**Local Curriculum Development in Sustainability Education
in New Zealand Secondary Schools**

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ABSTRACT

Sustainability, though not well understood, is an increasingly important concept in society, and as such has become incorporated in school curricula. In New Zealand, sustainability was added to the national curriculum in 2007 as a non subject-bound thematic link through the values and key competencies associated with student learning. Teachers use the national curriculum, a statement of policy describing educational objectives, to plan their classroom practice with their particular learners in mind, a process referred to as *local curriculum development*.

Though sustainability education is new to New Zealand teachers, there is a strong history of environmental education where implementation has been successful in many primary schools, in which the curriculum is integrated. In the secondary school setting, the implementation of non subject-bound learning, like environmental education, has proven to be less successful, partly due to the siloed nature of subject specialisation. Sustainability as the interaction between environmental, social and economic perspectives has proven to be particularly difficult to address in such siloed secondary schools.

This study investigates the sense making practices of some English, science, social science and technology secondary teachers as they interpret sustainability in the national curriculum and create local sustainability curricula in their school settings. The research occurred three years after the introduction of the revised national curriculum and at a time when few professional learning opportunities existed to support teacher professional development. The research is founded on sociocultural learning theory drawing on concepts of mediated action, and situated and distributed cognition. Research data was generated over a year-long collaborative action research programme and analysed using Cultural Historical Activity Theory as a tool.

The findings indicate that these teachers were challenged by the siloed nature of curriculum delivery in addressing the holistic nature of sustainability

in their local curriculum development. Teachers' personal sociocultural backgrounds were influential in their sustainability curriculum development practices. These experiences influenced their perspective of sustainability, often limiting their perception of sustainability. These perspectival views of sustainability had direct influence on teacher's curriculum development, constraining planned learning in sustainability to their perspective. Where teachers worked independently in their school to develop local curriculum their perspectives went unchallenged, resulting in local curricula that addressed only parts of the nature of sustainability.

Teachers' perspectives of sustainability also influenced their ongoing professional learning choices in a conservative manner. Without intervention, this self-reinforcement of existing perceptions may lead to strengthening curriculum silos and further constrain sustainability education. Where teachers worked collegially across curriculum silos, and had opportunities to negotiate meaning around sustainability and sustainability education in the wider culture of the school, their perceptions of sustainability become more comprehensive, leading to local sustainability curricula which reflected more fully the holistic nature of sustainability.

Meaning making around sustainability and sustainability education, in the culture of the school, includes considering how sustainability is expressed in the national curriculum, what is meant by assessment of learning in sustainability, the role of students in curriculum development and the influence of external stakeholders in local curriculum development.

Preface and Acknowledgements

In The Hobbit, Gandalf asks Bilbo, "I am looking for someone to share in an adventure that I am arranging, and it's very difficult to find anyone." Bilbo replies, "I should think so—in these parts! We are plain quiet folk and have no use for adventures. Nasty disturbing uncomfortable things! Make you late for dinner!" In reflecting on my PhD I am drawn to Bilbo's comment. My PhD adventure, though philosophical rather than physical, has at times been nasty, disturbing and uncomfortable journey to better understand the world of teachers and their practice.

Like Bilbo's journey, mine has been shared with a number of friends. Firstly a group of teachers with whom I co-researched. My heartfelt thanks go to; Sarah, Wayne, Greg, Mary, Chris and Jenny for their company and their willingness to adventure with me, making meaning of teaching practice and at times asking and answering uncomfortable questions.

Thanks also go to my family for allowing me to travel this road. The part time PhD journey can be a long road. I look forward to investing time with Verity, Cecelia, Campbell, Alistair, Chris and Cherie over the coming months. Thank you for putting up with me being present, but not, and late for all those meals. For those in the family that were there at the beginning of the journey, and who no longer are; Jean and Newton Lockley, and Bob Hellawell, I will miss the opportunity of trying to explain what it was all about. I owe much of who I am to you.

