (2008, p. 5) offer three principles that underpin learning; "dual coding – learners have separate channels for words and visuals; limited capacity – learners can only process a limited amount of information into the short term memory; and active learning – learners engage in the cognitive process of learning". These are then enhanced by selecting relevant information via sight and sound, organising information to form coherent mental representations and integrating words and pictures to prior knowledge and long-term memory.

As part of the educational practices series published by the International Academy of Education and International Bureau of Education, Vosniadaou writes on *How Children Learn* and offers a range of strategies a teacher may include within the classroom (Vosniadou, 2001). These findings are based on international research from "diverse areas of psychology, including educational, developmental, cognitive, social and clinical psychology" (Vosniadou, 2001, p.6). A combination

of 12 principles provides a holistic approach to allow students to reach their fullest potential. Vosniadaou takes into account the learning environment, cognitive styles (preferred way a student processes information) and metacognition (active control of the thinking process when engaged in learning). The one drawback of this literature is that information and communication technology is omitted. The following are the 12 principles grouped into three categories.

The first category is based on learning requiring the active participation of the learner. This can be achieved by offering a stimulating learning environment that entices students into learning. Examples are teachers providing hands-on activities, setting goals that are oriented around student interests, therefore targeting intrinsic motivation and seeking and valuing student input into classroom learning. In accordance with active participation, Sax (2007) states that boys require movement during the learning process, and this is discussed further in section 2.3.5.

The second category focuses on student prior knowledge that includes checking for accuracy and errors corrected if detected. This process also allows the teacher to "gauge" where the student is at and how best to relate the new information. The new information also needs to relate to student experiences and why and how this knowledge is transferred. All these processes allow the student to understand the information as opposed to memorising information. The final aspect of practice then needs to be allowed to happen with students being able to self-correct and reflect on their learning.

The third category focuses on the social nature of learning. By grouping students of mixed ability, students are given the opportunity to learn from each other. The focus is on the group completing the task and not on the individual completing the task, offering the individual a non-threatening setting. Initially strategies for problem solving may need to be modelled by the teacher but this needs to be shifted to students to encourage their own problem-solving strategies and not be reliant on the teacher. The social nature of learning directly relates to the concept of classroom whanau as previously discussed in section 2.3.1 (the success of classroom whanau in KKM, (Durie, 1998)), with the possibility that this concept could work in mainstream schools.

Similarly, according to Prashnig (2001), the learning styles of underachievers have eight commonalities: students need to move on a regular basis, prefer informal seating, require variety in teaching methods and resources, low light, tactile/kinaesthetic activities to introduce new information, optimum learning time late morning or early afternoon, non-authoritative teachers, and recognition of their motivation. Prashnig (2001) states that to ensure students' are at an optimal state for learning, de-stressing exercises such as creative visualisations and brain gym exercises (Dennison, 2006) would be beneficial to create this optimal learning state of mind for students.

Gender may also be another factor that needs to be considered as this study is placed in a male-only class and how boys learn is discussed next.

2.3.5 Boys only classes

As this study was based in an all boys' class, the following literature was included to broaden the researcher's knowledge base on the learning processes of boys, and what teaching strategies could be used to help boys to become engaged and provide ideal opportunities for learning. Boys' learning has become a subject of concern for New Zealand and Australian governments and literature initiated by both governments is now discussed.

In *Questioning Gender: Snapshots from Explaining and Addressing Gender Differences in the New Zealand Compulsory School Sector* Alton-Lee and Praat (2001) found that attendance at a single sex school made no difference to a student's learning compared to attendance at a mixed sex school. According to Alton-Lee and Praat (2001), what was of more importance was students' being able to link new concepts to existing knowledge, and cultural recognition within the classroom. As opposed to separating the sexes, it was argued that students need to gain an understanding of gender. The report *Mathematics: Trends in Year 5 mathematics achievement 1994 to 2006* also indicated that at this particular year level, there was no significant difference in the mean achievement averages between the sexes (Caygill & Kirkham, 2008).

However, Sax (2007) states that not only do boys develop at a slower rate, they are more inclined to require physical movement. Sax visited schools that had

boys-only classes, where sitting was not the norm and students were offered the freedom of sitting, standing, lying and one extreme where a school had adjusting desks to cater for boys that want to stand and work at their desk. Although not the typical classroom (according to Sax), the class teacher assured Sax that the students were engaged and learning was taking place because of the more relaxed format (Sax, 2007). Similarly Wylie, Thompson and Lythe (2001) suggest that the unstructured classroom environment creates a sense of freedom and mobility and provides students with another opportunity for learning. Sax (2007) also posits that because of the boys' need for motion they usually do not notice the antics of their classmates, whereas girls however are more inclined to be distracted by movement and prefer a more still, quiet learning environment. Sax (2007) also quotes a July 2007 research report based on magnetic resonance imaging (MRI) scans indicating that the rate of development in certain areas of the brain is different between the sexes, while Fogarty (2005) agrees that there are differences in how males and females process information using different parts of the brain. According to Sax (2006), two other factors affecting boys learning are: the classroom temperature – this should be keep at 20.5 Celsius (warmer temperatures make boys sluggish) and the teacher needs to be mobile and speak in a loud tone of voice.

In 2002 the Australian government funded a report into the achievement of boys, *Boys Getting it Right: Report on the inquiry into the education of boys (House of Representatives Standing Committee on Education and Training, 2002).* This report revealed statistics relating to the underachievement of boys in the education system and conducted the research project in primary and secondary schools (in which a total of 230 schools participated). The research was in two stages: stage one concentrated on schools identifying best practice in the education of boys, and stage two implemented a professional development programme for teachers based on the findings from stage one. The final report for stage one was *Meeting the Challenge: Guiding Principles for Success from the Boys' Education Lighthouse Schools Programme Stage One 2003 (Department of Education Science and Training, 2003)*, with stage two being published in 2007 (Cuttance et al., 2007). During the initial stage of the project, deficit theorising was evident amongst teachers with the 'blame' for non-achievement resting with factors outside the school, such as single parent families and low socioeconomic circumstances.

The A/NZ government, also concerned about the under achievement of boys, published several documents in 2007, including *Boys' Achievement: A Synthesis of the Data* (Ministry of Education, 2007a) and a four page leaflet of this report titled *Success for Boys* in 2008 (Ministry of Education, 2008d). The results of both the Australian and A/NZ research are similar in their findings, noting that the greatest under-achievement is amongst the indigenous males in both countries. The key findings listed are that boys develop problems in reading early in their education, become disengaged with education, are at the lower end of achievement in reading and writing, attain lower academic qualifications, and found that the first step to improving boys' education is to ensure that they are engaged and excited about learning (Ministry of Education, 2007a, 2008d). As engagement of boys in learning is of major importance in this study, the intervention should include activities that connect theoretical ideas with exciting and relevant opportunities for boys to learn.

2.3.6 Summary

Whanau forms the core of Maori society and the meaning has evolved with the changes in society. While a common ancestor connected whanau members, the meaning of whanau now may incorporate a group that share a common interest, such as a sports group or as a class of students. In a class whanau situation, the individual's strength and stability is gained by being part of the larger group. Tikanga that applies to the whanau is bound by promoting the group, not the individual. The class whanau provides the opportunity to establish positive relationships between students, students and teacher, and teacher and student whanau. Teacher expectations can also be addressed in this class whanau as an established relationship with student and the student whanau can reveal information that can help the teacher ensure the student is able to reach their potential. As a major component of the intervention the concept of whanau provided a link between IK, EE through whanau as a metaphor for harakeke.

Learning processes were also examined, although limited literature was available on how Maori students learn, general learning processes were examined. The literature indicated three general areas that would provide strategies to engage students in learning; active participation - involving topic areas of high interest to students; linking learning to student prior knowledge – this allows students to

understand the information as opposed to memorising; and the social nature of learning – the emphasis is on the group completing the task and provides a non-threatening environment for the individual. These three strategies would be important to consider when designing the intervention which forms part of this study.

Boys are underachieving in education and in particular indigenous boys, a concern to the Australian and A/NZ governments. Sax (2006) states that best practices for teaching boys include movement by both student and teacher, the teacher to speak in a loud tone of voice, and temperature of the classroom to be not too warm. In addition, findings from Australian and A/NZ governmental initiatives indicate that boys need to be engaged and excited about learning to keep boys interested in learning. To address engagement in the intervention, topic areas of high interest to boys need to be included with links to culturally appropriate activities.

2.4 Indigenous Knowledge (IK)

According to Grenier (1998), IK is the unique traditional local knowledge existing within, and developed around, the specific conditions of indigenous people in a particular geographic area. Flavier, De Jesus and Navarro (1995) provide a more detailed description and acknowledge the influence of external systems: "IK is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems" (p. 479). Another common element is that IK systems covered all aspects of life including a spiritual element (Bonny & Berkes, 2007; Grenier, 1998). As previously mentioned, not all knowledge was freely available to all in Maori society. Today we are reliant for information on Maori IK from books written by early ethnographers, many written by non-Maori, which, as previously discussed, may contain misleading information.

IK was developed over time (generations) through observations and trial and error in interactions between people and their environment, providing a deep empirical understanding of the environment, with the need for this knowledge driven by a utilitarian focus (Doolittle, 2002). This time of knowledge development for Maori covered centuries as the flora, fauna and climatic conditions were different

from their tropical homeland (Mead, 1969). Mead (1969) further describes how Maori needed to find a substitute product for the production of clothing, as the paper mulberry used to make tapa cloth did not grow very well in the cooler A/NZ climate. Harakeke grew rampantly throughout most areas of A/NZ and became the new source for clothing after much experimenting. The initial garments were simply made by tying harakeke leaf together to form a skirt. Over time muka (fibre from harakeke) was discovered within the leaf and this was extracted and fashioned into kakahu (cloaks), with the finest muka comparable to silk (Atkinson, 1922).

Grenier (1998) states that IK is stored in people's memories and activities. In relation to the making of kakahu, Diggeress Te Kanawa (a master weaver of Waikato) refers to the actual making of a cloak as maintaining the remembered knowledge (Te Kanawa, 1992). As Maori knowledge was based on an oral tradition, it was demonstrated in a variety of forms such as karakia (prayers), purakau (myth, story) waiata (song), moteatea (lament), tauparapra (incantation to begin a speech), poroporoaki (lament and farewell), whakatauki (sayings), korero tawhito (speak of the sages), whakapapa (genealogy), and haka (dance) (Foster, 2003; Grenier, 1998; Marsden & Henare, 1992).

2.4.1 An indigenous worldview

Indigenous worldviews all have a common thread: survival depended on knowing and respecting the environment in which you lived. The indigenous worldview does not separate mankind from nature or think that man can rule nature as is the view of western science (Constible, McWilliams, Soldo, Perry, & Lee, 2007). Being at one with nature provides a holistic view and appreciation for animate and inanimate objects.

Within Maoridom, from the union of Ranginui (Sky Father) and Papatuanuku (Earth Mother) the atua (gods) of nature were born. Tane, a son of this union, governed the forests and married several different wives to produce different families of children, for example, healing trees, trees used for building to name a few (Marsden & Henare, 1992). It was also from the union of Tane and Hineahuone (dawn maid) that mankind came into being (Marsden & Henare, 1992). The whakapapa (genealogy) for humankind then leads back to

Papatuanuku. It is whakapapa that identifies one's relationship with the whenua (land/placenta) and one's place within the world.

Whenua has two meanings one representing earth and one the placenta. It is a reminder of the link between mankind and Papatuanuku (earth) and also that it is the placenta that the embryo depends on during gestation (Marsden & Henare, 1992). Papatuanuku nourishes not only mankind but all life forms. The life cycle of birth, life and death are said to start and end with Papatuanuku (Patterson, 1992). Puketapu-Hetet (Patterson, 1992, p. 20) also explains that by returning the kaikaha of harakeke to the base of the harakeke this would provide nutrients for the plant: "It is deemed to have died a natural death and is allowed to go back to where it first began – back to Papatuanuku to begin a new life cycle". However, as times have changed, so has this practise as it is now recommended that the kaikaha not be returned to the base of the plant as it is thought that the kaikaha provide a fertile breeding ground for many pests that attack the harakeke (Scheele, 1997). Scheele identifies that one reason for this practise is that the "natural forms of control for pests and disease are out of kilter in our modern day environment" (Scheele, 1997, p. 11), and is an example of how western scientific ideas have changed indigenous knowledge.

With this notion of relationships, Maori are therefore seen to be children of Papatuanuku, charged with the responsibility to protect and sustain the environments in which we live. Indeed Pere (as cited in Patterson, 1992) states that Maori were aware that the land was forever and they were mere caretakers during their lifetime. However, as indicated by Marsden and Henare (1992, p. 17), Papatuanuku is now seen as a "commodity and the natural resources seen as disposable property to be exploited". This does not have to be the case and the revival of tikanga may be a way forward.

2.4.2 Tikanga

Tikanga is identified as being the rules of conduct or etiquette. "Tikanga have been handed down over generations and are accepted as a reliable and appropriate way of achieving a desired goal or outcome" (Marsden & Henare, 1992, p. 15). Although Mead (2003) states that the term tikanga is common, there are not many individuals that have in-depth knowledge of this subject and cites several reasons,

with a major one being the historical suppression of Maori culture by the Crown within the education system to hasten the process of assimilation of Maori into Pakeha society. Another reason suggested was that the politicians and educationalists viewed indigenous knowledge as inferior and that progress lay with the western knowledge. Pere (Gisborne Education Centre (N.Z.), 1985, p. 27) notes that "it is not possible for one to know all tikanga because tribal histories differ". It has been argued that one group of Maori that may lack knowledge of IK is *urban Maori:* with no ties to tribal structures, their identity is reliant on their physical appearance (Durie, 1995).

According to Mead (2003), tikanga involves three elements: background knowledge, concepts and practice. Concepts are based on the background knowledge and this may be obtained by research, speaking with practising tohunga or attending ceremonies, and talking to various people about them. This three part system is also described by Royal (Nga Pae o te Maramatanga, 2005) with stage one aronga (view of the world) influencing stage two kaupapa (values and beliefs) which leads to stage three tikanga (actions). The following section discusses three main concepts associated with tikanga: karakia, rahui and kaitiakitanga. These three traditional concepts are commonly practised in Maori society today and as with the holistic nature of tikanga, these three concepts interlink with environmental education (EE).

2.4.2.1 Karakia

Karakia is described as a prayer. As mentioned earlier, the progeny of Ranginui and Papatuanuku became the atua (gods) of the various forms of the natural environment. Since man lives within this environment, he demonstrates his respect and appeases the necessary atua by first saying a karakia before taking a natural resource. On completion of harvesting the resource, a karakia is said in appreciation. This act showed that man is part of nature and not superior to his environment (Patterson, 1992). According to Mead (2003), the tapu of learning is respected by starting learning sessions with a karakia, and included here is the separation of food and drink from the learning process. The tikanga of keeping food and drink separate from learning could be seen as simply as cause and effect; spillages would mar your work. Karakia applied to all areas of life with strict

protocols attached to the process. An error in the process would often be seen as a bad omen. Karakia was integral in the process of rahui.

2.4.2.2 Rahui

Rahui is one form of tikanga that relates to protecting a resource by banning human activity or access. Marsden and Henare (1992) offers that rahui was also a form of rotational farming. In effect the resource, if over harvested in one season, was allowed a period of time to regenerate. A rahui would be put in place with the required karakia and when the rahui was completed, karakia was also a requirement to lift the ban. Mead (2003) states that the rahui could apply to an individual or a group. Today, rahui signs are put in place by the local iwi and, as an example, signs prohibiting the harvesting of kaimoana can be seen at various beaches within the Bay of Plenty area. Another form of rahui relates to when a drowning has occurred making the place where the drowning happened tapu because of the death. This would put a ban on harvesting food from this particular area and also recreational use of the area would not be permitted. While rahui allowed for resources to regenerate, kaitiakitanga is a form of guardianship of the environment.

2.4.2.3 Kaitiakitanga

Kaitiakitanga refers to the guardianship of resources. According to Durie (1998), kaitiakitanga is the responsibility of the tangata whenua and is holistic in its approach to restore damaged resources to the same or better state for future generations. Tangata whenua do not own the land but as previously mentioned are but caretakers for their lifetime. To have rights to claim tangata whenua status to ancestral lands, whakapapa is required, which identifies you and your place within the iwi/hapu/whanau. Marsden and Henare (1992) state that kaitiakitanga was a form of conservation and rahui was one way of enforcing this on a resource. While karakia, rahui and kaitiakitanga are still practised today, other forms of IK have been lost. The importance of IK in A/NZ is discussed next.

2.4.3 The importance of indigenous knowledge

IK is of major importance, as Flavier et al. (1995) state "IK is a valuable national resource" (p. 479) and can invoke a sense of pride and ownership, and is a science that is user-derived, not scientist-derived. The techniques within IK have been

tried and tested over a long period, are effective and inexpensive, culturally appropriate and environmentally sustainable.

Using harakeke as an example, during the early 1800's the need for harakeke fibre (required for rope making) was driven by European needs (King, 2003). Atkinson (1922) states that by 1828, there was brisk trade between Australia and A/NZ, with the first shipment sent from Sydney to England in 1818, with most of the fibre being prepared by Maori. The production of muka (fibre from harakeke), when extracted by hand is comparable to silk in touch and appearance. For Maori this extraction process has changed very little over time, however, the down-side being that the process is time-consuming. During the Maori Wars of the 1860's, a mechanical method for extraction of fibre was required to keep up with international demand for muka (Atkinson, 1922). Machines were finally invented and production was at its height during 1873. Conservation was not lost on the millers and the practise of cutting the plant across all leaves 8 inches above the ground proved to be too severe and recovery time for the plant was longer than selective harvesting. However, according to Atkinson (1922), this method of conservation was not adopted by all millers. Although the quality of the machined fibre was inferior to that produced by hand extraction, the major benefit was that large quantities could be produced in a shorter period of time. Both processes were driven by different values, one to provide clothing (utilitarian) and the other to meet supply and demand (economic).

Tikanga surrounded all processes relating to harakeke: from harvesting, including the correct time to harvest when the plant was in peak condition, the correct time for the weaver to weave, the accumulation of material for adornment, and the type of garment to be woven. IK provided a holistic approach, taking into consideration time, the environment and the person. The machine extraction provided a quicker extraction method. However, the consequences of meeting demand and supply led to the draining of wetlands for planting of harakeke crops, which in the short term provided employment opportunities but in the long term destroyed existing ecosystems (Atkinson, 1922). The market for muka ropes was superseded by the development of cheaper synthetic fibres such as polypropylene, polyethylene and polyester, resulting in a reduction in demand for harakeke. Yet

the effects of manufacturing and disposal of these cheaper synthetic fibres have a detrimental effect on the environment.

2.4.4 Summary of indigenous knowledge

IK is defined as knowledge accumulated over time, based on observations and trial and error between people and their environment. Maori have formed their own corpus of IK that may have variations between iwi. IK is stored in people's memories and activities (Grenier, 1998). The skill of being able to accurately remember and recall facts was a highly regarded skill as Maori knowledge was orally-based. One method of retaining knowledge was purakau (myths) and in Maoridom the myth of creation starts with the union of to Ranginui and Papatuanuku. From the union all creation came into being both animate and inanimate, hence the view that mankind is not separate from nature and man cannot rule nature. As children of Papatuanuku and Ranginui Maori believe, they are responsible to protect and sustain the environments in which they live.

Tikanga is defined as being the rules of conduct or etiquette and are handed down over generations. While tikanga can cover every aspect of life this study focused on three, karakia, rahui and kaitiakitanga, as these three forms of tikanga are widely practiced today by Maori and have links to EE. As previously mentioned in Section 2.2.5.1, inclusion of culture in the classroom has positive effects on Maori students with research indicating students are more likely to achieve through the inclusion of their culture in the teaching content. IK can also invoke a sense of national pride and ownership and from an EE perspective, IK techniques are effective, inexpensive, culturally appropriate and environmentally sustainable.

2.5 Environmental Education

One possible way of providing cultural recognition in mainstream education is through environmental education (EE). The Maori worldview is represented throughout the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999a). The document recognises that Maori have a special place within A/NZ society and that their worldview offers education in sustainable living. This section begins with a brief historical perspective of EE, followed by classroom initiatives, resources in the community and some of the issues that may surround these settings.

2.5.1 Historical perspective of environmental education

During the 1960's and 70's scholars from all fields were noticing the degradation of the global environment, and the effect of the relationship between people and their environment (Bolstad, 2003; Chiarelli, 2007). Advancements in communications technology enabled individuals to gain a more global perspective of the situation, as previously situations were seen as isolated occurrences. A number of international conferences organised by the United Nations Scientific and Cultural Organisation (UNESCO) took place during the 1970's. As a result, the *Tbilisi Declaration* was developed which has provided guiding principles for much of the contemporary literature on EE (Parliamentary Commissioner for the Environment, 2004). Recommendation 2 of the *Declaration* endorses the following goals and objectives;

- the three goals of environmental education are:

  a) to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;

  b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;

  c) to create new patterns of behaviour of individuals, groups and society as a whole towards the environment;

  - and the five objectives for environmental education are; - awareness, knowledge, attitudes, skills, and participation.

(UNESCO, 1978, p. 26)

The awareness created in the 1970's needed to move forward and provide for the future generations. Tilbury (1995) states that a later link between the environment and society started the shift towards a sustainable approach embedded in future-thinking. During the 1980's and 1990's the language of sustainability began to emerge, with the realisation amongst scholars and researchers that the future of EE needed to reflect quality of life for all (Tilbury, 1995). *Agenda 21* was

developed and adopted in Rio de Janeiro at the 1992 Earth Summit and "called for the re-orientation of EE towards sustainably" (Tilbury, 1995, p. 198)

In A/NZ, Bolstad (2003a) posits that two major effects of *Agenda 21* were that the government developed and implemented EE policies to meet obligations to *Agenda 21*, and there was a subtle change in language within EE to reflect the integration of social, political, and economic development for the long term. As noted in Eames and Cowie (2004), the Government's changes to policies and legislation were to meet Treaty of Waitangi obligations. These obligations highlight the unique position of Maori by ensuring their right to exercise rangatiratanga (authority) and kaitiakitanga (guardianship) in managing natural resources and the environment (Ministry of Education, 1999a). This gave Maori a voice in the political and educational arena to sustain and protect not only natural resources but also cultural practices from unsustainable environmental activities (Ministry of Education, 1999a).

EE addresses all the senses and as such does not require a separate place within the curriculum, but has the ability to be integrated into all areas of learning, providing a holistic curriculum approach (Kemple & Johnson, 2002; Tilbury, 1995). Moseley and Utley (2008) make reference to the complexity of EE and state that not only is the content multilevel but also a range of teaching strategies is required. Researchers stress the importance of teaching children values as opposed to scientific knowledge, further suggesting that it is the values that determine our everyday actions, and it is the result of these actions that has led to environmental degradation (Bonnett & Williams, 1998; Leiserowitz & Fernandez, 2008). However, according to Tilbury (1995), one has to develop a personal environmental ethic, initiated by being able to clarify one's own values and how these values came into being; what factors may have been influential, including cultural and socio-economic factors. The implication for teachers in helping students develop their personal environmental ethic include remaining neutral and allowing the student to make their own judgements while actively promoting the values required for the development of a sustainable lifestyle (Tilbury, 1995).

2.5.2 Environmental education in Aotearoa/New Zealand

As previously mentioned, the Ministry of Education and the Ministry of Environment developed policies on EE in the late 1990's. This resulted in the development of an EE framework that schools could integrate throughout all curriculum areas. However, EE was not given a formal place in the curriculum (Eames & Cowie, 2004). Currently EE is not mandatory in schools. The Ministry of Education published *Guidelines for Environmental Education in New Zealand Schools* in 1999, as a supporting document for all schools (Ministry of Education, 1999a). In 2007, the Ministry of Education published a revised edition of the *New Zealand Curriculum* that includes EE at the directional learning level - vision, principles and values. Teachers have a diverse scope in how EE can be incorporated within these guidelines but as with the inclusion of te reo Maori and tikanga Maori, strong support from school management as well as an EE-capable teacher is required to ensure quality learning opportunities are provided. The *Guidelines* promoted the incorporation of Maori worldviews into EE as a key aspect. Maori worldviews recognise Maori origins are from the union of Ranginui (Sky Father) and Papatuanuku (Earth Mother) reflecting the interdependence between tangata (mankind) and the environment. Interdependence is one of the four key concepts emphasised in the *Guidelines*, linking cultural, economic, biophysical and social considerations. As previously mentioned Maori have established management systems such as rahui and kaitiakitanga. This link with Papatuanuku gives Maori the sense of belonging to the land - tangata whenua. Sometimes this link is weakened, especially if there is a lack of contact with the whenua, and this is discussed next.

2.5.3 Detachment from the environment

Leiserowitz and Fernandez (2007) note that many people are today detached from products that were once living and use the example of the packaged chicken available for purchase in the supermarket. They argue that there is little connection between this packaged item and the fact that it was once a living creature that was bred and fattened for sale. They further argue that this detachment is the result of people, in particular children, spending less time outside in natural settings. Bonnet & Williams (1998) state that society has become reliant on media such as television to provide these experiences in the natural environment. In addition, international surveys have noted that although

people profess strong environmental values, these are based less on personal experience and more on the perceived experience via other forms of media such as television (Leiserowitz & Fernandez, 2007). The cost of new improved technology to simplify life or solve a problem can often lead to unexpected detrimental effects on both people and the environment as in the example of the "pesticide DDT" (Leiserowitz & Fernandez, 2007, p. 64). New technology can also have a detrimental effect on IK; knowledge that was once included in daily living unless documented is often lost with the passing of person possessing the IK. Although new technology usually makes life easier in terms of being less time-consuming than employing IK, inevitably IK becomes obsolete and the knowledge lost. One example is the making of traditional hinaki, once this knowledge was known to the general public, now this knowledge remains with very few people. Technology such as metal rods and metal netting has replaced the traditional Manuka *(Leptospermum Scoparium)* frames and harakeke netting, products that are effective, inexpensive and environmentally sustainable.

Some educational possibilities that could provide Maori students with an opportunity to examine values towards the environment and contain elements of IK follow.

2.5.4 Environmental education for students

Students need to reconnect and develop a positive relationship with the natural environment. A starting point could be the school grounds, researching the history of the school and surrounding environments, studying the plants within in the grounds and participating in planting projects (Gisborne Education Centre (N.Z.), 1985). Cleaver (2007) states that findings from a study showed that by allowing students to spend more time outdoors with nature, the benefits were numerous: less stress and improved psychological well-being, improved health and self-confidence, an increase in cooperative and creative learning, and an improvement in students' critical thinking and decision making that was reflected in test scores. Kemple and Johnson (2002) also support designing EE around children's hands-on experiences and that by raising the awareness of children in terms of appreciating and responding to the beauty of nature provides the opportunity for instilling "environmental stewardship" or kaitiakitanga (p. 217). Bonnett and Williams (1998) state that an ongoing range of environmental

activities at school can help students develop a greater awareness of action-based strategies relating to EE. However, in some schools EE is not integrated throughout the school year but delivered as a one off unit providing no continuity with valuing EE as part of our daily lives.

Vowless (2002) identifies issues such as finance affecting the delivery of EE, as EE is practical in nature. By providing the first-hand opportunity in the environment via a trip, students are able to investigate the cause of environmental problems and suggest how to solve these problems, or investigate areas that have already been addressed and evaluate the solutions instigated. Wals (1996) states that for students to become engaged they should be encouraged to identify environmental issues that they would like to address (as cited in Vowless, 2002). However, Vowless (2002) did note that this was not always an option citing curriculum restraints placed on teachers as one cause for not permitting student-initiated inquiry. In A/NZ schools, one issue affecting the implementation of EE is its low profile within many schools (Oliphant, 2002). Some of the teacher misconceptions about EE include seeing EE as an add-on subject in an already crowded curriculum, and limited teacher awareness of the *Guidelines* for EE (Oliphant, 2002). While government funds had become available to provide teacher training in the area of EE, some experts suggest that most of these programme activities were based on litter schemes, tree planting and were not addressing the social and cultural implications of EE (Oliphant, 2002). As these implications are soundly based in the local community, there are possibilities of engaging schools with their community to provide EE opportunities.

2.5.5 Resources within the community

Both the school community and the local community can provide a wealth of knowledge to support the classroom teacher in the teaching of EE. Local authorities and community groups may provide speakers or information and possible funding (Vowless, 2002). Local knowledge can be enhanced by including local kaumatua who can share the tribal history and also the tikanga relevant to caring for the environment (Bolstad, Cowie, & Eames, 2004).

One issue with relying on volunteers is their possible overuse as identified in research by Bucchianeri and Shimkanin (2005), with a solution found by forming

a relationship with a local university. An elementary school based in Pennsylvania, America, relied heavily on volunteers from the community to man outdoor learning stations (part of their EE programme) that were situated within the school grounds. These learning stations provided hands-on inquiry learning for students, which became an annual event called an 'envirothon', which was a two day event and open to other elementary schools in the district. Some years it was difficult to source presenters at the different learning stations, which meant the student groups became very large and hands-on activities difficult to manage. In 2001 an elementary professor from a local university volunteered his group of pre-service teachers to man the learning stations. This resulted with the two institutions forming a formal partnership. The elementary school required staff to man the learning station and the university's pre-service teachers required field experience including planning and delivering lessons. Each year the university provides a new set of pre-service teachers that have different areas of interest to operate the outdoor learning stations, which keeps elementary students interested and stimulated, providing a win-win situation. While this programme is based in America, there is a local programme available to schools in A/NZ called the Enviroschools programme.

The Enviroschools Programme is run by the Enviroschools Foundation. The Enviroschools Foundation was formed in the Waikato in the 1990s and provides support and direction for schools throughout A/NZ via the Enviroschools Programme. Schools may become involved with the Enviroschools Programme at various levels of commitment. Support is offered through a regional coordinator, facilitators who offer in-school professional development, and various resources. The programme works on a whole school approach from Board of Trustee members to the grounds person. While this programme is available to all schools, participation is voluntary and not all schools in A/NZ are participants. For those schools that do not participate in the Enviroschools Programme and do not have strong internal support for EE issues may arise. One possible issue would be that of creating community networks, and could become the duty of the individual teacher, with implications such as time required to not only establish networks but also maintain the networks.

2.5.6. Summary of environmental education

This section has provided a brief history on EE, which initially seen as outdoor education, now requires integration of social, political and economic development with a focus on sustainability. While EE is not mandatory in A/NZ schools, there is the opportunity to use a holistic curriculum approach as EE is applicable to all curriculum learning areas. The A/NZ government has recognised Treaty of Waitangi obligations and these are recognised and stated in the 1999 *Guidelines for environmental education in New Zealand schools*. In A/NZ, EE provides the opportunity to incorporate a Maori worldview as this world-view is an integral component of the 1999 *Guidelines for Environmental Education in New Zealand schools*.

The Ministry of Education released a revised version of *The New Zealand Curriculum* in 2007 that incorporates EE within directional learning areas; the vision, values, and principles providing unlimited possibilities of how EE may be included in curriculum areas. However to enable a teacher to provide quality EE learning opportunities support from school management is required, also a teacher with sound EE knowledge or networks to provide support and leadership. There are issues related to EE such as the reliance on modern technology such as television to provide an environmental experience. This in turn has promoted a sense of environmental detachment within children.

While EE is considered a hands-on learning process, trips can provide one solution to engage students in the environment, but this is complicated by travelling costs. The Enviroschools programme provides a range of assistance to schools but not all schools participate in this EE programme. For those schools not members of the Enviroschools Programme, the resources in the community offer the teacher the ability to up-skill in EE (especially if there is a partnership with a tertiary institute) and gain valuable volunteers from community groups that may be willing to help with the teaching of EE.

2.6 Chapter summary

This literature review has provided a brief history of Maori education pre and post colonisation. While the effects of assimilation and colonisation within the Western school systems detrimentally affected Maori, current government strives

to address the educational problems. The answers, like the issues, are complex. Career paths promoted for Maori males were in the area of unskilled work and females' domestic work. The fact that both te reo Maori and Maori culture were suppressed within the education system for many years, led to the near extinction of the language.

During the 1980's, with the continual growing awareness of racial marginalisation, Maori sought to develop an alternative education system. This alternative system started with Kohanga Reo (pre-school) and was later developed to tertiary level, providing education delivered in te reo Maori, based on Maori tikanga, and formed the impetus for Maori language and cultural revitalisation. While these immersion institutions have proved successful in terms of Maori student achievement in these schools, the majority of Maori students attend mainstream schools and the academic levels of these students are of major concern and priority.

The concern of Maori under-achievement in education had not evaded successive governments and current government initiatives based on research identified that culture, language and productive partnerships can all contribute to realising Maori student potential. While the intentions to realise this potential are explicit in *Ka Hikitia – Managing for Success,* these intentions remain implicit in the current *New Zealand Curriculum,* which is the key document for teachers in mainstream schools.

Recent research into Maori student learning has argued that relationships are important. One key relationship system for Maori students is that of whanau. Whanau is at the core of Maori society, and is a Maori concept significant in this study for its emphasis on relationships, and allows for the exploration of manaakitanga and whanaungatanga within the classroom. The benefits of the class whanau include providing students with a sense of belonging, safety, security and strength from being part of a larger group. Whanau also offers students a familiar setting from the home environment.

Whanau also provides a link in its use as a metaphor for the harakeke bush. Harakeke is a mainstay of traditional Maori society and provides a range of topics

that could be of high interest to boys and possibly keep them engaged in learning, a strategy identified in research initiatives by the Australian and A/NZ governments based on the underachievement of boys in education.

This study proposes that one way to improve Maori student engagement and achievement is to incorporate indigenous knowledge (IK) into classroom teaching. Maori concepts and knowledge were examined in terms of how they may be applied in the classroom environment. IK was defined as knowledge based on observations between man and the environment accumulated over long periods with transference between generations orally-based. As part of the corpus of IK, tikanga is described as the correct procedure or custom and three were selected; karakia, rahui and kaitiakitanga based on the current use in Maori society and their links with environmental education.

A second avenue proposed to help Maori student engagement and achievement is through environmental education (EE). EE provides the opportunity for cultural recognition in mainstream education. Although EE is not mandatory in A/NZ schools, EE is mentioned in the current *New Zealand Curriculum* document in the vision, principles and values sections. While EE is still considered a relatively new learning area in A/NZ, schools are able to apply to participate in the Enviroschools programme that offers support through a regional co-ordinator and facilitators offer in-school professional development. However, those schools not participating in this programme and lacking EE expertise within the staff may be able to source support by forming partnerships with community groups or institutions. The school in this study was not a part of the Enviroschools programme and waste minimisation formed the current EE focus. This study sought to establish a partnership for EE that allowed learning for students, teacher and researcher.

This study then seeks to examine if the use of IK and EE can enhance Maori student engagement and achievement in a mainstream primary school classroom. The following chapter details how the study was carried out to examine this.

Chapter 3:Methodology

3.1 Introduction

This chapter presents the research question, research design, methodology, and methods employed to gather and analyse data in this study. Also presented are the ethical implications, and the process to check validity and reliability of the data, and how triangulation of data can be employed to ensure these checks are met.

3.2 Research question

This research sought to investigate the following question:

> Can the use of Maori indigenous knowledge (IK) and environmental education (EE) through harakeke enhance Maori student engagement and achievement in a mainstream primary school classroom?

3.3 Methodological perspective

The purpose of the study was to gain a better understanding of whether student experiences, framed in Maori (IK) and EE enhanced their engagement and achievement within the classroom/school environment. The chosen methodology would then need to fit with the objective of understanding these experiences and the influence of Maori culture. Kaplan (1973) posits that "the aim of methodology is to help us to understand in the broadest possible terms, not the products of scientific inquiry but the process itself" (as cited in Cohen, Manion, & Morrison, 2007a, p. 47).

Traditionally research was viewed in terms of the hard sciences and is defined by Kerlinger (1970) as "the systematic, controlled, empirical and critical investigation of hypothetical propositions about the presumed relations among natural phenomena" (as cited in Cohen et al., 2007a, p. 6). In this view the key is the word control; Cohen et al. (2007a) posit that the systematic control of research relies on the inductive-deductive model (from observation to hypothesis and from hypothesis to implications). This control is further enforced by the empirical aspect, defined by objectivity, while being validated by empirical facts and tests (Kerlinger as cited in Cohen et al., 2007a). However Cohen et al. (2007a) state that built into the scientific research is the self-correcting aspect; this is to protect

scientists from errors, as processes and results were open to public scrutiny. The traditional view of social science held that these approaches applied to the natural sciences could also be applied to the study of human behaviour, with the assumption there were universal laws that governed human behaviour (Cohen et al., 2007a). Yet not all people behave in the same way in the same situation. There are certain constructs that identify each person as an individual.

Cohen et al. (2007a) quote work of Burrell and Morgan (1979) who identified four sets of assumptions (with a discussion of three to follow) that distinguish an individual's social reality and ultimately for the researcher define the methodological approach required. The first of these is ontology and relates to how the individual views reality: is this internal (created by self) and viewed as a nominalist philosophy or external (already in existence) and viewed as a realist philosophy. The second assumption is the epistemological philosophy concerned with knowledge, its creation and how it is obtained. As with ontology, knowledge can be viewed from two different perspectives: that of the positivist where knowledge is seen as being already in existence and external to the individual, and the second view being that of the anti-positivist, where knowledge is created and given meaning internally by the individual. The third assumption is that of human nature, in particular two types with the first type the individual has no control of the environment and is acted upon by the environment (determinism) and the second type where the individual has free will to create their own environment (voluntarism). Each assumption has two distinct stances which lead to viewing research from either an objectivist (positivist) view where methods of inquiry can reveal universal laws that explain and govern that which is observed, or the subjectivist (anti-positivist) view where methods of inquiry can reveal the personal view of the individual (Cohen et al., 2007a). As this study is concerned with personal views of the world, it has adopted two approaches: interpretive – understanding how people make sense of their experiences and the world in which they live; and naturalistic – participants are studied in their natural environment. For the researcher to gain an understanding of the participants' experiences and their behaviour, Cohen et al. (2007a) posit that the researcher should inquire through "sharing their frame of reference" (p. 19). In this study, such a reference is Maori culture, and for participant and researcher to share the same culture enables increased subjectivity as discussed next in Kaupapa Maori.

3.3.1 Kaupapa Maori

A Kaupapa Maori methodology (further referred to as Kaupapa Maori) is research for Maori by Maori. Bishop and Glynn (1999) define Kaupapa Maori as "Maori philosophy and principles and was formed as a result of Maori resistance to mainstream initiatives during the 1970s" (p. 61). Kaupapa Maori enables research to be based within Maori cultural preferences and practices, in contrast to the ethnocentric view where one culture is researched in terms of another culture's preferences and practices with the belief that the researcher's own culture is superior to that of the researched (Bishop & Glynn, 1999; Smith, 1998). It also affords Maori empowerment of their research, how it is used, on whom by whom and with whom. According to Teariki and Spoonley (1992), research on Maori was done by many non-Maori not for the benefit of Maori but for the personal gain of the researcher. In addition Stokes (1985) states that "Maori have been guinea pigs for academic research" (p. 3). While Stokes does not deny that non-Maori are capable of researching Maori, and that one does not need to be of Maori descent, she advocates that the researcher must be able to operate with ease in both cultures and preferably speak te reo Maori. Of concern for researchers is the validity of Kaupapa Maori research. From an epistemological perspective Maori are very aware of where their knowledge is derived from, indeed Bishop and Glynn (1999) state that "Maori have always had criteria for evaluating whether a process or product is valid" (p. 64). The quandary is merging a western academic and Kaupapa Maori term for validity without compromising either approach. How this was attempted in this study is discussed later in this chapter.

Kaupapa Maori as a methodological approach offers me as the researcher many advantages. I am by descent Maori and whakapapa to the following iwi; Te Aitanga a Mahaki (Te Tairawhiti – Gisborne), Ngai Tai (Torere – Opotiki) and Ngai Tahu (Te Waipounamu – South Island) and being Maori identifies me as an insider to the researched group. Sharing the same culture creates an opportunity for the researched group to feel at ease, creating a sense of familiarity, shared cultural practises, and a shared language, te reo Maori. This means that this approach would be culturally appropriate for this study. While Kaupapa Maori has a cultural focus, interpretivism focuses on the individual and the complexities of knowing and meaning, and this meant that this approach was also relevant to this study.

3.3.2 Interpretivism

As previously mentioned, this study was concerned with the individual student and how they understand their experiences and the world in which they live. As a researcher to gain this understanding Cohen et al. (2007a, p. 21) argue that the researcher needs to "get inside the person's head and understand from within". In contrast to the normative approach, that focuses on behaviour derived from external or internal stimuli that places the cause of the behaviour in the past, interpretivism focuses on actions which, according Cohen et al., are placed in the future. As an interpretive study, theory does not precede research (as with a normative approach) but follows research. Or as Glaser and Strauss (1967) postulate "theory is grounded in the data generated by the research act" (as cited in Cohen et al., 2007a, p. 22).

Using these two approaches to research, a number of methods were used to gather data and these are discussed next.

3.4 Methods

Methods in research are the processes dictated by the methodological approach. As the methodological approaches ascribed to in this research are Kaupapa Maori and interpretivism, the following methods were employed to gather data to enable the study of the individual's experiences and behaviour. These methods included designing an intervention to promote change, and then using a case study to examine change incorporating questionnaires, interviews, observations of lessons in person and through video, field notes and document analysis.

3.4.1 Design of Intervention

The design of the intervention focused on the inclusion of Maori cultural practises, including the use of te reo Maori, with links to EE, student home life, subject matter that would appeal to students, and links made to other class term topics at the time of delivery. The intervention was a unit containing 10 lessons with harakeke (New Zealand flax) as the focal point of the unit. The intervention was for delivery to a class of Year 5/6 students (9/11 year-olds) in a mainstream primary school classroom, and was designed in negotiation with the classroom teacher. The intention was that the unit would be taught in 30 - 40 minute blocks on Monday afternoons throughout the ten weeks of Term 2, 2009. Methods

employed to gather data were, interviews, pre and post-unit questionnaires, samples of student works, field notes, video tape recordings, and school documentation.

3.4.2 Case Study

Case studies are pieces of research that are bounded in some way, hence examining a particular case. According to Merriam (1998), "a case study is an intensive holistic description and analysis of a single entity, phenomenon or social unit" (p. 34). One of the main characteristics of case study research is the unit being studied has boundaries or as Merriam (1998, p. 27) states the ability to "fence in" what you are going to study. They focus on cases in their natural settings, which in this research was an all boys' class of year 5/6 students studied in their classroom. Case studies provide an opportunity to collect richer, multi-dimensional and more complex data (Cohen et al., 2007a; Desimone & Le Floch, 2004). According to Robson (2002), "case studies opt for analytic rather than statistical generalisations, that is they develop a theory which can help researchers understand other similar cases, phenomena or situations" (as cited in Cohen et al., 2007a, p. 253). Cohen et al., (2007a) liken the case study to that of a 'television documentary', where events and situations are portrayed as they happen leaving the researcher to interpret the data as it is viewed.

3.4.3 Interviews

Interviews

Cohen et al. (2007a) describe interviews as a flexible tool for gathering information. They allow participants to share how they see the world they live in, and are also seen as a social encounter where information is shared. Merriam (1998, p. 71) notes that an interview can be viewed as a "conversation with a purpose". In addition, Kvale (1996 p. 20) states that a research interview can be characterised by the "methodological approach", where there is attention to question forms, the relationship between participants, and importantly what is said. The construction of knowledge is not completed by the interview process, the interaction of the researchers and their subjects, but continues with the researchers' interpretations and reporting of their interviews, "to conversations with other researchers about their findings" (Kvale, 1996, p. 296). In this research, semi-structured interviews were employed. This involves the participant

being asked a set of predetermined questions in the same order but with flexibility to probe further if required. This format allowed for more in-depth discussion and also clarification when required. Although interviewing is an excellent tool, Cohen et al. (2007a) note there are flaws, which include interviewer bias, time restraints, and availability of interviewees, interviewee fatigue, and ensuring respondent anonymity. How these potential flaws were reduced is discussed later in Section 3.5.4.

Historically research involving Maori has had researchers taking the recipients' stories and retelling them in a language and culture determined by the researcher (Bishop & Glynn, 1999). Bishop and Glynn (1999) state that "as researchers we need to acknowledge our participatory connectedness with the research participants" (p. 103) and promote a means of knowing that denies distance and enables power sharing. This connectedness can be achieved by the researcher collaborating with the research participants, co-jointly reflecting on information shared and stories from both researcher and research participant merged to create a new story (Bishop & Glynn, 1999).

3.4.4 Observations

Observations are another important research tool for gathering information and were used in conjunction with the interviews. Cohen et al. (2007b) state that observations can display attitudes to the environment and other messages and deem photographs and artefacts to be documentary evidence. These provide a live record of the dynamic situation at the time of recording. Furthermore Tolich & Davidson (1999), state that in order to present rich data for theorising, the observations must be detailed and show readers rather than tell them what is happening .

There are two types of observation: participant and non-participant, with the difference being the participant engages in the activities being observed and the non-participant does not engage in the activities but makes observations only. While both these positions are at extreme ends of the continuum the observer may be situated anywhere between the two ends, this dependent on the method incorporated. The non-participant observer may or may not be known to the participants being observed. The purpose of the non-participant observer is to

record activities without becoming involved in the activities and is referred to as an 'outsider' (Creswell, 2002). While this role does offer detachment from the group, Creswell (2002, p. 200) states that the observations may be less 'concrete' than if the researcher had participated and experienced the activity.

The role of the participant observer is to be a member of the group being studied and engage in the group's activities. The researcher in this role is referred to as an 'insider' and is able to see experiences from the view of the participant (Creswell, 2002). Participant observation means that "the researcher is not an objective outsider, but is directly involved with the social world being investigated" (Zuber-Skerritt, 1992, p. 134). One disadvantage of participant observation is the difficulty in taking notes as well as being actively involved in the activities. Although the research may have a framework for guidance, the observation remains open and flexible, with the meanings evolving as a result of the experiences of people in the natural setting (Zuber-Skerritt, 1992).

3.4.5 Video observations

Although Cohen et al. (2007a) classify oral and visual data as an observation, I have included a separate section as there are distinct advantages and disadvantages to recording information using a video camera. The advantage of video recording lessons provides an unbiased record of what happened at that point in time and overcomes observer bias (Cohen et al., 2007a). According to Clough and Nutbrown (2007), the reliance on hand written notes means that not all information is noted, and also state that the transcription process is very lengthy. Cohen et al. ((2007a) concur that the video recordings provide a complete and comprehensive collection of data but note participant reactivity and limitations on selectivity (camera movement) as disadvantages. These issues are discussed later in Section 3.5.4.