Chris Eames and Beverly Bell, my supervisors, friends, and mentors, I thank you for your unending patience and support. I have valued and enjoyed our collegial conversations over the journey and will miss the intellectual stimulation. All journeys are better for wise council and good company.

Table of Contents

Figures

Tables

Chapter 1   Introduction

1.1 Context of the Study

The concept of sustainability has been gaining awareness internationally, a trend which is mirrored in New Zealand with estimates of over 80% of people recognising it as being somehow important (Research New Zealand, 2007). It has been the subject of international interest since the early 1970's (World Commission on Environment and Development, 1987; World Council of Churches, 1974) leading to the development of educational responses such as environmental education (UNESCO, 1978) and education for sustainable development (UNESCO, 2005).

In New Zealand, calls for sustainability to be addressed in the school curriculum began in the 1990's. The then recently published *New Zealand Curriculum Framework* (Ministry of Education, 1993) did not indicate sustainability as a priority for learning, so a response to the growing need was to develop a set of stand-alone guidelines in Environmental Education (Ministry of Education, 1999). These guidelines were to be read in conjunction with the curriculum framework.

The *Guidelines* (Ministry of Education, 1999) were produced at a time when many countries were producing similar guidelines in sustainable development (Council for Environmental Education, 1998). The *Guidelines*, though addressing the environmental aspect of sustainability admirably, fell short of addressing all aspects of sustainability education by not recognising or addressing the relevance of human factors, such as human rights, equity and social justice, as essential components of achieving sustainability.

In 2010, the national *Curriculum Framework* was replaced with the *New Zealand Curriculum* (Ministry of Education, 2007). In this national curriculum statement, sustainability as a concept is embedded in the overarching themes

of the curriculum, positioned with relevance to all curriculum subject areas. Positioning sustainability at this level, rather than a separate curriculum subject, advocates an approach to sustainability education where connections can be made across curriculum subjects: "… exploring the long-term impact of social, cultural, scientific, technological, economic, or political practices on society and the environment" (Ministry of Education, 2007, p. 39). However, the corollary of positioning sustainability as an overarching theme is that it does not have the same detail of description or definition as other expected student learning. It is not presented as a mandated curriculum subject and therefore is not described through achievement aims or objectives that indicate and define intended learning in sustainability.

This inclusion of sustainability in the national curriculum (Ministry of Education, 2007), as an expected focus of teaching and learning, occurred during a period where no coordinated professional learning opportunities in sustainability or sustainability education were available for teachers. New Zealand was in a period of conservative, neo-liberal, National government, whose priorities for education were, and still are, firmly focussed on increasing rates of public literacy and numeracy, limiting teacher professional learning opportunities to literacy and numeracy.

1.2 The Research Opportunity

Despite being in the national curriculum, sustainability as a concept is not well understood in New Zealand. Many New Zealanders have struggled to answer what it means to be sustainable, with estimates of only 1 in 4 being able to articulate what sustainability is actually about (Research New Zealand, 2007). A high rate of sustainability illiteracy has been implicated as one of the major impediments to New Zealand society becoming more sustainable (Parliamentary Commissioner for the Environment, 2004). This public lack of understanding of sustainability adds weight to the argument for a need for research in this area. Furthermore, despite being present in the national

curriculum there is little evidence at secondary school level of sustainability being actioned in local curriculum leading to student learning in sustainability. The low rate of sustainability literacy seen in society may also apply for teachers, who themselves may not have well developed, holistic[1] understandings of sustainability.

Sustainability as a concept has been contextualised, interpreted, commented upon and re-stated in many different ways (Marien, 1996), but is generally perceived as the interplay between environmental, social, and economic concerns that lead to decision making and actions for a more sustainable world (Dresner, 2008; Thiele, 2013). The most common form of sustainability education internationally is education for sustainable development (Wals, 2009) which positions sustainability as: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 43).