3.4.6 Document analysis

Documentation provides another form of data collection. In most cases this is readily available, does not require respondent participation, and is factual (Cohen et al., 2007a). Documentation has the ability to provide factual evidence of what has been recorded in the interviews. Prior (2003 as cited in Cohen et al., 2007a) states that documents offer a visible representation of the phenomena under study.

Cohen et al. (2007a) posit that there is little or no reactivity on the part of the writer and this is prevalent if the document has not been written for the purpose of research data, and state that this fact can also be seen as bias purely because it has been written for a different purpose. Analysis of these documents can provide insights that can corroborate or refute other sources of evidence.

3.4.7 Questionnaires

As a research instrument, questionnaires allow researchers to gain a broad range of information from participants in both large and small-scale samples. While Clough and Nutbrown (2007) posit that a questionnaire will not reveal in-depth information on participant experiences or views, the choice of question type allows participants freedom to respond and explain their choice of answer in their own terms. In general, questionnaires can be defined as structured, semi-structured and unstructured. The structured questionnaire provides patterns and comparison of data, are quick to complete, simple to analyse and easy to answer if language is a problem for participants, however the planning and piloting stages are time consuming (Cohen et al., 2007a). The unstructured questionnaire allows participants to respond how they please and the semi- structured questionnaire has a clearly structured set of questions but allows the respondent to respond in their own terms (Cohen et al., 2007a). Of major concern is the assumption that participants will have the knowledge or an opinion to be able respond to the research questions. This applies directly to children and as Cohen et al. (2007a) indicate, a response option providing for uncertainty should be included as well as a yes and no option. Another implication relating to children is the choice of vocabulary and ensuring the concepts are understandable to the child (Cohen et al., 2007a). Having questionnaires meet the cognitive standards of the participants is also highlighted by Fowler (1998) who suggests that this will ensure that participants are able to respond. The validity of the questionnaire is dependent on the participant having the same understanding of the questions as the questionnaire designer, and that the questions have not misrepresented information pertaining to the phenomena being researched ((Desimone & Le Floch, 2004) .

3.5 Research Design

This section details the context of the school, sampling strategies used, selection of participants, and an overview of the intervention, and data gathering methods.

3.5.1 Context of School

The school is an inner city primary school ranging from year 1 to year 6. According to the *2008 Education Review Report* (Education Review Office, 2008) the percentage of Maori students was 60%, European/Pakeha 28%, Indian 4%, Asian 4%, Pacific 3% and other 1%. In 2009 the school introduced two single sex classes, a year 3/4 boy's only class and a year 5/6 boy's only class. Both classes have female teachers. When approached by the researcher about the school's involvement in this study, the Principal in consultation with the class teacher decided the class where the intervention was delivered. The school is not part of the Enviroschool Programme but does recycle paper and food scraps. The researcher was unaware of any programmes involving Maori indigenous knowledge and environmental education being delivered in the school at the time of the study.

3.5.2 Sample

The sample is another integral part of the research. According to Morrison (1993), the sample suitability is as important as the methodology and methods (as cited in Cohen et al., 2007a). Furthermore, Cohen et al. (2007a) state that before a sampling strategy is decided, three factors need to be taken into consideration; the sample size, representativeness of the sample, and access to the sample. In accordance with the case study method, the sample size was kept small and was defined by the class size and the high percentage of Maori students identified in the class ensured the representativeness of the sample. As noted above, access to the class itself was dictated by the Principal of the school and the teacher. As this class had certain characteristics, these act to limit the scope of this study. Once the class had been arranged, as the researcher was to co-deliver the intervention, access to the sample was not an issue.

Sampling strategies

As already mentioned the sample was purposive and, according to Miles and Huberman (1994), best described as criterion sampling - all those who met some stated criteria for membership of the group or class under study (as cited in Cohen et al., 2007a). In this case, the criterion was based on the high percentage of Maori students and the school had self identified in the most recent Education Review Office report that in the area of Maori student achievement progress needed improving. The class where the intervention was delivered was a boy's only class that had a high percentage of Maori students. The majority of the boys were identified as Maori 17/21, with 3/21 Pakeha and 1/21 Asian, and the teacher was a female Maori. As the research involved a particular group, there is full knowledge that this sample does not represent the wider population, and generalising is not possible (Cohen et al., 2007a). Patton also states that "there are no rules for sample size in qualitative inquiry" (as cited in Cohen et al., 2007a, p. 177), size is dependent on information required, purpose of the research, data that will be useful and credible, and what can be done within the resources available, e.g. time, money and resources.

Selection of participants

The class was selected by the school Principal on the basis that the majority of the class identified as Maori and also the intervention being delivered was in a priority area for the school, as noted in the *2009 - 2011 [School name] Strategic Plan*, Goal 4: Maori learners participating, achieving and contributing to (*school name*) through successful relationships and interactions with peers, staff and improve whanau partnerships. The class teacher also self-identified as Maori and offered to participate in the research by co-delivering the unit. All students were supplied with full information about the study and invited to participate in the research with informed consent gained from their caregivers.

3.5.3 Intervention

This section provides an overview of the intervention, a unit containing 10 lesson plans. The unit has a strong Maori cultural focus as promoted in current government educational initiatives referred to in chapter 2; one aim is for Maori learners to excel and successfully realise cultural distinctiveness and potential. Language is an important part of this cultural realisation and forms an integral part of the intervention, as is the importance of relationships and whanau a cultural

impetus. The unit also incorporates Vosniadaou's (2001) principles of learning: active participation, student prior knowledge and the social nature of learning. The following is a description of the unit overview.

Design of the unit

The intervention was a unit containing 10 lessons, plus a pre-unit introductory session. The unit was written by the researcher, in negotiation with the class teacher, and was to be co-delivered with the class teacher. A pre-unit interview was held with the teacher to capture her expectations and ideas about the unit. The researcher had strong knowledge of harakeke, some knowledge of te reo and tikanga Maori and EE, but had limited classroom teaching practise; however the class teacher had more than five years teaching experience but identified that she had limited knowledge of harakeke. By co-delivering the unit, the researcher would be able to observe, and verify observations with students if required. Although the intention was for the researcher to co-deliver the unit with the teacher, when the unit began the teacher felt that the researcher, with her stronger knowledge of harakeke, should deliver the unit. This is what then happened with the teacher providing logistical and organisational support.

The kaupapa was harakeke, selected as an indigenous plant to A/NZ, and also of high value to early Maori. Harakeke was also chosen as the researcher had experience in raranga (weaving) and had knowledge of the plant. As an experienced weaver, artefacts and resources, if not owned by the researcher, were readily available from other local weavers, and this knowledge would be able to support the class teacher during delivery of the unit. Harakeke provided a link between Maori culture, indigenous knowledge and EE. The versatility of harakeke also provided the opportunity to focus on male orientated topics such as hunting (construction of hinaki – eel traps) and weaponry (taiaha – spear) to engage the students. The unit was also designed to include a number of hands-on activities and movement-related tasks as a way of attempting to use the boys' physical energy and interests.

The following Figure 1 provides an overview of the unit.

Lesson	Curriculum Area & Achievement Objective	Stage of Unit	Learning Intention We are learning to/about	Tuning-in activities – checking prior knowledge	Main Lesson Activity
1	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources EE – interdependence – Maori reliance pre-European EE about the environment	Tuning in	identify the many uses of harakeke	Pair share brain storm uses of harakeke (assess prior knowledge)	Pre Test – Concept map and questionnaire View harakeke in school environment Create class chart from brainstorm Name & label parts of the harakeke Discuss Whanau concept – compare to students' whanau and class whanau Students & whanau to complete a prior knowledge sheet Extension – create a word search using new words
2	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources EE - sustainability	Finding out	about harakeke	Revise class chart lesson 1 uses of harakeke.	Legend – Hine-rehia (discovery of weaving) Role - play Students interview harakeke plant – write a list of interview questions, where do you like to live, what do you eat, who is your best friend and why, who is your enemy etc Write up class chart of questions and create a facts sheet

Lesson	Curriculum Area & Achievement Objective	Stage of Unit	Learning Intention We are learning to/about	Tuning-in activities – checking prior knowledge	Main Lesson Activity
3	Putaiao (Science) Living World – investigating in science EE – biodiversity	Finding out	about science processes and skills – observing, identifying classifying & predicting & writing	Pair share students examine harakeke toys and suggest a current day type of material	Examine leaf – label parts Classify harakeke by leaves using senses phormium tenax/cookianum hybrids(use branching classification system) Experiment – dried colour –the same toy is made from the 3 different types of flax, students make predications and write daily observations Create duck bill toy - noisy
4	Hangarau (Technology) Nature of technology – characteristics of technology – how society and environments impact on and are influenced by technology in historical and contemporary contests and that technological knowledge is validated by successful function EE - sustainability	Sorting out	about harakeke and recycling	Students recall Mahi Kai eeling Hinaki construction	Examination of fish traps and weapons – samples & draw 1 fishing trap Compare Bobbing for eels & fishing hook and line – what are the recycling possibilities of both materials Design a trap (continue over next lessons)
5	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources EE – sustainability,	Making conclusions	about the positive and negative - lawnmowers qualities of harakeke	Review class chart on facts and answer questions where possible	Design a poster about harakeke stating 4 positive qualities of harakeke (Pair share then join to groups of 4) Continue work on hinaki

Lesson	Curriculum Area & Achievement Objective	Stage of Unit	Learning Intention We are learning to/about	Tuning-in activities – checking prior knowledge	Main Lesson Activity
6	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources EE – sustainability,	Finding out	about appropriate harvesting times & traditions -	Pair share brainstorm when do you harvest vegetables, fruit relate to Matariki – school focus term 2	Discuss tikanga – harakeke harvesting, karakia, women -returning first fish caught to Tangaroa - harvesting water cress wrenching as opposed to picking Use role play to create movement and interaction. Learn waiata - Hutia Selection process for seed saving of riwai, kumara. Continue work on hinaki
7	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources EE - sustainability	Finding out	about ownership and access	Pair share – name ways that people show ownership of land, house, personal belongings	Discuss rahui, fences and signs -who is the sign written for -what will it say Use a continuum line for students to make a stand. Create a sign sculpture in a 4 member group Draw a sign Completion of hinaki
8	Putaiao (Science) Living World – investigating in science	Sorting out Making conclusions	about science processes and skills – hypothesis, procedure, variables & recording data	Review comparison chart from lesson 2	Legend How Maui tames the sun Experiment to test the strength of harakeke using a single strip - Variable change size of strips 5ml

Lesson	Curriculum Area & Achievement Objective	Stage of Unit	Learning Intention We are learning to/about	Tuning-in activities – checking prior knowledge	Main Lesson Activity
9	Hangarau (Technology) – Nature of technology Characteristics of technological outcomes Understand that technological outcomes are recognisable as fit for purpose by the relationship between their physical and functional natures EE – sustainability –recycling & EE for the environment	Going further	about the diversity of harakeke	Compare rourou to plastic plate	Construction of rourou Compare to plastic plates and the recycling process Students make a list of how they can make changes in their lives when using goods that are environmentally friendly To test the rate of decomposition, plant a rourou and a plastic plate – to be checked monthly
10	Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources Hangarau (Technology) – Technological knowledge (technological modelling) EE in the environment and action for the environment	Reflection and action	how we can help the environment and harakeke users	Review class chart of questions – ensure all questions are answered	Planting at Hannah's Bay/school Learn about wetland and its importance to local Maori? Test hinaki in the lake

Figure 1 Unit overview

Introductory session The main aim of the introductory session was for the students to meet the researcher, for the kaupapa to be introduced, student prior knowledge to be assessed by means of students completing a mind map titled harakeke, administration of the pre-unit questionnaire and for all students to make a caterpillar from harakeke. The making of the caterpillar was to provide students with a hands-on activity (providing movement) and also add a fun aspect to the session.

As previously mentioned in Chapter 2, there are two species of harakeke in A/NZ and a distinguishing feature is the korari (flowers/flower stalk). The seed pods of the Phormium *tenax* (weaving variety) remain upright when dried and the *Phormium cookianum* seed pods become twisted and face down. Samples of thee two varieties were supplied for the students to examine. Students were informed that the dried korari stalks were used as practise taiaha and a taiaha tutor would be instructing them in conjunction with the unit. This illustrated that not only the rau (leaves) of the harakeke was important, but the korari also had a purpose.

With the diverse range of literary skills in the classroom, students were given options in completing their mind map of harakeke. Students were offered a choice of using words or pictures or a combination; however the majority opted to draw pictures. The point was stressed to the students that it was not a spelling test, thus easing the potential pressure placed on students that may have been hesitant in writing words not within their vocabulary. While students were engaged in this task, discussion between students was encouraged, as this was an opportunity to share knowledge and gain new knowledge within the group.

The pre-unit questionnaire consisted of six questions; three relating to EE and three relating to IK (see Appendix A). The vocabulary in the questionnaire was kept simple, allowing for the diverse range of literary skills in the class. Questions were a range of closed and open questions providing the opportunity for the more able students to write down their thoughts. The researcher read each question to the class then allowed students to answer the question. The pre-unit questionnaire was administered to gain an indication of student prior knowledge of EE and IK. The findings of this questionnaire were taken into consideration in delivery of the unit.

The introductory session was also seen as a way to form a relationship between the kaupapa and the whanau of the students. As research indicates, whanau are an important part of a child's education (Ministry of Education, 2008b). With all students having made a caterpillar to take home, an opportunity for students to share their experience and perhaps any knowledge they had gained with their whanau arose. In turn this may have sparked memories that whanau would then share with their child/ren, which in turn would be brought back for the student to share with the class.

The following describes the key foci and outcomes for each of the 10 proposed lessons. The eight actual lesson plans used can be seen in Appendix B. Although the original unit plan consisted of 10 lesson plans, lesson two was delivered over two weeks (4/5/09 and 11/05/09), due to the other class priorities on the 4/5/09 enabling only the introduction of lesson two, with the completion of the lesson being done on 11/05/09. Lesson lessons six and seven were combined as Monday 1 June was a statutory holiday and lesson 10 did not eventuate as both time and resources became an issue. These changes were made in collaboration with the class teacher.

Lesson One Tikanga-a- Iwi (Social Studies) Understand how people make decisions about access to and use of resources; EE focus interdependence and EE about the environment. This lesson focussed on students identifying harakeke in the school grounds, labelling parts of the harakeke plant and making connections between terminologies that were similar in the whanau structure and the harakeke plant.

Identification of harakeke in the school grounds was to provide the students with a fact-finding walk to discover harakeke and education 'IN' the environment. This did not eventuate as the harakeke in the school grounds were not good specimens and were not discovered until the completion of the unit. However, the exercise did uncover the fact that some of the students were confused as to what harakeke was. This was able to be corrected as the researcher had a pu (bush) harakeke growing in a bucket that was brought to most lessons throughout the unit.

Te reo Maori was an integral part of the unit providing culturally appropriate terms and expanding student vocabulary. New te reo Maori words were written on the white board, providing students a visual context, and then students would repeat the word after the researcher to ensure correct pronunciation.

As the class operated as a 'class whanau', all students were familiar with whanau terminology. The high percentage of Maori students in the class enabled most students to use language that was familiar in their home environment. As whanau is the core of Maori society (Metge, 1990), the inclusion of whanau recognised Maori culture as part of classroom learning and created a possible link between home and the classroom.

The importance of harakeke to Maori was indicated in the whanau terminology appointed to rau (leaf). To reinforce the connection between the harakeke and whanau, students were put into groups of five to create a human sculpture of a pu harakeke and were required to identify the rau (leaf) name. This provided a movement activity in which students were required to think about the structure and correctly position themselves within the structure. The activity also required the group to work co-operatively to achieve the goal.

Students were also to work in pairs and brainstorm the uses of harakeke. One outcome of the pre-unit teacher interview was the teacher's view that the boys' group work needed to be developed. A new student had joined the class and changed the class dynamics. By allowing students to work in pairs it was hoped to minimise group conflicts, but allow student interaction. On completion of the brainstorm, all students shared their brainstorm with the class. This experience allowed students to build their confidence by being able to share with the class and practice using te reo Maori. A range of artefacts was displayed to prompt student thinking.

For homework the students were given a sheet with the word harakeke centred under a pu harakeke. They were asked to speak with their whanau and fill out this sheet and return this to class for lesson two. This sheet was another way to include whanau in the classroom experience. It offered whanau the opportunity to

share their experiences relating to harakeke with their children, who in turn would share these with the class.

Lesson Two Tikanga-a- Iwi (Social Studies) Understand how people make decisions about access to and use of resources; EE focus sustainability. This lesson incorporated a Maori legend about the discovery of weaving. Maori legends were a way of transferring knowledge from one generation to the next, although the true meaning was not openly obvious to all, but was revealed to those selected to be entrusted with this knowledge (Marsden & Henare, 1992). During the reading of the legend, students were asked to perform the actions as they heard them in the story. This provided students with a legitimate purpose to move. It also ensured they were listening to the story to keep up with the movements as the story was read.

Next role play was included by students interviewing a pu harakeke. Role play offered students another form of learning that involved listening skills (ensuring the question had not been asked already), thinking skills (the question was relevant to the kaupapa), and active participation – valuing student input. Role play also added a sense of fun for the students.

Lesson Three Putaiao (Science) Living World – investigating in science; EE focus biodiversity. This lesson had a scientific focus where students used observation skills to identify the different rau, and then sort these rau according to distinguishing features. In the original lesson this was to be done in pairs to minimise group conflicts, however due to time restraints the class was divided into two groups with the class teacher taking one group and the researcher another group. A set example was demonstrated with each group and then students were asked to identify another set of features. This exercise led to some group discussion – co-operative learning.

The sorting sheet used in this exercise served a dual purpose, one to sort the rau and the other to show the structure of whakapapa (relationships). Whakapapa also linked to the class topic of whanau.

The think aloud process ensured that all students were able to verbalise the sorting process and ensured the process was understood by students. The extension exercise was completed in a whole class situation.

The activity for this session was the making of the ngutu parera (duck bill toy). This was a hands-on activity for the students, with the toy chosen especially for the noise it created when operated. The toy was made from the butt of the rau, showing students an EE perspective that all parts of the rau were used. On completion of the lesson the rau used in the sorting activity were taken home by the researcher and woven into square balls. These were given to the class teacher to be given as rewards for students. That making of the toy also illustrated that toys as well as utilitarian items were made from harakeke.

Lesson Four Hangarau (Technology) Nature of technology – characteristics of technology – how society and environments impact on and are influenced by technology in historical and contemporary contests and that technological knowledge is validated by successful function; EE focus sustainability. This lesson focused on hinaki (fish/eel traps). This topic was selected because of the appeal to males and also to link to the Mahi Kai trips the class was involved in. As well as examining the hinaki, a comparison between bobbing for eels using muka (fibre extracted from certain varieties of harakeke) and fishing line and hooks was made. This comparison also considered the environmental effects when disposing of both types of fishing equipment.

Traditionally hinaki were made by men, from Manuka (forming the frame) and harakeke (woven to form the netting). A hinaki made by a local weaver was used as an artefact that the students were able to examine. The hinaki was over five years old with the frame made from Kareao (Supplejack) and wire mesh for netting. The hinaki was specifically chosen as a high interest item for the boys being associated with hunting and also eeling was to form part of the Mahi Kai programme. The hinaki provided the students with a tangible artefact, and it became apparent that not many of the students had seen a hinaki before, as there was little knowledge of how the eels entered the hinaki and how they became trapped.

The initial activity planned for this lesson was to have students create a shoe box diorama. However after discussions with the class teacher it was recommended that timing would be an issue and most students would not be able to complete this activity, with the view that it would not be a good choice to set students a task that they would not be able to complete. It was decided that each student would make a small hinaki being no more than 20 cm in length. Materials would include pipe cleaners for the frame – easily manipulated, and tulle for the netting – this is relatively cheap. Students would be required to examine and draw a design of how to make a hinaki, on completion the design would then be explained to the researcher before moving on to the next stage. Once the design had been completed and explained, the student was then given the materials to create the hinaki.

Lesson Five Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources; EE – sustainability. This lesson incorporated a lesson warm up using brain gym and a visualisation exercise. Brain gym was developed by Brian and Gail Dennison and is a program based in neuroscience and kinesiology that works on integrating the left and right hemispheres of the brain through movement, in essence brain gym is about learning through movement (Dennison, 2006). Dennison has created exercises that target specific areas where students may have learning blockages such as reading and writing skills. The exercises are fun, simple, quick and only require space for individuals to move their limbs. The exercises in this lesson focused on listening skills, creative skills and abstract thinking skills. All these skills were required for the lesson but also as a lead into the visualisation exercise.

Visualisation was incorporated as this relaxed students and, according to Prashnig (2001), creates an optimal learning state by allowing students to de-stress and relax. Furthermore, students are then able to access higher brain functions and this includes creativity. The visualisation exercise allows the process to finish on a positive note by including positive learning affirmations.

The activity for this lesson was creating a poster about the versatility of harakeke. Students defined the criteria of what makes a good poster. This provided student ownership of the project and also gave them a standard that they had set and not

standards set by the teacher. The poster activity also addressed those learners with a dominant visual learning style.

Lesson Six Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources; EE focus sustainability. This lesson focused on IK and EE. The tikanga (custom) applied to karakia (prayer) was discussed with students and the relationship between karakia in class, and for some students in their home environment, and karakia in the process of harvesting kai (food) as in the Mahi Kai programme or other resources. Matariki (Maori new year) was another class topic for the term. Matariki included the harvesting of the summer crops and links were made between the harvesting of food and Matariki. Within the class some students had identified that they had experience in harvesting watercress and eels. Links were made to their prior knowledge and they were able to contribute to the class and share their experiences.

During the harvesting of harakeke demonstration, students were introduced to the concept of sustainable harvesting. This provided the base for discussing sustainable harvesting of watercress and eels and how this would affect future harvests.

Lesson Seven Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources; EE focus sustainability
This lesson introduced rahui - a Maori concept of conservation. Rahui was included as an example of an old tradition that is still used today. Links between rahui and sustainable harvesting were also made. Discussions around the signs that a tohunga (expert) would erect and the current day signs provided an example that although Maori did not have a written language, the use of signs was not new to them.

The activity of creating a sign sculpture was incorporated to allow students constructive movement and also co-operative learning was required to achieve the final outcome.

The drawing of a sign was also included to provide an exercise for the visually dominant learners. Visually dominant learners were also catered for in the lesson resources that included pictures of signs old and new.

Lesson Eight Putaiao (Science)
Living World – investigating in science. The lesson focus was on western science techniques to test the strength of harakeke. The lesson also included the legend *How Maui Tamed the Sun* as a cultural precursor to the scientific testing. This legend indicated the strength of harakeke in terms of slowing down the sun, and also the ability for men to weave.

The focus on science processes and skills were incorporated in this lesson. A simple table was created that required students to hypothesise the outcome of how many people it would take to break a strip of harakeke. Students were required to tick a box to indicate their hypothesis in pen, then on completion of the experiment the correct answer was marked using a pencil.

Student's participation was incorporated by having them suggest a way that the strength could be tested in the experiment. This provided the opportunity for the class to work co-operatively to reach a decision.

The activity for this lesson was for the class to plait a rope from the harakeke for a class tug o war. This was a hands-on activity that would also create a game where students could test their strength against each other.

Lesson Nine Hangarau (Technology) – Nature of technology, Characteristics of technological outcomes, Understand that technological outcomes are recognisable as fit for purpose by the relationship between their physical and functional natures; EE focus sustainability – recycling & EE for the environment. The lesson focus was centred on the rourou (type of plate made from harakeke). The cultural significance of the rourou was discussed as rourou were quick and easy to make especially at large hui (gatherings), when there would be over 100 people in attendance. These were made for one use only and then discarded. As part of the Mahi Kai programme students and their whanau would celebrate with a hangi at

the end of the term. As part of this celebration, students would make their own rourou.

A comparison between plastic plates and rourou was made with a focus on recycling and the effect both items had on the environment. The discussion would focus on materials required to manufacture products and how the manufacturing process affected the environment. The ability for harakeke to naturally decompose was also included. This formed part of the test to check rates of decomposition. An activity that students could monitor and record, that would form part of their learning in science.

Lesson 10 Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources; Hangarau (Technology) – Technological knowledge (technological modelling); EE focus in the environment and action for the environment. The final lesson was to include a planting of harakeke at a local reserve. Students would be able to interact with a local community group to help improve the environment. As part of the reserve a wetland restoration project was in progress and this provided a discussion point on the importance of the wetland to local Maori. As the reserve was in close proximity to a lake this also would have enabled students to test their hinaki and discuss design problems that might need to be addressed to create a better hinaki. As noted earlier, unfortunately this lesson did not eventuate due to time and travel issues.

3.5.4 Data gathering

This section details what data gathering methods were incorporated in the research and how this was achieved. Data were gathered from interviews, field notes, video recordings, questionnaires, student work and school documents.

Interviews

The class teacher was interviewed pre-delivery of the introduction session, and post-delivery of the unit using a semi-structured interview protocol (see Appendix C). The first and final interviews were audio taped with the teacher's permission and transcribed. The transcribed interviews were returned to the teacher to verify and modify, with the transcription from the first interview reviewed in the second interview in terms of checking to see if the teacher's expectations of the unit had

been met. A brief discussion was held with the teacher after the delivery of each lesson and these were recorded as field notes and filed with the transcripts from the video recordings of the relevant lesson.

As previously mentioned in Section 3.4.3, there are possible flaws relating to interviewing in this research, and these flaws were reduced by allowing the interviewee to nominate a time and place to conduct the interview that was suitable to her – reducing time restraints, availability and interviewee fatigue; interviewer bias was reduced by the interviewee checking the transcript; and clarification sought by further probing during the interview when the interviewer was unclear on interviewee responses.

Also in Section 3.4.3 reference was made to connectedness with the research participant and also power sharing. The researcher's relationship with the class teacher involved a collaborative approach to the unit design and negotiated curriculum links. This included the unit linking to current class kaupapa, such as the Mahi Kai programme, whanau and Matariki. The unit overview was emailed to the teacher for comment and feedback before being finalised.

Field notes

Field notes were made after each lesson and recorded in a research journal and were included in as part of the transcriptions from the video recording of the relevant lesson.

Video recordings

Initially the video recordings were going to be used to confirm observation notes as the class teacher was to deliver the unit with the researcher being a participating observer. However, as the class teacher withdrew from delivering the lessons and the researcher delivered the unit, this placed a greater reliance on the video recordings. In some cases in the video recording, it was not possible to identify which student had spoken as only one camcorder was used and this remained focused on one position, which limited the view of what was recorded. In some cases the high level of background noise prevented full conversations being captured, this also proved an issue when students moved from the mat (where the camera was focused) back to their tables. As previously mentioned in

Section 3.4.5, participant reactivity towards the camcorder was noticeable in the first lessons of the unit. This was evidenced in the students making faces at the camcorder, positioning themselves near the camcorder and in some instances students walked up to the camcorder and spoke directly to the machine. However, this behaviour did subside as the existence of the camcorder became a normal part of the lessons. All lessons were video recorded and partially transcribed.

Questionnaires

The questionnaires were administered by the researcher. The pre-unit questionnaire was delivered at the end of term one during the introductory session (17 students completed it) and the post-unit questionnaire was delivered at the end of the last lesson (19 students completed it).

Student works

Samples of student works were gained with student permission. These were collected post delivery of the relevant lesson.

School documentation

These were available from the school website and were accessed when required and formed part of the triangulation process to verify data.

3.6 Data analysis

From the various forms of data, a matrix was formed with the components taken from the themes relating to the research. These themes focused on IK and EE. Within each of these themes, data was then categorised into areas of student knowledge, student skills, and student attitudes and values. On completion of all transcripts, data were then viewed as a whole. Data were then categorised into codes in the matrix, which was helped by cutting and pasting information within Microsoft Office Word 2007. Where gaps occurred in the transcripts, the original source of the data was revisited (audio tapes of interviews/video recordings of lessons) to gain clarity.

Interviews

Teacher interviews were transcribed and, once verified and modified by the teacher, were included as part of the data and stored as part of the field note

transcripts and transcripts from the video recording of each lesson. These interviews were coded in accordance with the themes on IK and EE and were then matched within the matrix as described above.

Video Recordings

As there was a heavy reliance on the video recordings, these were firstly viewed giving a general overview of the lesson and then transcribed, then viewed again to pick up gaps found in the transcriptions. Field notes were then added at the end of each lesson; these provided more information from the researcher. From these transcripts data were then selected according to the matrix.

Questionnaires

As the student sample was small and of an age where completing questionnaires was not routine, an uncomplicated questionnaire of six questions was used. Data from these questionnaires were recorded in Excel spreadsheets. Themes were identified in each questionnaire and then put into categories that responded to the research themes. Categories were developed in accordance with the research theme and coding was identified by words or sentences in the answers to open ended questions. Finally, data were tabulated to display answers from pre and post-unit questionnaires and analysed.

3.7 Validity, reliability triangulation

According to Cohen et al. (2007a), there are many types of validity and reliability with both needing to be addressed to ensure the quality and integrity of the research; if research is not valid, it is worthless. Carmines and Zeller (1979) state that both reliability and validation are a measurement of the data gathered. In addition, Carmines and Zeller discuss the difficulty of measurement in social sciences with the notion that measurement relates to counting of objects or events as phenomena and can be seen as abstractions. What they propose is that the empirical component that is measured is the observable response, for example, a student's response to a question, must be able to be linked to the thought process that lead to the response which is unobservable and un-measurable (Carmines & Zeller, 1979). Winter (2000) posits that validity in qualitative data can be attained through honesty, depth, richness and scope of the data achieved (as cited in Cohen

et al., 2007a). Further, a main cause of invalidity is bias and Cohen et al. suggest validity can be greatly improved by minimizing the amount of bias, listed as race, religion, gender, sexual orientation, status, social class and age. The length of engagement with participants enabled the opportunities for continual data analysis ensuring the researcher categories matched participant realities; participant observations were conducted in the natural setting of the classroom reflecting the life experiences of participants (Merriam, 1998). To capture valid or truthful data, the researcher included multiple methods of data collection, which provides data aimed at presenting a holistic interpretation of situations, enabling readers to translate the findings into their own context.

According to Cohen et al. (2007a), reliability in quantitative research refers to the possibility of replication (same methods and sample will produce same results), however qualitative research in stark contrast finds the fact that results cannot be replicated a strength. Carmines and Zeller (1979) define reliability in the field of social science as the ability for any measuring procedure to replicate the same results on repeated trials and include a margin for chance error, with this chance error indicating that results may never be exactly the same but offer some form of consistency. In this research, reliability was achieved by prolonged engagement with participants in the field, observations of participants, interviews with the teacher pre and post-unit, and with the teacher offered the opportunity to validate transcripts.

Cultural validity is defined by Joy (2003 as cited in Cohen et al., 2007a) as the degree to which a study is appropriate to the cultural setting where research is to be carried out and applies at all stages of the research and affects its planning, implementation and dissemination. Likewise, Bishop and Glynn (1999) attest that within kaupapa Maori framework rules for verification is the fact that knowledge is regarded as taonga tuku iho (treasures from tipuna – ancestors) and is protected and maintained by the tapu of Maori cultural practices. These treasures are the collected wisdom of ages and set the guidelines for determining whether a process or product is valid (Bishop & Glynn, 1999). Cohen et al. (2007a) state that validity can be achieved by minimising bias between researcher and participant. This research removes cultural bias between participant and researcher as congruent with the Kaupapa Maori framework, research for Maori by Maori. As

previously mentioned cultural bias has been minimised by the researcher and participants being of the same culture.

Triangulation can refer to the collection of data using different methods, which allows a check to see whether messages given through one method are consistent with those given through other methods. According to Campbell and Fiske (1959) "triangulation is a powerful way of demonstrating concurrent validity, particularly in qualitative research" (as cited in Cohen et al., 2007a, p. 141). The interpretive methodology of this research required methods to capture the complexity of the human behaviour and a range of methods were incorporated. This range is described as a multi-method approach by Cohen et al. and provides the researcher with more confidence than being reliant on a single method approach. The multi method approach provides a holistic analysis of all data gathered and provided the means to triangulate the data. This research included triangulation of interview transcripts, transcripts of the video recordings of lessons, field notes, pre and post-unit questionnaires, and examples of student works.

3.8 Ethics

Researchers face ethical problems because of the tensions that may arise with seeking information and their participants' rights and values becoming threatened in the research process (Cohen et al., 2007a). While ethics covers a vast range of areas, this section will focus on informed consent, anonymity, confidentiality and begins with ethical approval from the academic institution.

Ethical approval

Prior to gathering data, an ethical proposal was submitted to the Centre for Science and Technology Education Research (CSTER) Human Research Ethics Committee and approval was given on 25 March 2009 in response to my proposal: Investigating the relationship between the use of Maori indigenous knowledge and environmental education and Maori student achievement in a mainstream primary school. This document sets out processes to help ensure both participant and researcher are protected throughout the research process.

Informed consent

Informed consent is defined by Diener and Crandall (1978) as "the procedure in which individuals choose whether to participate in an investigation after being informed of facts that would likely to influence their decision" (as cited in Cohen et al., 2007a, p. 52). Diener and Crandall also attest that participants need to be aware of issues such as competence - referring to responsibility and comprehension, voluntary participation including withdrawal options and participants being fully informed.

As this study takes place in a state primary school, research consent was gained from the school Principal and then research consent was gained from the class teacher where the intervention was to be delivered. However, when minors are involved there is a two step process to gaining informed consent. Firstly, consent from the minor's caregiver is required, then consent from the minor (Cohen et al., 2007a). Forms were given to each student in a sealed envelope and signed copies were returned to the class teacher. These were then collected from the class teacher before the delivery of the introductory session by the researcher.

Anonymity

In essence, anonymity means that any information gathered from participants will not reveal who the participant was. This ensures that the participant's privacy is guaranteed. Frankfor-Nachmias and Nachmias (1992) proffer that the use of codes for identifying people achieves participant anonymity and this is the process that was incorporated in analysing of data gathered in this study (as cited in Cohen et al., 2007a).

Confidentiality

Confidentiality is another process that ensures participant privacy. The researcher knows the participant who has provided the information, but does not make this publicly known, protecting the participant's identity. Confidentiality also applies to data gathered and who may have access to this information. The video recordings of the lessons during this study were viewed by only the researcher and codes allocated to students in the transcripts and data analysis.

3.9 Chapter summary

This chapter provided an overview of the research question, and the methodological approach taken by the researcher that influenced the methods for collecting data, research design, sampling strategies. Also included was discussion of the design of the intervention, data gathering and analysis, validity, reliability, triangulation and ethics.

The researcher was influenced by two methodological approaches: a Kaupapa Maori methodology and interpretive methodology. The Kaupapa Maori, though created from Maori resisting mainstream initiatives in the 1970s, gives my culture a voice in the academic world, my research is for Maori by Maori and the learned knowledge to be disseminated to Maori students and staff in my future teaching practise. Yet the interpretivist methodology enables my research to draw equally from the western academic world. Social science is defined as the study of human behaviour, and the interpretive methodology requires methods that enable the complexity of human behaviour to be captured and analysed.

As a case study, individual units (a class) in their natural surroundings become the focus. The small sample size allows for rich, multi-dimensional data to be collected by the incorporation of the following methods: interviews, observations, documents and video recordings.

The research question indicated the school, the sample and the intervention. As the research question related to IK and EE, a strong link in the intervention the two was required and this was harakeke. Harakeke also provided the link with whanau. Te reo Maori also formed an integral part of the intervention, expanding the vocabulary of students, teacher and researcher.

The next chapter presents the findings from the data gathered under the auspices of these two methodologies and methods.

Chapter 4: Findings

4.1 Introduction

This chapter reports the findings of this study. These findings are the results of analysing the following data: transcripts of teacher interviews conducted pre and post-delivery of the unit, transcripts from the video recordings of the class sessions, researcher's field notes post-delivery of each session, student pre and post-unit questionnaires, pre-unit student mind maps, examples of student work and school documentation. As described in Chapter 3, an analytical matrix was developed to analyse the data around themes suggested by the research questions and informed by the literature review. These themes were centred on indigenous knowledge (IK) and environmental education (EE) with these two headings further refined into the following categories, knowledge, skills, and attitudes and values. Data that emerged within these themes are now discussed. Where appropriate, the data source for quotes is indicated in brackets, where L1 means Lesson 1, INT means interview, preQ means pre-Questionnaire, and VCR means video data. Other themes that emerged from the data were whanau involvement, student resources, and unplanned science opportunities, and these are discussed later in the chapter. Before discussing the findings a brief paragraph of the current status of tikanga based on observations and school documents is given.

4.2 Indigenous knowledge context

Underpinning all teaching and learning at this school is a set of beliefs, one of which is the "recognition and provision for instruction in te reo Maori (Maori language) and Maori tikanga (customs) in a mainstream context" as cited in the school's *Cultural Diversity and Maori Dimension and Beliefs* documents (see Appendix D). Both te reo Maori and tikanga are delivered in various forms: kapa haka (Maori dance) is integrated into school life; whanau (family) group meetings are held regularly, Haere Tonu (te reo Maori programme) is delivered by teachers (in accordance with staff competence); and development of powhiri (ceremonial welcome) processes and waiata (songs) in area (inter-school) and school assemblies. Although the school has no male Maori teachers, local kaumatua (Maori male elders) are available when protocol requires a senior male.

The teacher in the study class had established class tikanga from the beginning of the school year which included: karakia (prayer) twice a day; karakia timatanga (prayer to start the day) and karakia whakamutunga (prayer to finish the day); no sitting on tables (this is considered unclean as food is served from the table and your backside is considered unclean); hats off inside (sign of respect); no hats on tables (the hat is tapu (sacred) because it has been on your head - considered the most tapu part of the body (Salmond, 1975); shoes are removed once inside the classroom (firstly this relates to showing respect to the householder and also eliminates dirt being trodden into the room); and addressing the teacher as Whaea (name) (this a sign of respect as children did not address their elders by their first name only). As illustrated, tikanga can be seen as common sense or "cause and effect" (Mead, 2003, p. 17), for example, if you wear shoes (that have dirt attached to the sole of the shoe) indoors, the dirt will then be trodden into the carpet – dirty shoes create a mess that needs to be cleaned up.

During the periods of the study (term two in 2009) the topics for the class were Matariki (the Maori New Year) including harvesting kai (food), and whanau. Matariki is celebrated at the start of the new moon (24 June 2009), and whanau were invited to meet and view the cluster of stars known as Matariki in the pre dawn, at a local venue, and this focus also included Maori myths relating to Matariki in classroom activities. Traditionally, Matariki also marked the end of the harvesting season when food would be plentiful and also celebrated new beginnings. This class was also involved in an outdoor education programme (Mahi Kai Programme) that focused on hunter-gatherer type activities, providing student with hands-on experiences in the outdoors, and also provided male mentoring. Whanau was another topic for the class with the focus on identifying roles and responsibilities of whanau members. The unit also included te reo Maori kupu that were kaupapa (theme) specific.

The class teacher self-identified as Maori and her whakapapa (genealogy) is to the local iwi, and therefore the tikanga of the local iwi was taught in the class. The teacher identified that her teaching of te reo Maori was not structured but "comes out naturally" (TeacherINT2), however she was aware sentence structures in te reo needed to be developed by the students, as required by the Haere Tonu programme delivered at the school. The teacher noted that her knowledge of te

reo Maori and background knowledge of tikanga had developed her ideas and beliefs which she then reflected in the practice of tikanga in the classroom. This enabled her to instruct in the school in kapa haka and tikanga processes such as powhiri. Another advantage for support in tikanga is the teacher's established networks within the local community, which allows access to experts when required.

Focussing on harakeke and whanau formed the starting point for exploring student knowledge of IK. As earlier discussed in Chapter 1, harakeke is indigenous to New Zealand and a common plant within the New Zealand landscape. Items produced from harakeke such as kete (basket), piupiu (skirt) and cloaks are still very much part of everyday life for some New Zealanders. This section presents findings around student learning and use of Maori indigenous knowledge. The findings are discussed in terms of student knowledge, skills, attitudes, and values.

4.3 Student knowledge of IK

The findings related to student knowledge of IK are discussed in terms of tikanga, te reo Maori (language) and whanau.

4.3.1 Tikanga

The pre-unit interview with the class teacher revealed that she felt the majority of the year 5/6 students at the school thought tikanga was confined to "kapa haka" (TeacherINT1). As she said during the pre-unit interview "I found that out when we did rotation week and I did tikanga Maori and I was teaching them the powhiri process to prepare them for interschool and I asked them, I said to them what's tikanga – kapa haka" (TeacherINT1). Students' knowledge relating to tikanga was probed through questions four, five and six of the pre and post-unit questionnaire. The following tables represent findings from these questionnaires.

As previously mentioned these Mahi Kai trips were organised by a group under the umbrella of the local iwi and were based on hunter-gatherer type activities. The experiences relating to the harvesting of kai would include feral pig and deer hunting, eeling, and fishing to name a few of the activities. At the time the students completed the pre-unit questionnaire they had experienced their first Mahi Kai trip, which was fishing at the beach.

Table 1 Number of students reporting their belief that tikanga was practised on the Mahi Kai trips

Response	Yes	Unsure	No	No Response	Students Absent
Pre-unit	13	3	1		4
Post-unit	16	1	1	1	2

The data from this table indicates that the majority of students thought that tikanga was practiced on the Mahi Kai trip. There was a slight increase in the number of students answering in the affirmative to this question in the post-unit questionnaire, despite no further Mahi Kai trips being experienced during the study period due to transport issues with the organising group. One possible reason for the increased positive response might be that the students felt a negative response from them may have had a detrimental impact on any future Mahi Kai trips.

The students' knowledge about tikanga at home was also probed, with responses shown below in Table 2.

Table 2 Number of students reporting their belief that tikanga was being practised at home

Responses	Yes	Unsure	No	Students Absent
Pre-unit	8	3	6	4
Post-unit	11	2	6	2

The data from the pre-unit questionnaire indicated that some students felt that some form of tikanga was practised by their whanau at home. However, over half the students were unsure or felt that no form of tikanga was practised in the home environment. For those students that did indicate tikanga was practised at home, the following table indicates the major themes of tikanga that the students described in the pre and post-unit questionnaire responses.

Table 3 Student reports of the types of tikanga practised at home

Reason	Karakia	Greeting	Respect	Self discipline	Tidiness	Waiata	No detail provided
Pre-unit		2				1	5
Post-unit	3		3	3	2		

The responses from the pre-unit questionnaire were classified under greetings and waiata (songs). The greetings column included the following comments "shaking hands, kiss, hongi" (c3, c7/PreQ) and "sing songs" (c6/PreQ) in the waiata column. The latter comment could be linked to student thinking that tikanga was kapa haka. However, as indicated in the table, the majority of students, although they had answered yes to tikanga being practised at home, offered no written response to the type of tikanga practised. This could indicate student lack of knowledge as to what tikanga is.

The data from the post-unit questionnaire indicated several changes. Karakia had been identified as tikanga during class discussions throughout the delivery of the unit and was subsequently identified as one type of tikanga practised at home. Included in the theme of respect were the following student reasons with the first two relating to respecting property as indicated in the following comments "don't play with thing that not yous [sic]" (c14/PosQ), "don't smash window" (c16/PosQ) and "respect" (c5/PosQ). Types of tikanga classified under self-discipline included not fighting (c1, c11/PosQ) with a third student stating that "play once you have done your job" (c14/PosQ). The last classification in the post-unit questionnaire was tidiness and one of the two students related this to their personal space at home "tidy my room up" (c6/PosQ) with the second student taking a more EE approach in his practise of tikanga as indicated in the following example "put rubbish in the bin" (c20/PosQ). During class discussions in lesson eight students were offered the word rule as a meaning for tikanga. Previously tikanga had been referred to as 'the correct way of acting'. Students were able to make a connection between tikanga and rule which was clarified by the class teacher, with the example of classroom tikanga – not talking on the mat. Students may have then been able to transfer the meaning of tikanga to their home environment. While the meaning of tikanga was clarified for students, this may

have affected student responses to the importance of tikanga in the post-unit questionnaire as detailed in the following table.

Table 4 The importance of tikanga to students

Response	Yes	Unsure	No	No Response	Students Absent
Pre-unit	12	4	1		4
Post-unit	10	6	1	2	2

The data from the pre-unit questionnaire indicates that the majority of students (12/17) felt that tikanga was important, with (4/17) indicating they were unsure of the importance of tikanga and 1/17 indicating that tikanga was not important. For those students that did answer yes to tikanga being important, they were further asked why they thought it was important, and common themes were identified and are shown in the following table.

Table 5 Reasons why students felt tikanga was important

Reason	Behaviour	Identity	Safety	No Response
Pre-unit	1	2	1	8
Post-unit	3		4	3

The pre-unit questionnaire findings indicated that one student felt tikanga was important "because its showing the right way of doing things" (c11/PreQ) and two students indicated that tikanga related to their identity as being Maori, as illustrated in the following examples, "because were singing songs about our ancestory [sic]" (c6/PreQ) and "get to know Maori things" (c5/PreQ). One student indicated that tikanga was important "because it hples [sic] us" which has been coded under the safety heading. Although 12 students indicated that tikanga was important, eight students were unable to give a reason why it was important.

Post-unit data in Table 4 indicates that after the unit more students were unsure about the importance of tikanga which could be interpreted as students thinking shifting because of new information attained from the unit. The numbers indicate

that just over half the students (10/19) still felt tikanga was important. For these students there were differences in the reasons for thinking this was important compared to responses in the pre-unit questionnaire, as indicated in Table 5. The student reasons classified under behaviour were "so we can become good people" (c6/PosQ), "because are rules" (c8/PosQ) and "because there will be a lot of evil people" (c11/PosQ), interpreted as without tikanga people would become evil. The student reasons classified under safety were "it defends you" (c13,c16/PreQ), another student indicated a more personal approach to safety as the following indicates "defenss [sic] you slif [sic] in fihgting [sic]" (c15/PreQ) with another student referring to safety in general "so you keep safe" (c20/PosQ).

In summary, the pre-unit questionnaire of student knowledge of IK indicated that although many of the students felt that tikanga was important they appeared to lack sound knowledge of what tikanga was. While the studentds indicated an awareness of the word tikanga, the cultural significance and application appeared to be unclear. This may have prevented students supplying a reason why tikanga was important or providing an action that indicated tikanga was practised at home. The post unit questionnaire indicated that student thinking had shifted and that slightly more students were able to supply reasons and actions for tikanga, indicating a possible improved understanding of IK amongst the student group.

Student knowledge of IK was also evidenced in the depth of information supplied by students and their familiarity with Maori terms and concepts, as shown through their use of Maori terms during class discussions. This knowledge could be acquired from a range of environments (home, school, community) and from the past or the present. As previously mentioned in Chapter 2, Grenier (1998) states that IK is stored in people's memories and activities providing an opportunity for students to share in their whanau experiences. According to Marsden and Henare (1992), Maori placed great value in myths and legends as this was a format where the essence of the Maori world view could be concealed and passed on to future generations. The true meanings of myths and legends were not known to the general public but those who were privy to such sacred knowledge held the key to unlock the true meanings. Myths were included as part of this intervention, providing students with the idea of what Maori thought was probable, possible and impossible, in contrast, in Western thinking, scientific methodology is applied

to explain and understand the natural world (Marsden & Henare, 1992). While myths and legends provide a Maori world view, "language is the essence of culture" (Ministry of Education, 2008b, p. 24) and te reo Maori is now discussed.

4.3.2. Te reo Maori (Maori Language)

Te reo Maori was integral to this unit as it provided an instant connection between the researcher (who is familiar with many te reo Maori words) and the students (who have been taught many te reo Maori words), and provided oral and auditory schema for the students. In giving evidence to the Waitangi Tribunal Sir James Henare was adamant that language was essential to culture and a key marker of cultural identity, and he stated that "The language is the core of our Maori culture and mana" (Durie, 1998, p. 59).

For Maori, te reo Maori is one way to identify oneself as Maori and offers membership to the group. The level of te reo Maori did not appear to be relevant in determining membership, as simple kia ora (hello) appeared to be an indicator that you belong to this class group. Neither the class teacher nor the researcher were fluent in te reo Maori, however te reo Maori included in the unit was pronounced in the same way and used in the same context. The unit was based on a Maori kaupapa (knowledge area) harakeke with te reo Maori integrated throughout the unit and involved the students learning new kupu (words) that were content specific.

The learning of new te reo words for the students appeared to be facilitated by continuous use and exposure. The evidence suggests that although most students had an awareness of the word harakeke, during the early lessons the students preferred the word flax, and they appeared to be more familiar with this word. For example, the researcher brought a harakeke plant in a bucket as a living example into the classroom for the students. When holding the harakeke plant, the researcher then asked the students "What is this?" The replies from students were "Flax, leaf, harakeke'. Throughout the unit the researcher constantly employed the word harakeke ensuring the students had regular exposure to the word. As the unit progressed, the word harakeke was used more often than the word flax, as the video transcripts of the final lesson reveal that the word harakeke was used six times, flax was not spoken at all, but twice referred to as 'it'

compared with the first lesson where harakeke was spoken twice, flax was spoken twice but referred to as 'it' 20 times.

In another example, in early sessions of the unit a hesitation over unfamiliar words by students was noticed by the researcher. During lesson one, student pairs were asked to complete a brainstorm on harakeke and then present this to the class, with each pair giving two examples. Having already given the required two examples, one student insisted that he name the parts of the harakeke that he had drawn. During this presentation, this particular student's hesitation before saying Maori words was noted and in some cases he would say English equivalent words but also incorporate Maori words he was more comfortable with. For example when describing what could be made from harakeke "…harakeke, flax you can make a basket" and "This is the baby and this is the mum and dad and this is the nanny and koro" (c4, L1/VR). During lesson one, the use of te reo Maori words required prompting but by the end of the unit, this student was more fluent in te reo Maori (noticeable in an increased use of Maori words) with no noticeable hesitation. In the last lesson, the word rourou (food basket) was re-introduced during a comparison exercise. The boys unfamiliar with this word employed the strategy of pointing to the item as opposed to saying the word during class discussions.

The inclusion of te reo Maori was an attempt to indicate to the students that their language and culture was valued, as described in *Ka Hikitia,* "language is the essence of culture ...but for a language to live, it must be spoken" (Ministry of Education, 2008b, p. 24). The students had previously been taught a range of te reo Maori words, in classes prior to the start of this unit, which the researcher was also familiar with. These established words were incorporated during the unit, in an attempt to create another form of language continuity between the researcher and the students. Some of the established te reo Maori words included names to address Maori adult females and males, and simple instructions such as sit, stand, and karakia. Students addressed both their teacher and the researcher as Whaea (Mrs) with or without a first name or surname attached. The preference for first name or surname was dependent on how the adult introduced themselves to the students and this was reinforced when an error was made. On arrival to class the

students often greeted the researcher with ‘Kia ora Whaea’ and the farewell at the finish of the school day with ‘Ka kite Whaea’.

As previously mentioned, the focus of the unit was harakeke and that created the opportunity to expand the te reo Maori vocabulary of the students with words specific to that kaupapa. An example is the word rito, which means central shoot or the new growth of the harakeke bush, and is also a metaphor for baby. Rito is not a common word spoken every day and pertains specifically to the harakeke. New words introduced in the first lesson also included awhi rito (parent leaves within the harakeke fan), pu harakeke (harakeke bush) and rau (harakeke leaf). The students were continuously exposed to these words throughout the unit through a variety of learning modes, visual, auditory and kinesthetic to name a few. A laminated bilingual chart of the words associated with whanau (family) was displayed for the students on the white board and they were given time to look at and read the words aloud. For example, Student A read out “Whaea, mother”, Student B “Aunty, Whaea”, and Student C “Tama” (boy and also a first name) (L1/VR). Students were provided with a kinesthetic mode of learning by creating a human sculpture of a pu (bush) harakeke in groups. Students were able to identify their whanau role within the sculpture by using the correct terminology and ensuring their physical placement was accurate botanically within the structure. Standing in the correct position student A made the following comments to student B “I’m the grandpa. You’re ko mate (dead)”. Student B who was lying on the floor but still part of the pu harakeke responded by saying “I was a koro (grandfather) and then I died” (L2/VR). This indicated student knowledge of the life cycle of the harakeke and the similarity to that of human beings.

Success in employing kinesthetic activities was not always achieved. A second example was when the students were asked to create a human sculpture of a hinaki (fish trap) in lesson four. Creating a complex three dimensional shape proved difficult for the students with two of the three groups off task, including two of the groups becoming fragmented with students talking in pairs. However, it did provide one group with an opportunity to work collaboratively to try and solve the problem, but with the majority of students off task, the activity was stopped. This activity was not repeated whereas the pu harakeke formation was repeated in most lessons.

Finally, the continual use of te reo Maori in the unit by the researcher ensured the students were exposed to correct pronunciation of te reo Maori and also that te reo Maori was a normal part of classroom life. This constant exposure also led to an observed increase in student ease and confidence in speaking te reo Maori, including both new and familiar words.

4.3.3. Whanau - a lived experience

According to Bishop and Glynn (1999, p.82), the "whanau is a primary concept (a cultural preference) that contains both values (cultural aspirations) and social process (cultural practices) and, as indicated by Metge (1990) and Mead (2003), forms the foundation of the whole Maori social system. Metge, Mead and Bishop all note that the word whanau has many and varied meanings that are dependent on the context, with the underlying factor that there is some form of relationship between the members. Within this class, the students identified as a class whanau, offering individuals a sense of belonging, value and security. Examples observed during this study included valuing the korero offered by fellow classmates during discussion time, whole class participation in mirimiri (massage) which is discussed later in this chapter, and use of whanau terminology.

4.3.3.1 Whanau terminology

In te reo Maori (as with other languages) one word may have several meanings and, although there are generic terms for whanau members, individual whanau may have slight variations in how and who is assigned a particular term within the whanau. The term Whaea can be used to address a female of senior rank or authority, an adult female, a female of the same age, or an aunty. The students in the class addressed their teacher as Whaea (first name) and the researcher as Whaea (surname). Difference in use of first or last name is the preference of the individual. The students appeared to be aware of the range of meanings of Whaea as indicated in their responses of "mother", "aunty", "Miss" and "Mrs" (L1/VCR) to the question What is another name for Whaea? Other whanau terminology included matua identifying an adult male and koro identifying an elderly male or a grand father figure. Another whanau phrase that was incorporated when addressing the class was "Tama ma", tama meaning boy and ma referring to the group.

4.3.3.2 Whanau structure

Existing student knowledge of the whanau structure was evident in student awareness of the names associated with whanau and the place and role of each member. Students were then able to use their existing knowledge of whanau and make connections with the whanau concept within the harakeke bush. Metge (1995)makes the parallel between the life cycles of people and plants as growth, dying and regeneration, and both cycles flourishing with loving care (1995, p. 16).

The structure of the harakeke fan provided the students with a visual interpretation of the whanau system for people. Starting at the rito (central leaf) which indicated new growth (size), then to the awhi rito, the rau (leaf) on either side of the rito (likened to the parents providing care and protection to the rito), then the tipuna (nanny and koro -grandparents) rau. The students were able to compare the harakeke and whanau and make connections between the two systems. For example Student A said, "It's (the harakeke) just like us, cause one of them used to be the baby and then they got old".

The word rito meaning baby was new to the students, however, this was easily identified by the students because of the position (centre) and size (smallest leaf) within the harakeke fan. The students were then able to follow the sequence with naming the awhi rito (again new words) as parents, for example, as Student A exclaimed "Adults, mummy and daddy" (L1/VR) and then the tipuna "Grandparents" (Student A, L1/VR).

4.3.4 Summary of student knowledge of IK

In summarising student knowledge of IK, it appeared that this was dependent on a variety of factors. Although te reo Maori was identified as a main theme within the class, the degree of inclusion of te reo Maori in the unit was dependent on the researcher's input. Certain te reo Maori kupu were necessitated by the kaupapa and for many of the students these were new words. Students gained familiarity with these words by repeated exposure to them and through the researcher incorporating a variety of teaching modes in which the words were used.

The whanau of the students was another factor influencing student knowledge of IK, as for many students this is where their prior knowledge of te reo Maori and

IK was gained. For those with limited knowledge, they were subsumed in the class whanau, which meant everyone owned the knowledge offered by those that had prior knowledge and no-one was excluded from having access or ownership of this knowledge, as previously mentioned Durie (1998) states that knowledge belongs to the group. This appeared to enable students to engage with new knowledge at their own pace.

4.4. Student skills in IK

As previously mentioned, the unit was designed to work in with the Mahi Kai programme which included the harvesting of eels and watercress, and these formed the focus of documenting student skills in IK. Although these activities were not physically performed as part of the unit the researcher used class discussions to collect data about student skills. The inclusion of the hinaki (fish trap) as part of the unit provided an opportunity for students to share their knowledge and skills about eeling, that provided a link between new and existing knowledge. Eeling was also included from a student interest perspective as the hunter-gatherer and also making connections with lived experiences of the students and their whanau.

4.4.1 Harvesting of kai

Students were able to share their experiences on the harvesting of kai. By students being able to share these experiences indicated that they had skills and knowledge associated with the task of harvesting kai. These skills and knowledge had been learnt from those more knowledgeable, which were in all cases whanau (whanau in this sense including extended family) as indicated in the following examples. Student A "... I went with my aunty and uncle and they showed me how to kill the eels" (L4/VCR) and Student B "...I was on the bank with my cousins watching" (L4/VCR). Skills were acquired by actually performing the task with an expert whanau member on repeated occasions.

The skills required included being able to identify where the most ideal place the resource would be found, or have knowledge of where to go to look as indicated in the following example "There's watercress down the stream at my brothers farm. I went to my brother's farm on the weekend and we went down to the stream and got some watercress…" (c2,L6/VCR). In the case of eeling,

knowledge of the equipment required for the harvesting process included how to work the equipment, and where to place the equipment for optimum effectiveness.

Student c15 was able to correctly identify the eel trap as a hinaki and further went on to describe the eeling process (L4/VCR). While c15 shared his experiences all students sat quietly listening, some students sat looking at the student during his korero (talk), while others sat quietly not requiring eye contact. Interestingly, this student (c15) had previously sat at the back of the class with minimal participation. This was one lesson where he sought to position himself at the front of the class and engage with the class. The connection between the context (eeling) and his personal experience enabled him to speak knowledgeably and confidently to the class.

4.4.2. Karakia

Karakia (prayer) provided a spiritual communal practise that brought the class together at the start of the day and provided closure of the school day. The students identified karakia as one form of classroom tikanga, and as the following example illustrates students identified karakia as a prayer making a request, "It (karakia) is a prayer" (Student A, L8/VR) and "You pray that you will have a good day" (Student B,L8/VR). According to Shirres (1986 as cited in Mead, 2003) karakia is a Maori ritual and participation identifies oneself with one's people, ancestors and spiritual powers and covers every aspect of life, including the harvesting of resources. For the class whanau, karakia provided the opportunity for the individual to think of them self as part of the class group.

In lesson six the purpose of karakia relating to harvesting harakeke was discussed with students. The initial karakia was to thank the harakeke for growing and being available to harvest. Then on completion of the task a karakia was said to thank the harakeke for the harvest. When the researcher was demonstrating how to harvest harakeke one student called out "You didn't say a karakia" (c6,L6/VR). The researcher then pointed out that karakia did not need to be said for everyone to hear but had already been done silently. This highlighted the student's thinking that the correct process for karakia was that it needed to be verbalised and heard, as in the practice of the class karakia.

4.4.3 Summary of student skills in IK

In this section student skills in IK explored through the unit were centred on harvesting of kai and karakia. Harvesting of kai seemed to be dependent on local area knowledge and in the area of eeling (a predominantly male-dominated domain), this required a knowledgeable male within the whanau to instruct. As indicated above, the harvesting of both eels and watercress were done in rural settings. Urbanisation could be seen as affecting the knowledge base of some Maori (not of the local iwi) in regard to where to find these resources and in some cases there could be issues relating to access. Here, whanau was important in the transference of skills and knowledge and in some cases whakapapa was required enabling access to local land. Finally karakia is seen as a ritual that is Maori culture. Although this class performed karakia twice daily as part of school life evidence suggested that student awareness between culture and karakia was limited. However, by participating in the karakia students bonded as a class whanau. Karakia was a ritual that they performed together as a group and offered the sense of whanaungatanga.

4.5. Student attitudes and Values within IK

Attitudes and values are learnt over a period of time within the whanau environment, with the attitudes and values passed down from former generations and may differ between whanau, as no two whanau have the same lived experiences, with even the age of the individual affecting the attitudes and values at the time. Attitudes and values, as identified by Durie (1995), are not static but are affected by a range of factors such as demographics, technological advancements and interaction with other cultures and nations. In this section attitudes and values are discussed under the following headings; whanaungatanga which relates to relationships, and manaakitanga, the actual action of caring, showing respect and support.

Whanaungatanga in essence reflects the Maori concept of kinship by showing aroha (love) for fellow whanau members. The whanaungatanga bond requires each individual to support and promote the whanau (group), not the individual, and this is somewhat in contrast to Western ideology where the individual is more often promoted. Although there were Maori and non Maori students in the class, there was no indication of racial discrimination. All students were accepted as members of the class whanau. However, this aspect of whanaungatanga was not

only applicable to this class but was evident throughout the school as the following example from the teacher interview reveals. "I think it [respect for each other] is something our whole values system is based around; respect and you know I think that has a lot to do with how the children are towards each other. .... some of them can be nasty and that's through play and whatever but overall they take an interest in other children, other cultures..."(Teacher INT2).

One activity that enabled students to experience whanaungatanga was taiaha training. As previously mentioned, this training was initiated to demonstrate the versatility of the harakeke, provide practise of te reo Maori, provide an opportunity for participation in a traditional cultural activity which would be of interest to the boys, and expose the students to well known local male role models. On one occasion when the researcher and class teacher were in charge of taiaha practise, the student who tended to take a leadership role in the group was absent. This lead position involved calling out the instructions for the moves using the taiaha in te reo Maori. In response, the other members of the group would perform the actions in unison and in some cases give a verbal response of 'hi'. Members of the class were given the opportunity to try out in this position and lead the class. Several of the students including non-Maori boys tried and were encouraged by their classmates. This encouragement was offered by the students prompting the leader when words were forgotten. This support was offered to all students who attempted the position. However it was evident that the boys wanted to have the best person for the position to lead the group. The leader position was a major role that the group was dependent on and would be reflected in the group's performance.

Manaakitanga can be described as the act of caring, showing respect, and hospitality. For the teacher this entails providing a safe environment where her students feel nurtured, supported and safe. This was reflected in the teacher post-unit interview where the discussion was about whanau, and the home environment not providing support for the students. "... when they do come to school, school for them is a safe environment and teachers do their utmost to get the support for that kid. Whether it's in reading, the Hei Awhiawhi Tamariki ki te Panui Pukapuka (HPP) programme, referrals to the Resource Teachers: Learning and

Behaviour (RTLB) … and they know that they've got support you know from their class mates and their teachers..." (Teacher INT2).

The students showed manaakitanga in a variety of forms, one in particular was the act of mirimiri. At the start of the afternoon sessions music from the adjoining classroom would filter through concertina doors that separated the classrooms. When the boys came to sit on the mat they would automatically sit in rows (usually 2), one behind the other and perform mirimiri (massage) on the student in front of them. This required no instruction from the teacher and was done almost in silence. To ensure all boys received mirimiri they merely turned around and those that had done the mirimiri were now able to enjoy the mirimiri in return. Even in the act of turning there was very little talking, indicating it was an activity that all enjoyed. Mirimiri had the effect of relaxing the students, and providing a change in their state of mind similar to that of the visualisation exercise in lesson five.

Another example of student inclusion of manaakitanga was evident during the introductory session, when students made a caterpillar from harakeke. This activity revealed that several of the students were adept at manipulating the harakeke and were able to help the not so proficient students complete the task, showing manaakitanga toward their fellow classmates.

4.6. Summary of indigenous knowledge

The findings for this section indicated that there had been a shift in student thinking towards tikanga. In assessing student knowledge of IK the class teacher had established in term one that the year 5/6 students identified kapa haka as the meaning for tikanga. While the pre and post-unit questionnaires indicated a shift in student thinking about tikanga, initial data from the pre-unit questionnaire revealed that although student's responded that tikanga was important, 8/12 students made no response to why tikanga was important. Responses in the post-unit questionnaire indicated that only 3/10 students related the importance of tikanga to behaviour, 4/10 related the importance to safety, with 3/10 not responding.

The shift in student thinking may have been directly associated with the inclusion of te reo Maori as language is seen as the essence of culture. Evidence of student

use of te reo Maori was indicated by increased student use in class discussions, and the hesitations that were noticeable in early lessons of the unit, were no longer evident during the final lesson.

The cultural concept of whanau was also integral to this unit. The inclusion of whanau terminology was evidenced as being in use by most students and was identified in student application of the terminology and the frequency of use in classroom discussions. Students were able to make links between their own whanau and that of the whanau structure evident in the harakeke plant. Links were also made with the life cycle of the harakeke and the life cycle of the whanau. While the class whanau providing the individual a sense of belonging, safety and strength.

Student skills in IK related to harvesting of kai and karakia. Several students were able to share their experiences of harvesting eels and watercress. During these discussions student engagement was high, indicating a high interest topic - hunting/gathering food and that the korero (talk) was coming from a peer.

Although this class performed karakia twice daily, evidence suggested that student awareness between culture and karakia was limited. However, karakia provided student participation in whanaungatanga. Whanaungatanga focused on the group, as in the importance of selecting a leader for taiaha training, the group's performance was dependent on this person. Manaakitanga - the action of caring and respect was also noted in the manner in which students addressed adults and importantly towards each other in the act of mirimiri.

The next section discusses the findings in relation to EE in the unit.

4.7 Environmental Education in the unit

This section begins with a brief description of the environmental education (EE) context for this study. This includes the school's current participation in EE and a brief introduction to the Maori perspective of harakeke and EE. This is followed by teacher and student knowledge of EE, student skills in EE, and student attitudes and values towards EE.

4.7.1 Environmental education context

The school is a medium-sized co-educational suburban primary school that takes a proactive approach to promoting EE with the main focus on waste minimisation. For the past several years the school has recycled both food scraps and paper. Food scrap recycling bins are stationed in both the senior and junior school lunch areas. The onus on bin usage is placed on students; the bins are collected by a local pig farmer. Each class operates a two rubbish bin system; one for paper recycling and one for 'other' rubbish. The school also promotes education for the environment by raising parent awareness about ways they can minimise their impact on the environment. This is done via the school newsletters. This includes articles offering sustainable options in lunch wrappings, and prompts parents to think about product packaging in terms of recycling. The school is not a member of the Enviroschools Programme. This unit had a focus on harakeke and the main aim was to provide students with a different perspective on EE that included a Maori worldview.

From a Maori perspective, harakeke and all other plant life whakapapa (originate) from the great atua (God) Tane-mahuta who was one of the sons of Ranginui (Sky Father) and Papatuanuku (Earth Mother). Tane also breathed life into the first woman and from this union produced the Maori race, making the lines of plant and human entwined as we share a common tipuna (ancestor). To bring this to an understandable level for the year 5/6 students the relationship between the harakeke and humans was made through the concept of whanau, as discussed in Section 4.3.3.2. This provided an opportunity for students to explore the relationship between themselves and the plant by finding similarities. Although the school did have harakeke growing within the grounds, the plants were not of the best quality, due to poor soil conditions and an unsuitable growing location. To overcome this problem, a harakeke plant that had been growing in a bucket of water was brought into the classroom. The water was not required for transportation of the plant or for the duration of the lesson, making the plant portable, and the students had visible access to the whole plant. Within these contexts, findings related to knowledge, skills and attitudes and values in environmental education are now discussed.

Teacher knowledge of EE was explored during an interview prior to the unit, as this knowledge had the potential to influence student thinking on EE during class time other than when the unit was being delivered.

As the school operated recycling systems, there was some evidence that the teacher's focus in EE may have been constrained to waste management. This was evident in the pre-unit interview with the teacher's only reference to EE being in terms of the school's current systems. During the pre-unit interview, the teacher's response was to answer in the affirmative when asked if she incorporated any EE in her teaching. However, when she elaborated on this she referred to EE as activities such as picking up rubbish and recycling paper and explained that "…in the past I've done a unit on recycling and that was years ago but I haven't done anything like that since then" (Teacher/INT1). This comment also indicates that the teacher thought of EE as a separate subject and not something that could be integrated in other curriculum areas.

A Maori perspective on the environment suggests that the bond between Maori and the whenua (land) stems from the union of Ranginui (Sky Father) and Papatuanuku (Earth Mother). This link is further acknowledged by Maori referring to themselves as tangata whenua, the people of the land. Data from the interviews with the teacher implied that she had a Maori perspective in relation to EE. During the pre-unit interview the teacher made several references to the whenua and natural resources as the following response to a question about what EE is indicates: "…it's about the land, the waters" (Teacher/INT1). Another Maori perspective evident in the interview was her reference to kaitiakitanga, which reflects the guardianship of the resource including the "responsibility and obligation to sustainably use and manage the resource" (Ministry of Education, 1999a, p. 13). This was evident in the teacher's elaboration of her thoughts on what EE was "[It's] how to look after our land and using the land" (Teacher/INT1). The notion of kaitiakitanga was also interpreted by the teacher as a value that would be beneficial to the students by making them aware of how their everyday actions affect the environment as she described "…an awareness of our actions of, you know, how we treat the land" (Teacher/INT1).

Although the teacher professed little knowledge of harakeke, she was keen to up-skill, as she said I'm "looking forward to learning more" (Teacher/INT1). During the pre-unit introduction lesson, the researcher assumed this statement related to the art of raranga (weaving), however the teacher possessed basic skills in raranga and was able to assist students when making caterpillars from harakeke. With the focus of the unit being harakeke, the teacher felt this would have a positive effect on student participation because of the Maori connection as she said "...anything Maori, the boys are engaged" (Teacher/INT2).

From this data several observations can be made. The first is in relation to the effect of the school's EE practice on the teacher. The current school practice of waste minimisation had become well ingrained in school life to the extent that it had literally become invisible to the teacher. EE was defined by the school practise and because there did not appear to be any support to develop it further, EE for the teacher seemed to remain limited to waste minimisation.

Secondly, the teacher was initially supportive of being involved in teaching the unit as there was a Maori focus with the kaupapa being harakeke and the unit introduced an indigenous alternative to teaching EE. However, this support diminished once the unit began and led to the teacher declining to co-deliver the unit. Her own view of her limited knowledge of harakeke and EE were seen to cause teacher apprehension, which seemed to contribute to her declining to co-deliver the unit. The unit design had taken into consideration that the teacher's knowledge base was not required to be in-depth and that the researcher as co-deliverer would be able to support and add to the teacher's existing knowledge.

Thirdly, although the teacher pre-unit interview indicated that she was aware of Maori worldviews and seemingly comfortable with them, this did not appear tosignificantly help the teacher make a connection between harakeke, EE and the Maori worldview. This was revealed in the post-unit interview in the following comment to the inquiry about if there was anything in the unit she had learnt about how EE fits with a Maori worldview, her reply was "No it (my view) hasn't changed, there are bits that have added …." (Teacher/INT2).

4.8 Student knowledge about the environment

Student knowledge of the EE was probed in the pre-unit questionnaire. In general, the findings of this questionnaire indicate that student knowledge of EE was influenced by the school's main focus of waste minimisation, however the data also included a range of knowledge areas from personal actions to thinking globally.

As previously mentioned in Chapter 3, the pre-unit questionnaire consisted of 6 questions with questions 1-3 relating to EE and questions 4-6 relating to tikanga. The class numbered 21 students with only 17 completing the pre-unit questionnaire and 19 students completing the post-unit questionnaire due to student absences. The following tables represent some of the findings from these questionnaires.

In Question 1, the students were asked if they thought that the environment needed looking after. The findings are shown in Table 6 below.

Table 6 Student agreement that the environment needs looking after

Question 1	Yes	Unsure	No	Students Absent
Pre-unit	13	4	0	4
Post-unit	13	6	0	2

The data from this table indicates that more than half of the students had some awareness of environmental issues and thought that the environment required some form of attention. The data also indicated that none of the students thought the environment did not require attention or some form of action on their part.

Table 6 summarises the responses to question 1a of the pre-unit questionnaire. If students had answered yes to the first part of question 1 they were asked to give one reason why they thought the environment required looking after. Thirteen students had indicated yes to question 1, but a total of 15 students responded to question 1a. (The post-unit data is not shown as only 6 students responded due to the limited time allocated for completing the questionnaire.)

Table 7 Reasons why the students felt the environment needed looking after

Reason	Pollution	Unhealthy Trees	To be a tidy kiwi	Global issues
Pre-unit	3	4	5	3

The analysed data revealed four themes: pollution, unhealthy trees, to be a tidy kiwi and global effects. These themes reflect a broad range of student knowledge of EE and reflect the aims 1,2,3 and 5 of EE as outlined in the 1999 *Guidelines for Environmental Education in New Zealand Schools.* Student reasons that reflected aims 1,2 and 5 are discussed below, while those concerning aim 3 regarding attitudes and values are discussed in Section 4.10 and aim 4 regarding skills in Section 4.9.

The first aim of EE relates to awareness and sensitivity to the environment and related issues (Ministry of Education, 1999a, p. 9). The reasons given by the students relating to this aim indicated varying levels of awareness of environmental issues as Table 7 indicates, from the physical recognition of pollution, to the process of trees providing oxygen to breathe, to major global issues such as global warming.

The second aim of EE relates to knowledge and understanding of the environment and the impact of people on it (Ministry of Education, 1999a, p. 9) and responses to question one could be indicative of student thinking. Students C21 and C5 refer to the environment being 'polluted' (PreQ), a past tense action indicating that it is the result of someone or thing performing a detrimental action causing the pollution.

Student reasons also indicated a sense of responsibility through participation and action as individuals or members of groups (Ministry of Education, 1999a) as identified in the reason "to be a tidy kiwi" (c18,c3,c10,c12,c7/PreQ). This sense of responsibility was also reflected in student responses to question 2 "Who do you think should look after the environment?" with all students indicating that *everyone* was responsible for the environment. Responses to question 3 related to actions students took to help the environment indicating the main action was to

pick up rubbish, which included a range of areas: home, school, lakes and beaches. These responses indicate student thinking being at several different levels: first at an individual level where their personal actions could make a difference, second at a national level instilling that sense of national pride by being a "tidy kiwi" that students can help keep the country clean, and third that the environment was not one particular area, but encompassed local and national areas.

As previously mentioned in Chapter 3, on the last day of term one, the pre-unit questionnaire was administered and students were given a brief introduction to the unit. Several artefacts made from harakeke were displayed and students were given the opportunity to examine these. A class discussion enabled students to share their knowledge about the artefacts and harakeke. On completion of the questionnaire students were given an A4 sheet of paper with a harakeke plant in the centre with the words Harakeke (Flax) located beneath the plant, and asked to complete a mind map (refer
Figure 2)

Students were given the option of using words, pictures or a combination, which allowed students to convey a range of responses.

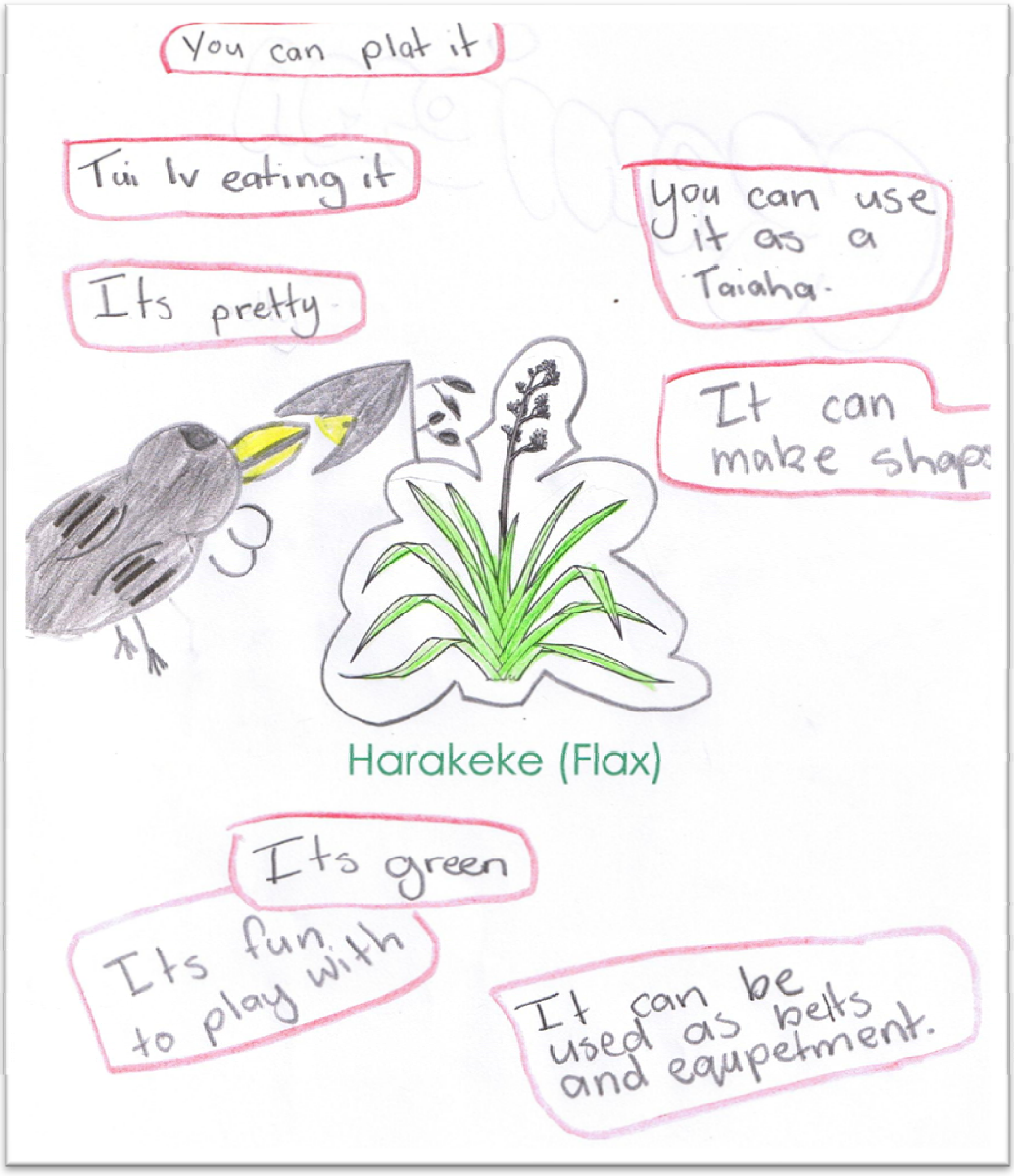

Figure 2 Mind map by student c6

Students were also encouraged to discuss and share ideas with each other during this process. Some of the notes on the mind maps presented the following student ideas. "It can be used as belts and equpetment [sic]" (c6/MPr) and "you could make all most [sic] anything out of flax" (c4/MPr). Some of the student drawings from the mind maps included, kete (woven bag), whariki (mats), and flowers. Several students drew birds next to the harakeke flowers indicating the birds feeding on the nectar, illustrating student awareness that the plant supported bird life. Yet others drew birds and other animals away from the bush; this may have been inspired by the various projects made from harakeke in the book *Fun with Flax* by Mick Pendergrast (Pendergrast, 1998). This book was made available to

the students and they were encouraged to use the book as a resource during the lesson. Some students had previously made the harakeke fish featured in the book and were keen to make other animals illustrated in the book. To provide students with hands-on activities throughout the unit, making of several toys from the book was incorporated.

One such toy was the ngutu parera (duck's bill). This toy was selected for several reasons. Firstly, it was simple and achievable for the students to make. Secondly, it illustrated to the students that all parts of the rau could be used in some form. During lesson three the butt end of the rau was cut off and students sorted the top of the rau based on the different margin and keel colours. On completion of this lesson the researcher then took the rau home and wove a selection of square balls (featured in *Fun with Flax)*. These were then returned to the class and given to the boys by the teacher as a reward for good work done during the week. The activity for this lesson was making the butt end of the rau into a ngutu parera. The third reason for selecting this toy was the noise factor and it was hoped that this would appeal to the students. When operated correctly the toy could be very noisy. A hinge is formed and to create the noise the toy is moved vigorously up and down. After demonstrating how to operate the toy, students looked at the toy and were unsure on how to work it. One student c3 approached the researcher and said "It won't work". However, after applying vigour to his movements he was very pleased as was seen by his smile and laughter (L3/VCR). This lesson ended with the students sat on the mat with an individual using his ngutu parera to clap out a song with the rest of the class trying to guess what song it was, with the final song (a school favourite) being clapped out and sung by students and the class teacher (L3/VCR). This collaborative activity created a feeling of whanaungatanga (sense of family).

The students had also drawn taiaha (a hand weapon usually made from hard wood); this weapon is part of the formal powhiri (welcome ceremony) and is used when performing the wero (challenge). Although the students were familiar with the taiaha they were not aware that practice taiaha were made from the korari (flower stalk of the harakeke). The korari provided the taiaha student with a light stick that was easy to handle, but still required care as it was more fragile than wood and could easily be broken. Once the taiaha student had become proficient

they would graduate to a wooden taiaha. The arrival of the korari in lesson two was met with great enthusiasm from the boys as each korari was cut to the correct height of the individual (from the ground to under the student's chin). The korari was then transformed from a simple korari (a resource from the environment) to a taiaha, a weapon of cultural significance (L2/VCR). In conjunction with the unit, students also received taiaha training with the intention that the versatility of harakeke was highlighted and the links to Maori culture would appeal to the students.

During lesson one the retention of student knowledge was checked by asking the students to remember what they had learnt in the introductory lesson last term, to which several students replied "We made caterpillars' (L1/VCR). The caterpillar dominated the conversation for the first part of the lesson and led to an experiment being conducted as mentioned in section 4.12.3. The lesson focus then became the identification of harakeke with students being asked if they knew of the plant growing within the school grounds. One student (c5) claimed that there were "heaps of them" growing in the junior school area, which was actually another genus of plant, *Astelia*, similar in appearance to harakeke and was known as "bush-flax" (Atkinson, 1922, p. 12). A second student (c11) thought there were harakeke plants "in the car park under the lights" (L1/VCR). But this student had identified Mikoikoi (New Zealand Iris) that has a similar appearance to harakeke but on a miniature scale with a height of just 38cm. One student was able to correctly identify harakeke growing on a street adjacent to the school (c6, L1/VCR).

Using the harakeke in the bucket, the fan structure of the harakeke was examined and students were then asked to name the different leaves of the harakeke starting with the rito, the central rau. The students initially responded with "flax, leaf, harakeke" (L1/VCR), however once the rito was identified as the baby within the fan, the students correctly named the awhi rito as the parents and the tipuna as the grandparents. The students were then asked to form three groups and recreate a pu harakeke. During the first attempt the noise level increased and there was a great deal of loud discussion on who will be what has identified in the following example "Who is going to be the nanny and koro" (L1/VCR). The boys were asked to stop and sit and the second attempt was much quieter with students

whispering. One group had the awhi rito with raised hands protecting the rito, showing that the boys have an understanding of the role in the plant of the awhi rito. By the end of the first lesson students were able to correctly identify and name the different leaves of the harakeke and create a human sculpture in groups of five or six with correctly positioned leaves, for example the rito in the centre with the awhi rito on either side.

During lesson eight of the unit an exploration of student knowledge on the effects of plastic and natural items on the environment was made. This involved comparing the affects of a rourou (food basket made from harakeke) and a plastic plate. The first responses related to the manufacture of the items. One student referred to the plastic plate being made in a factory from plastic, then added that "sometimes it melted and the steam comes out causing global warming and that one (pointing to the rourou) it doesn't need anything, it just grows out of the ground and you just cut it" (c6, L8/VCR). Another student supported this by saying "You can just make it" (c8, L8/VCR).

The discussion continued on to disposal of both items. The responses to disposing of the plastic plate included "chuck it out, chuck it away, recycle it' and "Take it back to the machine and make a new one" (c14, L8/VCR). The data indicated that the perception of recycling was evident but knowledge of the full process remained uncertain. The disposal of the rourou prompted the following responses "chuck it, throw it in the compost bin" and "That hurts the earth (plate) and that doesn't (rourou)" (c9, L8/VCR). These responses reflected student knowledge of nature's process of recycling organic materials.

4.8.1 Summary of student knowledge about the environment

From this data several observations can be made. Firstly, the pre-unit questionnaire revealed that student knowledge was not being limited by the school's EE practice. Previous experiences 'in' the environment had enabled students to establish a broad range of knowledge about the environment. However, data from the beginning of the unit indicated that students had minimal prior knowledge or experiences of harakeke from an EE perspective. This was confirmed in the initial lesson of the unit, with some students having

misconceptions in identifying harakeke. This was rectified by employing the use of the harakeke in the bucket.

Student awareness of the cultural versatility of harakeke increased from seeing harakeke as being used to make kete and clothing, to the other uses as in the korari as practise taiaha, the netting on the hinaki originally being made from harakeke, before being replaced by new technology, and that harakeke could also produce toys. Students were also able to see the benefits when disposing of harakeke, as compared to disposing of plastics, for the environment. The harvesting demonstration also raised student awareness of sustainable harvesting. Students were able to see the life cycle process, and how by cutting the rito this would kill that fan, and so were able to see the advantages of leaving the matua parents to care for the rito and harvest the tipuna rau, allowing the rito and matua to grown and be available for future harvesting.

Secondly, harakeke provided an opportunity for students to gain cultural awareness and to establish links between harakeke and EE. A connection was made between student prior knowledge (whanau terminology) and the harakeke fan formation. Cultural awareness was further acknowledged with the use of the korari as a practice taiaha with the added advantage of capturing student interest and providing a memorable learning experience. Explicit links between EE and harakeke were made with the comparison of the effects of a plastic plate and a rourou.

Thirdly, although student comments revealed some knowledge about education *for* the environment this appeared to be the weakest of the three dimensions: education in, about and for the environment (Ministry of Education, 1999a). The data revealed several misconceptions by some students but because of time restraints not all of these were explored further or corrected.

4.9 Student skills in EE

This section discusses student skills in EE and focuses on rahui, a traditional Maori concept of conservation that is still a current practise by Maori, and sustainable harvesting of eels, watercress and harakeke.

Although te reo Maori formed an integral part of the intervention, there were kupu (words) the students found difficult and rahui was one such kupu. The students were not familiar with either the word rahui or the concept of rahui and it proved difficult for students to comprehend the concept. The teacher in the post unit interview agreed, but did feel that it provided the students with a brief insight into the concept, as the following example illustrates "The rahui part was just a taste, I mean you didn't go in-depth into it" (Teacher/INT2). Rahui is considered as a conservation approach which prohibits people from harvesting a resource or prohibits access to an area for a defined period of time. According to Mead (2003), in terms of conservation, "rahui was used to protect the products of the land and water" (p. 197). An example of a rahui includes a ban on taking kaimoana (seafood) from a particular area, initiated by someone of rank, and would include the correct karakia when being put in place and lifted. In this example, a rahui allows time for the kaimoana numbers to regenerate with the rahui being lifted when numbers had reached required levels to sustain harvesting.

The students were introduced to the concept of rahui using the example of a rahui being placed on the collecting of pipi (shellfish, bivalve). Students were then asked to discuss in pairs possible reasons for this. The student responses indicate mixed interpretations as the following examples indicate "…it could be a curse" (c4, L6/VR) and "…like a dangerous place" (c20, L6/VR). These comments suggest students attached a sinister connotation to the word rahui. One student did offer the correct interpretation as the following example illustrates "…it's not allowed, because it's (resource) running out" (c6, L6/VR). At the beginning of lesson seven, a recap of lesson six in which the concept of rahui was introduced revealed that the majority of students had not retained this information, as only one student (c6) was able to correctly recall the word rahui and meaning. Limited teaching time did not allow for repeated learning experiences and no connection with student lived experiences may have contributed to the limited uptake of understanding of rahui.

One concept the students were able to grasp was that of sustainable harvesting by focusing on the size of a resource during the harvesting process. To help reinforce student learning in the area of eel harvesting, an actual hinaki (trap)(1.5 meters in length) was included as part of lessons four and six. The students showed great

interest in the hinaki and it was evident that some had not seen a hinaki before as indicated by their not knowing what the hinaki was or how it worked. When the students were asked if they knew what the hinaki was, several students offered "Fishing net" (L4/VCR). Comments by students relating to how it actually worked also illustrated a lack of knowledge as the following student example indicates "You just put it in the water and the fish, I mean eels, come by and just swim in it (points to the exit door of the hinaki) (c17, L4/VCR). This idea was supported by three other students in the class. A harakeke rau was used to illustrate how the eels entered the hinaki and became trapped. The hinaki had been constructed more than four years ago by a local school teacher and a group of year 7/8 students at a rural local school, and because of the construction materials used, was in a very fragile state. The frame of the hinaki had been constructed from Kareao (Supplejack), with wire netting used instead of harakeke netting. Although the fragile state of the hinaki was explained to the boys they were unable to just look, many did touch the hinaki but with great care. This high interest was evident in video recordings of both lessons as the students vied for a position next to the hinaki (L4, L6/VCR).

There was a general consensus amongst the students that young or small fish or eels should be left to mature to a size acceptable to harvest in the future in their group response of "no" to the researcher's question "Is it good to take little fish or eels?" (L6/VCR). During lesson four, discussion prompted the following comments from the students including "There is no point in taking little eels"(c11, L4/VCR) and "If you take all the little eels you won't have any bigger eels later" (c4,L4/VCR). The students identified ways that size selection could be achieved when harvesting with a hinaki. By using observational skills, the students identified that the size of the netting covering the hinaki would determine what size eel would be permitted to escape capture. This led to some discussion on the size of the eels students wanted to catch with some making large 10 centimetre circles with their hands, indicating that they were only interested in eels larger than this (L6/VCR).

In terms of watercress, harvesting is done by picking the part of the watercress that was growing above the water level and leaving the root system beneath the water intact. One student was able to share his harvesting experiences with the

class “We just picked it… picked the top we didn’t get any of the stalks (roots)” (c2,L6/VCR). This allows for re-growth as the root system is left relatively undisturbed and intact, as compared with the stress of being wrenched from the water and discarded. Although one student dominated the discussion on harvesting watercress (as other students did not appear to have anything to say on the topic), the other students listened with no interruptions.

Finally, the process of harvesting harakeke was not one the students were familiar with. The correct harvesting procedure ensures the rito and awhi rito are intact with the tipuna rau harvested. The tipuna leaves are cut on a downward angle as close as possible to the base to ensure water does not become trapped and rot the plant. One student remarked “you must be right and left handed” (c16, L6/VCR) as leaves are cut on the same angle on either side of the plant. The students were then asked if the rito could be harvested to which several responded with a “No, no” (L6/VCR), and when students were asked why, one student offered “It won’t grow any more” (c2, L6/VCR). The students had become accustomed to seeing the rito at the centre of the fan and were intrigued when the researcher identified a rito (barely visible) growing at the base of one of the tipuna leaves. Students commented on this as being “cool” (L6/VCR), with one student thinking about the next harvest and commenting “so if we come back in a couple of weeks it will be big” (c14,L6/VCR). This indicated a lack of understanding of the 18 month time span it takes for the rau to mature.

4.9.1 Summary about student skills in EE

While most students were unable to fully grasp and retain the rahui concept, the opportunity to find the reason for the students’ apparent sinister connotation of rahui was not pursued. Perhaps if this had been done a more positive acceptance of the word may have resulted. Also the fact that there were no links between the rahui learning experience and the lived experience of student lives may have contributed to the limited uptake of the understanding of rahui. However, in terms of sustainable harvesting students were able to share in the lived experiences of some of the students. One benefit of students sharing in the experiences of their peers in how to harvest eels and watercress was, sustained student engagement during these lessons. A demonstration by the researcher on how to harvest harakeke provided a new experience for students. In this demonstration students

were able to clearly identify the rito and why it should not be cut to allow for future harvesting. As part of the harvesting practise karakia was observed, and this cultural practise relates to attitudes and values towards the environment, as is discussed in the next section.

4.10 Student attitudes and values towards the environment

Students demonstrated some evidence of attitudes and values towards the environment in the unit. One example was the empathy shown regarding not taking the young or immature resources. As previously mentioned, students were aware that the very young were not to be harvested, as one result would be fewer larger resources in the future (L6/VCR).

Student attitudes and values towards the environment included the use of karakia. This was noticed in the harvesting demonstration with one student stating "You didn't say a karakia" (c6, L6/VCR). Tikanga regarding fishing and returning the first fish caught to Tangaroa (God of the sea) was not something the students were aware of. However, one student did note that he had seen people kiss their first fish and put it back into the water on a fishing show on television (c13, L6/VCR).

Student attitudes and values had a link to waste minimisation as indicated in the pre-unit questionnaire answers. Some of the student responses included "to be a tidy kiwi", and "because it is polluted", with the implication that these were undesirable.

Student attitudes and values could also be gauged from the responses to question two of the pre-unit questionnaire which asked Who do you think should look after the environment? and allowed a choice from: adults, children and everyone. The responses from all 16 respondents indicated that they thought everyone was responsible for the environment.

Initial evidence suggests that student attitudes and values towards harakeke were minimal, which may have been caused by limited exposure previously. Students were unaware of the importance and versatility of harakeke to Maori. Many students were familiar with the artefacts of today such as kete, piupiu, and many had experienced harakeke in a more recreational sense, for example making

putiputi (flowers) and toys such as fish. Traditional knowledge relating to the making of traps such as the hinaki that incorporated harakeke proved to stimulate interest for the boys.

The students' awareness of the attributes of the harakeke changed over the period of the unit, from limited to one of inquisitive interest. This was noticed in lesson seven when the strength of the harakeke was tested. Most students were unaware of the strength of the harakeke. A piupiu-making variety with high muka (harakeke fibre) content was used in this experiment. The high muka content makes the harakeke very strong and this attribute was highly prized in the late 1800's when harakeke was exported as rope. The students tried in various ways (other than the agreed method of pulling a strip between two students) to break the 50 centimetre long strips. Some students used the edge of the table to try and strip away the para (green epidermis layering) and weaken the strip in an attempt to break the harakeke, with some reverting to cutting the strips with scissors. The strength of the harakeke was mentioned again during the class reflection of the unit when several of the students commented on the strength of the harakeke and how they did not realise how strong harakeke was (L8/VCR).

4.11 Summary of EE in the unit

With the school having a strong waste minimisation approach to EE, the class teacher's view on EE was focussed in this area. Students were also influenced by the school's EE practise although data also reflected students thinking on a more global scale. Harakeke provided an ideal kaupapa that offered a range of possible links to student prior knowledge as well as the opportunity to add new knowledge. Harakeke also provided students with a cultural view of EE.

Student skills in EE focused on rahui and sustainable harvesting of resources. The term and concept of rahui proved difficult for students to understand and retain information. The inability to relate these to the lived experiences of students and the possibly sinister connotation attached to the word may have attributed to this low uptake of knowledge. Though not all students had first hand experiences in the area of harvesting kai, they were able to share in the experiences of students who had. As this information was delivered by their peers, students were engaged during the time these students were speaking.

Student attitudes and values towards the environment were identified in the pre and post-unit questionnaire, in karakia and in relation to harakeke. The pre and post-unit questionnaire indicated that students were aware of environmental issues at a local and global level. While karakia was identified as a form of prayer included in daily practise students were introduced to incorporating this as part of the harvesting practise. An increased awareness in student attitudes and values towards harakeke were also noticed in the interest shown by boys in regard to hinaki, and the realisation of the strength of muka recalled by students during reflection at the end of the unit.

4.12 Other themes in the findings

Included in this section are other themes that emerged from the findings that were not presented in the sections on IK and EE. These themes include whanau involvement, student resources and unplanned science opportunities.

4.12.1. Whanau involvement in education

Although research by Bishop & Glynn (1999) indicates that whanau are an important part of a child's education, the response from trying to include whanau involvement in this study produced poor results. To involve parents in the unit, a brainstorm sheet was set for homework for lesson one. The intent was for whanau to share their experiences of harakeke with their child/ren and these child/ren would then share this with the class. Six of the 21 students had completed the homework and returned this to class. One student had not discussed the homework with whanau but had downloaded two pages of information from a website and glued these into his homework book (c6,L2/VCR). When the researcher had asked the class who had completed their home work with their whanau only five of the 21 students responded. Another student appeared unsure of the word whanau and said "I did mine with my Nan" (c20,L6/VCR) to which the researcher responded "That's whanau" to confirm the meaning that whanau included Nan (L6/VCR). This could be interpreted as the student seeing only his immediate family as whanau.

What was interesting to note from the video recordings was that the boys who did not have their homework finished were interested in looking at the homework completed by their classmates. Students who did not have their home work were

observed peering over the shoulders of students to see what they had done, and one student moved to view three of the students' books (c12, L2/VCR). This was done in an unobtrusive manner without touching the person or their homework book, and these students looking on seemed interested and were engaged with the content of their classmates' homework.

4.12.2. Student Resources

During the course of the unit students were required to complete work that required resources, for example, the students were asked to colour in their posters with jovi crayons. These were a component of their school resources that are bought at the beginning of the year. The majority of the students did not own a set of jovi crayons and many students shared a set of colouring pencils to complete their work. This created a downtime for students who had to wait until there was a free pencil of the required colour. The class did have a large selection of wax crayons which the students declined as these flaked when used, which in turn created smudging. This indicates that for some whanau the purchase of resources for school is not high priority and could be seen as a luxury; an observation I made and also confirmed by research by Ball and Wilson (2002), Cunningham, Stevenson and Tassell (2005) and Krishnan, Jensen and Ballantyne (2002).

4.12.3. Unplanned science opportunities

Lesson one provided an opportunity for students to make observations and predictions regarding the colour of harakeke during the drying process and what happened to the colour when harakeke is placed in water. Harakeke caterpillars previously made in the introductory lesson during term one and which had since dried,losing their original green colouring, provided an opportunity to discuss colour. The researcher showed the caterpillars to the students and asked them what had happened. To which one student replied "The greenness had gone out of them" (c6, L1/VCR). The researcher held a caterpillar so students could see the underside and this then revealed that some parts were still green. Another student offered "It's fading" (c5, L1/VCR). The researcher responded "Fading, fading that's a good one. It's drying out". To this, another student responded "You should put it in water". The researcher asked "What will that do?" The student

responded “That’ll make it soft.” The researcher then asked “Will it bring its colour back?” The student responded “No, but it will stop it.”

A container was found and filled with water and the caterpillar was placed in the water. The researcher then asked students what they thought might happen to the caterpillar. One student offered “It will come undone” while another offered “It might get greener or might get un-greener”. Students were asked who thought the caterpillar will get greener and who thought it will remain the same. These numbers were noted and students were asked to make observations over the next weeks. The results were discussed in lesson three.

In lesson three, when the researcher asked the students what happened to the caterpillar, student c5 answered “It stunk” and student c2 offered “It stunk like cow manure”. The researcher then asked what colour was it. Students replied “Brown.” Student c5 responded “It was dark brown.” Student c1 then said, “So there’s your proof, we got it right.” This lesson provided science content (though unplanned in this instance) that stimulated student thinking. This led to students performing a range of science process skills initiated by their own inquiry. By making a hypothesis ‘What would happen to the harakeke colour if it was put into water?’; and performing the experiment; making their own observations and checking their hypothesis, the students were engaged in science. This outcome created a sense of achievement as identified in the student comment “So there’s your proof, we got it right”.

The living harakeke provided students with the opportunity to examine the plant in its entirety. This led to students exploring the harakeke from a science perspective. Lesson one provided an unplanned opportunity for students to make observations and develop scientific knowledge about the root system of the harakeke. As the harakeke had been growing in the bucket for 3 years, the root system had developed in the shape of the bucket. The students showed interest by asking “What’s that [roots] on the bottom” (c5, L1/VCR) to which another student replied “A nest” (c14, L1/VCR). A student correctly identifies and calls out “Roots” (c11, L1/VCR). In response to the researcher’s question “Why do you think they grow round like that?” a student replied “You put it in the bucket which is round, so they go round” (c5, L1/VCR). The exploration continued with

students asking "…doesn't it need dirt to grow" (c17, L1/VCR). A brief discussion followed on how the water was taken up through the roots, but also that although the plant was alive, a plant that was growing in soil would be three times the size of the sample due to a better nutrient supply in the soil.

These unplanned science opportunities were initiated from student curiosity and where possible the researcher allowed the discussion to follow the inquiry, even though in most cases it deviated from the lesson kaupapa.

4.13 Chapter summary

The findings of this chapter have indicated that through delivery of a unit themed around harakeke, and which emphasised Maori IK and EE, there has been evidence of student engagement and achievement. Key themes have emerged around te reo, whanau, relevance to students' lives and the learning of sustainability and science.

The inclusion of te reo Maori was an attempt to indicate to the students that their language and culture was valued, as affirmed in *Ka Hikitia: Managing for Success*. Students were regularly exposed to te reo Maori and kaupapa specific kupu that were delivered with consistency by both class teacher and researcher. The findings indicated a positive improvement in student use of te reo Maori; at the beginning of the unit the researcher noticed several students hesitant with using the new kaupapa-specific words, however by the end of the unit there was a noticeable lack of hesitation; students also incorporated te reo Maori more frequently during class discussion and displayed correct pronunciation and contextual application of te reo Maori.

There were however issues around the conceptual understanding of Maori kupu, by the teacher, students and researcher. An issue was the researcher's ability to explain concepts in terms that the students would understand. Students had difficulty with grasping the concept of rahui, a form of conservation but an unfamiliar word with no links made to their lived experiences. In the example of karakia, it was observed that while incorporated twice daily in classroom life, its true cultural significance seemed to elude the students, (and the researcher previous to this study). The tikanga pertaining to karakia timatanga (starting

karakia) relates to knowledge seen as tapu and karakia recognised the sacredness of the learning process (H. Mead, 2003). Students' thinking surrounding karakia was based on praying that you would have a good day. The class was however familiar with the word whanau and identified themselves as a class whanau.

The whanau concept as the core of Maori society provided for the inclusion of language skills, and tikanga skills including attitudes and values. Whanau linked to student prior knowledge in varying degrees as not all students were Maori, but the with teachers 'natural inclusion' of te reo Maori, these students were aware of whanau terminology. The class whanau provided students with a familiar setting and feelings of safety, support, a sense belonging, stability and strength. As a class whanau the group was cohesive and strongly protective of each other, with the strength coming from being part of the group. With whanau the group and not the individual is promoted, successes and failures are shared as a group with this sharing including group ownership of knowledge. The class whanau allowed students to practise manaakitanga and whanaungatanga. Whanau terminology and structure linked to the harakeke that was the bridge between IK and EE.

As part of the intervention unit, links were made to other class kaupapa. One such kaupapa was the Mahi Kai Programme. This programme focused on hunter-gatherer type activities and incorporated male mentoring. The programme structure was to include eeling and harvesting watercress. For the students this was to provide the opportunity to put into practise their classroom learning. However, only one trip eventuated as transport issues arose with the programme organisers. Although students did not get the opportunity to partake in these field trips, there were students that were able to share their knowledge in these areas. During this korero students were engaged, (identified by all students listening), and the topic was of high interest to students.

One aspect of whanaungatanga was that knowledge was freely shared, with everyone allowed free access and ownership of the shared knowledge. Aspects of manaakitanga were readily identified in the manner students address adults and in the act of mirimiri (massage), with all students participating.

The pre and post-unit questionnaire identified students' thinking was influenced by the school's current waste minimisation programme; however data also indicated a range of knowledge areas from personal actions to thinking globally. Data from the beginning of the unit indicated that students had minimal prior knowledge or experiences of harakeke from an EE perspective, and this included misconceptions on identifying harakeke. During the unit, student awareness on the versatility of harakeke had increased from seeing harakeke as being used to make kete and clothing to the other uses as in the korari as practise taiaha, the netting on the hinaki originally being made from harakeke, before being replaced by new technology, and that harakeke could also produce toys.

Students were also able to see the benefits when disposing of harakeke, as compared to disposing of plastics, on the environment. The harvesting demonstration also raised student awareness of sustainable harvesting. Students were able to see the life cycle process and how by cutting the rito this would kill that fan, and were able to see the advantages of leaving the matua parents to protect the rito and harvest the tipuna rau, allowing the rito and matua to grow and be available for future harvesting. This demonstration enabled students to envisage how the present action of harvesting would affect the ability to harvest in the future, with over-harvesting being detrimental to both the plant and person as recovery time for the plant increased and increased the time between harvests.

Although student comments revealed some knowledge about education 'for' the environment this appeared to be the weakest of the three dimensions: education 'in', 'about' and 'for' the environment (Ministry of Education, 1999a). The data revealed several misconceptions about rahui, karakia and global warming by some students but because of time restraints these were not explored further or corrected.

While research indicates that whanau play an important role in a child's education, attempts to involve student whanau in this unit did not meet with great success. However, it is realised that the short duration of the unit did not necessitate the time required to establish such relationships. Research also indicates that some whanau do not place a high priority on learning, and if income

is an issue, educational resources are seen as a luxury. As some students did not have all the required resources, the latter may have contributed to this.

The use of harakeke as a theme in the unit provided several unplanned science opportunities. Maori myths were incorporated in the unit to give a Maori world view. The link between these myths and student reality, although questioned by students, was not fully explained. An opportunity was missed to explain the importance of myths to students. In the instances of the unplanned science opportunities these were initiated by the students, and allowed the students to practise science skills and processes to explore what was meaningful to them.

Throughout the findings, a tension between IK and western thinking is noted and knowledge of both is required to help students navigate between the two. This, and other ideas, is examined in the final chapter, which presents a discussion of the findings, draws some conclusions and suggests some implications.

Chapter 5: Discussion and conclusions

5.1 Introduction

This chapter discusses the findings of the study, based on the following research question:

Can the use of Maori indigenous knowledge (IK) and environmental education (EE) enhance Maori student engagement and achievement in a mainstream primary school classroom?

The discussion is considered in two major themes, IK and EE, in relation to the research question and literature reviewed for this study. These sections are then followed by conclusions from the study, limitations and the implications of the study. The chapter concludes with suggestions for further research.

5.2 The role of indigenous knowledge in Maori education

Historically, education for Maori in A/NZ post-settlement has not been positive for the majority of the Maori population. Bishop and Glynn (1999) view the deprivation of language and culture as a major cause of Maori under-achieving in education and links have been identified between education levels and income levels. Maori are over-represented in areas of unemployment, unskilled labour, low academic qualifications, and low income (Statistics New Zealand, 1998). The inclusion of IK in Maori education has been shown to have a positive effect on Maori students in immersion kura from Kohanga Reo (early childhood) to Kura Kaupapa (primary to secondary schools) (Bishop & Glynn, 1999), and more recently in research projects that form Te Tere Auraki – Maori in Mainstream, consisting of three research projects: Te Kotahitanga, Te Kauhua and Te Mana Korero. These projects focus on professional development of teachers in the areas of culture, productive partnerships, and Maori language, and have been mainly situated in mainstream high schools.

The focus of this study was to provide an intervention that reflected some of these ideas and was based on Maori IK and EE in a class of mainly Maori students in a mainstream primary school. The intervention consisted of eight lesson plans that would enable the inclusion of Maori IK and EE through harakeke in a year 5/6

boy's only mainstream primary classroom. The main focus of Maori IK was tikanga (practises and protocols). Tikanga can be termed as the appropriate way to act in any given situation, and there are tikanga to cover every aspect of life, with this knowledge handed down over generations (Marsden & Henare, 1992). However, Mead (2003) states that there are not many individuals who possess in-depth knowledge of this subject. While this may be the case there are certain aspects of knowledge that can be incorporated within classroom practise that do not require in-depth knowledge, but require cultural sensitivity and awareness by the teacher.

The class where the intervention took place had a Maori teacher who had already established cultural practises such as karakia in the class. The class also operated as a class whanau that was governed by whanaungatanga and manaakitanga. Inclusion of te reo Maori by the class teacher was not structured but came naturally in the form of instructions, and in addressing the students and Maori adults. This study incorporated both te reo Maori and IK in the form of tikanga associated with aspects of harvesting kai and resources, while harakeke provided the link between te reo Maori, IK and EE.

5.2.1 Te reo

The findings from the intervention indicated that several students initially lacked confidence in pronunciation and use of te reo Maori kupu (words), but this improved as the unit progressed with a noticeable lack of hesitation in speaking te reo Maori in class discussions, improved pronunciation, using kupu in the correct context, and te reo Maori being spoken more frequently. This was facilitated by several factors including the class teacher being Maori and the constant exposure and inclusion of te reo Maori in classroom practise.

The inclusion of te reo Maori in learning activities is deemed to have a number of benefits to Maori students. *Ka Hikitia – Managing for Success* states that "through te reo, Maori learners can affirm their identity and access te Ao Maori (Maori world) and Maori world views" (Ministry of Education, 2008b, p. 24). Furthermore, May and Aikman (2003) state that the inclusion of te reo Maori provides the legitimisation of not only the language but also the culture, and Durie (1998) reported that research at a Wellington secondary school showed inclusion

of te reo in classroom teaching helped students by improving student self-confidence and also enhanced their success in examinations. While students in this current study were a mainstream primary school class and as such there were no examinations, success in the inclusion of te reo was measured in the observations made by the researcher during the delivery of the unit and in particular through student learning of introduced kaupapa-specific kupu (words).

Although students were able to pronounce most new kupu introduced in the unit, the meaning of some kupu remained vague, with examples being rahui and tikanga. While students attached a sinister connotation to the word rahui, the reason was not ascertained due to time restraints. Finding an English translation that students understood for the word tikanga proved difficult, with the initial translation given as 'the correct way to act', however this was unable to provide an understandable link and the word 'rule' given as an alternative. However, during the teacher post-unit interview, she said that although the students related to this word (rule), she found it restrictive and that it did not encompass the true meaning of the word tikanga for her. This supports McKinley's (1995) notion that writing Maori into Pakeha-based knowledge systems can be seen as a demotion of te reo Maori and IK. While students performed karakia twice daily in te reo Maori with excellent pronunciation, the findings revealed that for students the karakia was a prayer to have a good day. While the rote learning of these karakia helped students to memorise them and provided practise in pronunciation, there was limited understanding or value attached to the actual act of karakia (Vosniadou, 2001).

5.2.2 Whanau

The whanau considered to be the core of Maori society has evolved over time to refer to not only a group related by a common ancestor but a group who share a common interest, such as a sports team or class of students (Metge, 1990). For many of the students in this class, whanau and whanau terminology was a lived reality. As a class whanau, this structure provided several benefits for the students; a safe learning environment for the individual as the focus was on the group completing tasks and not the individual; strength and stability was gained by the individual from being part of a group, with the group promoted, not the individual; and also the class whanau provided a sense of belonging and value.

This was reiterated by the teacher in the post-unit interview, who felt that when children do not have a supportive whanau, "…they know that they've got the support ...from their classmates and their teachers..." (Teacher INT2). This teacher felt that relationships between herself and the students were of paramount importance, while knowledge of the student's whanau enabled her to "cater to the needs of the child" (Teacher INT2). Productive partnerships have been identified in the three research projects forming Te Tere Auraki – Maori in Mainstream as being a strategic approach to improving outcomes for Maori students in mainstream schools. The class whanau provided members with the opportunity to partake in whanaungatanga and manaakitanga, and both these values were displayed by the class. Whanaungatanga (sense of family) was exhibited by the class thinking as a group by wanting the best leader for the taiaha group, as this would be reflected in the group's performance, and manaakitanga (caring and respecting each other) within the class was illustrated when the boys addressed Maori adults and also in the act of mirimiri (massage). All students participated in this activity with no hesitation.

Another aspect of whanau was the link this concept provided between IK and EE. While most students had an awareness of harakeke prior to the intervention, the importance of this plant to Maori was limited for the students. Students were able to learn how the plant names were similar to their own whanau (the importance of harakeke noted in the use of whanau terminology in naming rau (leaf)), and also about the similarities in the life cycle from birth to death.

The versatility of harakeke provided a range of culturally male-oriented topics including taiaha training and hunter/gatherer activities such as eeling. Several students in the class were able to share their experiences of eeling and during this korero (discussion) students were engaged. Sax (2007) states that students need to be engaged for learning to occur and Vosniadou (2001) states that for this engagement to take place topics of high student interest need to be employed. In this particular lesson both components were met, as the high interest topic of eeling engaged the students. An added advantage was that while not all students had experienced these activities, for those that had, their shared retelling of these experiences to the group allowed the knowledge to become the possession of the group, and no individual was excluded from possessing this knowledge.

5.2.3 Relevance

Students in this study were seen to be engaged in the Maori kaupapa. One student in particular, who frequently sat on the fringe of the group was able to confidently share his experiences with the class on harvesting kai, and another student known to be shy gained confidence and was able to lead the group in taiaha training. It should be noted that non-Maori students were also encouraged by the class to try out for the leadership role. During the delivery of the intervention there was no racial discrimination observed by any members of the class. The class operated as a class whanau, a cohesive group.

Research that has been undertaken by the Ministry of Education points to the fact that IK is relevant to Maori students and that it does have a positive effect on their education (Ministry of Education, 2008b). Government documents such as *Ka Hikitia –Managing for Success: The Maori Education Strategy 2008-2012* are explicit in the description of how Maori student achievement is to be improved by the inclusion of culture and language (Ministry of Education, 2008b). When Maori students see their culture and language gain recognition in the classroom, this enables them to see themselves achieving, enabling them to be "Maori in all learning contexts" (Ministry of Education, 2008b, p. 20). This implies that teachers will be required to adjust to student cultural perceptions, as opposed to students adjusting to the teachers cultural perceptions (R. Bishop, 1999).

5.3 The role of environmental education

The role of environmental education in this study was to provide a context in which cultural knowledge through harakeke could be shared with students. The *Guidelines for Environmental Education In New Zealand Schools* recognises the unique position of Maori in New Zealand society and this position is represented by the Maori world view being embodied in the concepts of EE (Ministry of Education, 1999a).

Initially, EE was seen as outdoor education about the environment, however EE became an international issue with the advancement of technology that enabled individuals to gain a more global perspective on the degradation of the global environment, as previously situations had been viewed as isolated occurrences. The United Nations Scientific and Cultural Organisation (UNESCO) organised a

number of international conferences to discuss and consider approaches on the issue of global degradation. The *Tbilisi Declaration* was developed from such conferences with the three goals of EE being to create an awareness of EE, to provided EE learning opportunities and create new behaviours towards EE (UNESCO, 1978). Five objectives for EE were also developed: awareness, knowledge, attitudes, skills and participation (Bolstad, 2003) . According to Tilbury (1995), understanding the link between the environment and society started the shift towards a sustainable approach embedded in future thinking, which led to the development of *Agenda 21*, where sustainability became the direction for EE. The New Zealand Government developed and implemented EE policies to meet obligations to *Agenda 21*, reflecting the integration of social, political and economic development for the long term (Bolstad, 2003). According to Eames and Cowie (2004), these changes in policies and legislation also allowed the Government to meet Treaty of Waitangi obligations; recognising the special relationship of Maori with the environment, ensuring the rights of Maori to exercise rangatiratanga (authority) and kaitiakitanga (guardianship) in managing natural resources (Ministry of Education, 1999a). EE in A/NZ schools, while not having a formal place within the curriculum (Eames & Cowie, 2004), has the ability of being integrated in all areas of learning and provides a holistic curriculum approach (Kemple & Johnson, 2002; Tilbury, 1995). As well as EE being complex, the content is multilevel and a range of teaching strategies is required (Moseley & Utley, 2008). Bonnet and Williams (1998) and Leiserowitz and Fernandez (2008) state that children need to be taught values as opposed to scientific knowledge and that it is the values that determine our everyday actions that have led to environmental degradation. However, according to Tilbury (1995) an individual needs to develop a personal environmental ethic, by clarifying and establishing where one's values have come from and what factors have influenced these values, including cultural and socio-economic factors.

5.3.1 Relevance

For the school involved in this study, the EE focus was waste minimisation and had been for some years. The class teacher stated in the pre-unit interview that she had a delivered a unit on recycling years ago and for her EE included such activities as picking up rubbish and recycling. Also during this interview the teacher indicated an awareness of Maori worldviews; however this awareness did

not appear to help the teacher make the connection between harakeke, EE and the Maori worldview.

Student pre and post-unit questionnaires revealed that the majority of students were influenced by the schools waste minimisation focus, with the majority of student thinking based on how individuals could care for the environment, at national level instilling that sense of pride by being a 'tidy kiwi' to a few students considering global environmental issues. While these findings suggest that these students have an environmental ethic, the process of clarifying and reflecting on the factors influencing their own values such as culture and socio economic systems could provide students with a deeper level of understanding of EE (Tilbury, 1995). This deeper understanding of EE would also strengthen student knowledge on education 'about' the environment and education 'for' the environment.

One focus of the unit was to promote the Maori worldview of EE through harakeke. At the beginning of the unit, findings revealed students had limited knowledge of harakeke, but this knowledge had increased by the end of the unit. This awareness was gained by students learning about the versatility of harakeke, with kaupapa (topic) being selected in relation to what would be of high interest to students. Firstly, Hinaki (eel trap) was one such kaupapa, which appealed to the boys hunter/gatherer interests and was further enhanced by several students being able to relate their personal experiences of eeling with the class and having an actual hinaki present for students to examine (Vosniadou, 2001). Secondly, a comparison was made between a plastic plate and a rourou (harakeke plate) and what effects each item would have on the environment during manufacture and disposal. Students had an awareness of manufacturing processes and recycling processes of plastics but their articulation of these processes indicated that their knowledge was incomplete. However, in relation to manufacturing of the rourou, this was seen as a resource that was readily available and that was better for the environment, with regard to the disposal of the rourou, students showed some understanding about composting processes.

5.3.2. Sustainability and science

Rahui was included in the unit as a Maori concept relating to sustainable harvesting practices. While the word rahui was difficult for the students to comprehend, the concept of sustainable harvesting of resources and kai was understood. In terms of eeling, the examination of the netting size dictated the size of eels that would be allowed to escape and those that would be caught and eaten, promoting sustainable harvesting (Ministry of Education, 1999a). The students then came to the realisation that these smaller eels would grow and be available to harvest in the future and that if smaller eels were harvested in the present there would be no eels for the future.

The harvesting of harakeke was not an activity the students appeared to be familiar with and this provided another opportunity to examine sustainable harvesting, by ensuring the rito (baby) and awhi rito (parents) were not harvested as these would mature and become the next rau available for harvesting. Karakia also formed part of the harakeke harvesting process, which one student in particular was aware of as he pointed out the fact that a karakia had not been said by the researcher before harvesting. This finding showed that students' understanding of karakia was related to it being verbalised, as was their class practise. The researcher informed the students that a silent karakia had in fact been performed and that it was not always necessary to verbalise karakia and that this did not demean the tikanga.

The unit provided specific science components, and the students engaged well with these. There were also several unplanned science inquiries that were generated by the students and when time permitted these inquiries were allowed to continue to find some form of solution, or in one case, an experiment carried out over several lessons. While these unplanned science inquiries were unexpected by the researcher, it does reflect that science is of interest to boys when couched in a context that they find relevant to their lives.

Throughout the unit I felt that there has been a subtle expectation that Maori IK has needed to be validated in terms of Western knowledge in order to be respected in the classroom. One example is the interpretation of myths. In terms of Western knowledge myths are considered fireside stories, whereas to Maori they

are culturally significant, providing the opportunity of transmitting IK and allowing students to see what is probable, possible and impossible (Marsden & Henare, 1992). This tension is further explored in the implications below.

5.4 Conclusions

This study has sought to address whether the use of Maori indigenous knowledge and environmental education through harakeke can enhance Maori student engagement and achievement in a mainstream primary school classroom.

The following conclusions can be drawn:

- Harakeke as a kaupapa for learning provided a diverse range of kaupapa that could be tailored to the interests of the students, and provided a link between IK and EE. For example, harakeke as a metaphor for whanau was useful as many of the students were familiar with the concept of whanau and whanau terminology. The whanau concept enabled the history and importance of harakeke to be explored by students. Harakeke also allowed the students to consider tikanga employed in harvesting the harakeke rau, namely karakia and rahui. Both karakia and rahui were also applied to the harvesting of kai (food).

- Several different tikanga, some of which aligned to EE concepts were incorporated in the unit. The findings indicated that memorising information as in karakia allowed students to learn the correct pronunciation of words, but did not lead to learning about the value associated with the particular tikanga. Tikanga needs to be introduced and the value of the tikanga explained so students are able to understand why the tikanga is performed (Nga Pae o te Maramatanga, 2005). For example, karakia timatanga (start) is a karakia that acknowledges the sacredness of learning and settles the mind and separates food and drink from learning (Marsden & Henare, 1992). Student understanding of karakia timatanga was to pray for a good day.

- The findings indicated that the inclusion of cultural kaupapa had a positive effect on student engagement, and that if student prior knowledge of these

kaupapa can be incorporated through teaching and learning events, there is evidence of strong engagement by Maori students in these events.

- Teachers require knowledge of what concepts in both IK and EE mean. While both subject areas are complex, students need to be given correct information. Both IK and EE can be seen to involve actions based on values and beliefs and students need to learn how these are established within themselves, and while the teacher needs to be able to help students with this process, they must remain unbiased but also encourage a sustainability perspective.

- Te reo Maori in this study was facilitated by continual exposure in a variety of modes, kinaesthetically, auditory, orally, and visually. Including words that are kaupapa-specific, and also of high interest to students or able to be linked with prior knowledge, provides the possibility that new information will be understood and not just memorised (Vosniadou, 2001). It can also be concluded that teacher perseverance to include te reo Maori daily is important. Continual incorporation by the teacher leads to te reo Maori being seen as a normal part of classroom life in mainstream primary schools.

- The findings of this research provided evidence that the incorporation of IK and EE through harakeke strongly engaged students in learning in the curriculum areas of hangarau (technology), tikanga-a-iwi (social studies), putaiao (science), and hauora (health and physical education) in this mainstream primary school classroom. However, the study was unable tosignificantly address the issue of student achievement as the nature of the study and the small sample did not provide sufficient data to evaluate student achievement.

5.5 Limitations

One limitation of this study was teacher expertise. While the intention was for the researcher to co-deliver the intervention unit with the class teacher, this did not eventuate and the unit was delivered by the researcher only. The researcher

considered that her limited teaching experience may have restricted the delivery of quality teaching strategies and procedures.

Another limitation is that this case study provides only a snapshot in time (Merriam, 1998), and the findings are limited to one class in a mainstream primary school. The findings are not generalisable but may be transferable to other contexts.

Research at this particular level posed challenges in collecting data, with issues surrounding interviews and in-depth questionnaires. This led to observations being the main instrument of data collection. However observations present events as they occur but there is the inability to gain a full understanding of the student's thinking at that point in time from observations only.

5.6 Implications

A number of implications can be drawn from the findings of this study:

The findings from this study indicate that a Maori kaupapa did engage these students and for some students, had a positive effect on their self-esteem and confidence. For Maori teachers inclusion of IK provides an opportunity to include IK from their own experiences gained in their own whanau or in other environments outside the classroom and sharing these personal experiences with facilitate student engagement. The sharing of personal experiences can also help strengthen the teacher-student relationship.

While teachers who identify as Maori may recognise the value of teaching through Maori IK, they may lack the knowledge and confidence to do so. Professional development should be provided to raise confidence levels and support provided by the school kaumatua (elder) when required (if available). A local kaumatua provides a wealth of local knowledge and are considered the best source of local IK, as their knowledge is based on a lifetime of experiences in the local environment. While the status of kaumatua usually denoted a knowledgeable person, today this may not be the case as urbanisation has meant Maori may no longer have the strong connections with their marae, hapu or iwi which may affect personal knowledge of IK.

If students are to gain an environmental ethic that embraces "values of social responsibility, concern for others and harmony with nature" (Tilbury, 1995, p. 201), the teaching of EE needs to expand further than waste minimisation. The skills required to scaffold student learning in EE can also be applicable to all curriculum areas, as is the holistic nature of EE. However, this also presents the need for teachers to not only have the required skills but also provide students with opportunities to develop these skills.

Based on my own experiences during this research, I have developed awareness that there is tension between te Ao Maori (Maori worldview?) and te Ao Pakeha (western worldview?). While these claims are not supported by any findings within this research, I feel that for Maori students to be able to operate in both worlds with confidence and success, cultural integration where both cultures are valued equally in the education system is required.

5.7 Suggestions for further research

This research was a small scale exploration to examine if incorporating Maori IK and EE through harakeke could enhance Maori student engagement and achievement in a mainstream primary school classroom. The following are possible suggestions for future research:

- Research is required into the integration of IK and EE. Although this study focused on harakeke, could another context such as rongoa (Maori medicine) provide the same learning opportunities by providing the link between IK and EE?

- Research is also required on creating an effective monitoring system of teacher delivery of IK and EE in the classroom that did not cause extra work for teachers in terms of more administrative work such as student testing. A possibility could be an informal classroom visit by a kaumatua.

- Research is required into how community-based partnerships based on IK and EE would contribute to the school and also the community.

- Research is required into the production of effective IK resources. As indicated in the implications, kaumatua are the preferred source (Mead, 2003). However, with the passing of kaumatua we lose an unknown quantity of IK. As part of this research I have had access to books written by early ethnographers, which has developed my knowledge of IK, this is however a lengthy process and one that may not be available to the classroom teacher. With current communication technologies, it would be advantageous for recordings to be made for viewing, but the tikanga surrounding this would also need investigating.

- Further research is required to address the area of Maori student achievement, with a larger sample required. Although this formed part of the research question for this study, claims about achievement were unable to be ascertained because of the scale of the study.

- Research into the co-mingling of Maori IK and Western Science is also another area that requires further research.

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Appendix A

Pre/Post-Unit Questionnaire

Patai (Questions)	Yes 	Unsure 	No 
1. Do you think the environment needs looking after? If yes write one reason?			
2. Who do you think should look after the environment? Adults			
Children			
Everyone			
3. Do you ever take any actions to help the environment? If yes what do you do?			
4. On your Mahi Kai trips was there tikanga practiced?			
5. At home does your whanau practice tikanga? If yes what do they do?			
6. Do you think tikanga is important? If yes why?			

Appendix B

Lesson Plans

Lesson 1	
Curriculum area: Tikanga-a-Iwi (Social Studies) Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Links to other curriculum areas: Environmental Education Hauora (Health & Physical Education)	Evaluation: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources: Locate harakeke in school grounds A3 size picture of harakeke Te Whanau – laminated A3 sheet resource Sheet for list RIQ info sheet Mahi kainga sheet	Learning experiences: Class to view harakeke in school grounds – ask students to share their prior knowledge. The environment - Have students think about whether the plant is a healthy plant and what makes it healthy – water etc. Make connections between what makes us healthy food, shelter, friends, whanau. While at the bush name the parts, pu harakeke – flax bush, rau – blades, korari – stem with flowers and pods, rito centre shoot, Whaea-matua or awhi rito, tipuna – older blades and paiaka - roots. While at the bush have students form into groups of five and make a statue of a harakeke fan each person being able to name their part. Return to class prompting students to think about the different uses of the harakeke. Complete class labelling sheet Discuss the whanau concept of harakeke how harakeke was so important to Maori that whanau names were used to name parts of the harakeke. Display Te Whanau Resource. Pair share – brainstorm uses of harakeke (verbal) Create a class list (this list can be added to throughout the unit.) Reflection - Students pair share RIQ Extension – Write RIQ Mahi kainga – Home work students to have whanau brainstorm harakeke. This sheet to be shared in class in lesson 2

My whanau brainstorm on Harakeke (flax)

Lesson 2

Curriculum area: Tikanga-a-Iwi (Social Studies) Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins Stage of Unit: Finding out Links to other curriculum areas: EE - sustainability Hauora (Health & Physical Education – interpersonal skills)	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning Intention: We are discovering facts about harakeke through interviewing	Evaluation criteria: Based on Student mahi kainga sheets – whanau participation Students interview questions and number of Students participation in interview process Student reflections verbal/written
Resources Orbell (1995, p. 60) Maori Myth and Legend A4 Sheets for students to write up questions Large sheet for class patai	Learning Experiences Pair share mahi kainga work sheets – pairs to share one interesting fact with the class Recap on lesson 1 whanau names Read the legend about the discovery of weaving. During the reading have students act out all movements in a sitting position. Role Play – students to interview harakeke plant. Teacher and self to demonstrate - suggested patai, where do you like to live, where do you live, what do you eat, who are your enemy, how old are you? Students to form pairs and write at least 3 questions each Students pairs join with another pair and interview each other Questions from the interviews to form class chart of patai and used to create a fact sheet Reflection - RIQ – Verbal Extension – write RIQ

Lesson 3

Curriculum area: Putaiao – (science) The Living World Topic: Harakeke	Achievement objective(s): Use scientific processes to discover facts about harakeke
Level: 3 Time frame: 30 mins Stage of Unit: Finding out Links to other curriculum areas: EE - biodiversity	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Listening, recalling classifying working with a partner and class discussions
Learning intention: We are learning about observing, identifying, classifying and predicting	Evaluation criteria: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources	Learning Experiences
Harakeke Toys	Tuning in activity – Pair share – students examine harakeke toys and suggest a modern alternative material
Harakeke rau Harakeke Rau (leaf) sorting sheet Fun with Flax (Pendergrast, 1998, p. 97)	In Pair Share - Examine leaf – this consists of four parts Solid joined part at the base of the flax rau The keel or spine that joins the blades all the way to the top The margins on the outer parts of the rau The body of the blade Teacher to demonstrate classifying leaves – using the branching classification system All leaves start at A, then divide into two groups – green leaves and coloured leaves, divide into four groups, using colour of margins Each student to use "think aloud" process – the student classifying verbalises the processes as he does each step. There is no comment from the partner. Extension – students to find other ways of classifying leaves. Create Ngutu parera duck bill toy

Lesson 4

Curriculum area: Hungarau (Technology) – Nature of Technology Topic: Harakeke	Achievement objective(s): Understand how society and environments impact on and are influenced by technology in historical and contemporary contexts and that technological knowledge is validated by successful function.
Level: 3 Time frame: 30 mins Stage of Unit: sorting out Links to other curriculum areas: EE - sustainability	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning intention: We are learning about the versatility of harakeke to trap food	Evaluation criteria: Based on observations of Student participation in class drama's Student drawings of fishing trap in use Student designs
Resources Hinaki ,Muka for bobbing Laminated sheets "traps" Hula hoop Rakau for fencing Word bank – stream, stream bank, pa tuna, scour mat (whariki) Leading net (purangi) hinaki Shoe boxes – to check sizing Materials: pipe cleaners - structure, tulle – netting	Learning Experiences Examination of fish traps (hinaki, bobbing)and bird snares As a class enact how the hinaki would work. As a class enact how eels would be caught when swimming overland from one lake to the next. Compare bobbing for eels and fishing hook and line – what are the recycling possibilities of both materials. Students to draw fishing trap being used in a river. Include labels Students to design a miniature fish trap to be the feature in a shoe box diorama. Brainstorm as a class - What questions do we need to ask? How big do we need to make it? How to attach netting to structure?

Lesson 5

Curriculum area: Tikanga-a-Iwi (Social Studies) Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins Stage of Unit: sorting out Links to other curriculum areas: EE - sustainability	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning intention: We are learning about the versatility of harakeke and will display this information in a poster	Evaluation: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources Labelled piupiu, kete and rourou A3 Sheets of paper www.extension.iastate.edu/NR/.../WhatMakesaGoodPoster.doc for additional information	Learning Experiences Brain gym – warm up. Learning intention Lesson format – visualisation exercise, create criteria for a poster, create a poster Visualisation exercise Look at examples of posters and write up criteria on what makes a good poster. Large pictures, large words – easy to read, use of space, use of colour – good to look at. Students to design a poster – ensuring all criteria have been met.

Lesson 6

Curriculum area: Tikanga-a-Iwi (Social Studies) Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins Links to other curriculum areas: EE – sustainability	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning intention: We are learning about the tikanga of harvesting and how to harvest harakeke and other foods.	Evaluation: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources	Learning Experiences
Organise groups for students to work in throughout the lesson	Recap – what are the uses of harakeke (check to see if posters have been completed?) Ensure completion of poster before making hinaki In groups create pu harakeke, name the rau/whanau Explain the meaning of tikanga – the correct way to perform an action
Harakeke in bucket Harvesting tools including rubbish bag	Karakia – when do say karakia in class timatanga and whakamutunga (who can remember last week in the visualisation what was said in the karakia) Thanking the plant for being there and growing to allow us to harvest. Acknowledgement – do not take plant for granted. The tikanga for fishing – returning the first fish caught to Tangaroa Harvest from the plant in the bucket. Repeat the names of the rau – class. What happens if we cut the rito – no stock for the future? Do not cut in the rain, or at night. Can you think of reasons why? Harvesting water cress – wrench out plant roots and all or cut off and leave roots in the water. Students to enact these 2 processes. Matariki – the right time to harvest. Harakeke is harvested in the summer months Rahui – means you are not permitted to harvest in a certain place or a certain thing and example is the pipi's at Maketu. Today our focus is food. What might some reasons be for this?
	Signs –The chief and tohunga of the tribe would have a korero and decide if a rahui was needed. In some cases the tohunga would use a stick as a sign that a rahui was in place.

Sign examples – traffic sign, and do not enter	What tells us that we must travel at a certain speed, or not permitted to enter an area? Who is responsible for the signs? Students to create sign sculpture – no fishing
Hinaki – Pipe Cleaners, twist tie, netting, needle and cotton/wool	Group activity – Hinaki design, explain the resources – pipe cleaners, twist ties and netting. Each member of the group must be able to describe the design. Once design has been approved resources given to students. Hinaki making to be carried over if required

Lesson 7

Curriculum area: Putaiao (Science) – Living World - Investigating in science Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins Links to other curriculum areas: Environmental Education, Social Studies	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning intention: We are learning about the strength of harakeke.	Evaluation: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources	Learning Experiences
Te Ake Ake (1999, p. 50) Myths and legends of Aotearoa Experiment Sheet Pens 10 strips of each harakeke width	Recap – rahui, tikanga, harvesting We are learning about the strength of harakeke. Legend – How Maui Tames the Sun. In this legend what part did harakeke play? Why? Scientific predictions – what is a prediction (pair share) Volunteers to share with class Explain experiment Same harakeke cut in different widths How can we test the strength? Guessing what might happen. A guess is also called a hypothesis. A hypothesis is what we believe will happen. Hand out sheet and have students hypothesis how many people it will take to break the strip of harakeke have them tick in the appropriate box (using pen). Hold up each strip. No talking 10 seconds. Repeat with each strip size. Check each student has made a hypothesis. Perform experiment starting with the .6cm strip. Have each student record the results in pencil. When complete share results as a class. Pair share patai – What did we learn about harakeke? Did you think it would be that strong, weak? What effect would harakeke have on the environment – decomposing as compared with nylon? Students to make a plaited rope for a tug of war between classes.

Lesson 8

Curriculum area: Putaiao (Science) Topic: Harakeke	Achievement objective(s): Understand how people make decisions about access to and use of resources – in this lesson students identify the parts of a harakeke plant, harakeke as a resource and harakeke as a metaphor for whanau
Level: 3 Time frame: 30 mins Links to other curriculum areas: EE – sustainability Tikanga-a-Iwi (Social Studies) Understand how people make decisions about access to and use of resources	Key competencies: Thinking, managing self, relating to others and participating and contributing – these will be achieved by students: Brainstorming, listening, recalling classifying working with a partner and class discussions
Learning intention: We are reviewing our learning about the harakeke and tikanga.	Evaluation: Based on observations of Student participation in pair share and class discussions Student participation in harakeke statue
Resources	Learning Experiences
Word list (attached), plus artefacts Forms Word cards	Recap – testing the strength of harakeke. What did we learn about the strength? Is this good or bad, why is this good. Tikanga – looking for connections What are some tikanga practised in the classroom, how do you start and finish the school day. What about the tikanga when you're at school assembly. School values can also been seen as tikanga. For example the tikanga bout honesty is … telling the truth. Tikanga also helps the environment – not taking the smallest or undersized fish so that there are resources for the future. One word that could describe tikanga - rules. Match the word with the article Harakeke and the environment – compare a plastic plate and a rourou. What is the rourou made from and what is the plastic plate made from. Can I find a plant that grows plastic plate? Plastics are not found in nature, but are manmade created from the products of coal, oil, and natural gas. Which is better for the environment, why? The rourou will rot yet the plastic plate will take years a plastic bottle will take 450 years to rot. Post-unit questionnaire Charades Thank class

Appendix C

Teacher Interview Questions

1. Do you feel tikanga has a place in primary school education, and if so do you incorporate tikanga in your teaching practise? Can you provide an example?
2. Is tikanga incorporated on a daily basis/ or how often.
3. What do you think tikanga offers students?
4. Are you aware of the *Guideline for Environmental Education in New Zealand Schools* published by the Ministry of Education in 1999, and does XXXXXX School incorporate EE in either school wide, syndicate or any other form.
5. What are your experiences of EE in XXXXXX School?
6. Do you think incorporating EE will benefit your students, if yes in what way?
7. In regard to your students, what do you believe their current understanding of EE is?
8. Are students aware of EE issues at a local level, national level, and international level? Can you provide examples?
9. What are your expectations of this intervention?

Appendix D

SCHOOL BELIEFS

Beliefs:

These Beliefs underpin all our teaching and learning at School.

Belief 1

Recognition and respect for diversity of culture, background and identity.

Belief 2

Respect for others reflected through honesty, tolerance, non-discrimination, caring and compassion.

Belief 3

Recognition and provision for instruction in Te Reo and Tikanga Maori in a mainstream context.

Belief 4

Learning is based on the students needs.

Belief 5

Innovative teaching that fully utilises advances in information and communication technology.

Belief 6

Involvement of parents and the wider community in the life of School.

CULTURAL DIVERSITY AND MÄORI DIMENSION

Our School will reflect New Zealand's Cultural Diversity

By

Encourage representation on B.O.T.

Kapa Haka group integrated into school life

Whanau group - meeting regularly

Haere Tonu programme throughout every classroom

Class programmes reflecting cultural similarities and differences

ESOL programmes operating throughout the school

Unique position of Mäori culture at School

The school curriculum will recognise the unique position of Maori in New Zealand society....

The curriculum will acknowledge the importance to all New Zealanders of both Maori and Pakeha traditions, histories and values (N.Z. Curriculum Framework).

The school will incorporate Tikanga Mäori (Mäori culture and protocol) into the school's curriculum.

- *Te Reo / Tikanga Maori at staff meetings and B.O.T. meetings*
- *The Haere Tonu programme will be used as a basis for instruction in all classrooms*

The school will provide instruction in Te Reo Mäori for full time students whose parents request it.

- *Instruction provided according to staff competence*
- *Development of waiata in area and school assemblies*
- *Teams will be encourage to regularly visit local marae*

The Board will take every opportunity to consult with our Maori community through....

- *Encourage and attend regular Whanau hui, twice a term (documented)*
- *B.O.T. representation and Senior Management at such meetings*
- *School annual report on Maori achievement*
- *Community Survey every three years*
- *Team Marae visits*
- *Overnight Marae stays*