In the New Zealand context, sustainability education is referred to as education for sustainability, a slightly different form than education for sustainable development. The discourse on sustainability, sustainability education, and the development of education for sustainability has been influenced by the history of environmental education research, including the publication of the *Guidelines for Environmental Education* (Ministry of Education, 1999).

It is within this context that secondary teachers in New Zealand have been directed to create local curriculum in sustainability where teachers interpret the national curriculum (Ministry of Education, 2007) and develop a site based plan for teaching and student learning, a process labelled *local curriculum development*.

This research investigates the local curriculum development practices and associated meaning-making by some New Zealand secondary teachers

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[1] Holistic in that they recognise environmental care, social wellbeing and economic development aspects of sustainability as being equally important.

around the concept of sustainability and sustainability education at a time of little professional learning support. The teachers in this research have taken up the challenge to create local sustainability curricula, creating their own opportunities for professional learning, and making meaning through their own practices.

1.3 The Researcher Position in the Research

Paralleling this national trend of the increasing prominence of sustainability, I myself became increasingly engaged with teaching sustainability. At the University of Waikato, Faculty of Education, I was a lecturer developing and delivering the undergraduate paper in Environmental and Sustainability Education. Prior to this, my interest in sustainability education and local curriculum development had increased through my experiences as a teacher working in the secondary and tertiary fields for over 30 years, where I had been involved in curriculum development for most of that time.

In addition to my teaching experiences, in the 1990's I was involved in the implementation of the, then new, Technology Education Curriculum in New Zealand. During this period I worked on contract to the Ministry of Education developing classroom curriculum exemplars in collaboration with classroom teachers. This local curriculum development work was formalised and published nationally to support teacher professional learning.

My personal interest in sustainability and sustainability education is twofold. Firstly, through the lens of someone interested in curriculum development. As the presence of sustainability increases in the national curriculum I am interested in how teachers make sense of, and develop, curriculum in the absence of coordinated professional learning. Having worked with the introduction of the last major addition to *The New Zealand Curriculum*, Technology Education, I am interested in the way sustainability is being introduced to teachers.

The second personal interest in sustainability and sustainability education is from my own sociocultural / historical background. My original honours degree is in ecology. I am a trained ecologist who went on to teach science, chemistry and biology at secondary school. My own sociocultural lens on sustainability is founded in ecological principles, but also includes awareness and action around more social issues. I have a deep commitment to social justice and equity expressed through my long-standing volunteer involvement in organisations such as *Christians Against Poverty*, the *Hamilton Combined Christian Foodbank Trust* and *Te Whānau Pūtahi* (Community Centre). Within these organisations, working mainly at the governance level, I advocate for, and serve in practical ways, those in society who are in poverty and are working for a more sustainable future.

I have also held a long interest in sociocultural research which can be traced from my experiences as a beginning secondary teacher, where in the early 1980's I was a research participant in the *Learning in Science Project Professional Development* research programme. My experiences in that research team made me aware of the role of research in education, and the relationship between theory and practice. As a beginning teacher this experience influenced my view of teaching, and has led me to pursue a career in research-led, and research-informed, teacher education.

1.4 Relevance of the Research

This study is significant in a number of ways. Firstly, as an example of sociocultural theory applied to education and the meaning-making practices of teachers. The research takes a systems approach, recognising the ideas and thinking of teachers as they consider developing local curriculum. It also recognises the interactions between these ideas, the ideas of others and the influences of the community in which these teachers work. This systems approach is founded in sociocultural theorising drawing mainly on the

sociocultural theories of mediated action (Wertsch, 1991), situated cognition (Lave & Wenger, 1991), and distributed cognition (Salomon & Perkins, 1998).

The second area of significance in the research is the use of Cultural Historical Activity Theory (Engeström, 1999) as a conceptual tool to investigate the sociocultural influences on teacher's curriculum development practices. Cultural Historical Activity Theory was chosen as the analysis tool in this research for its ability to investigate the sociocultural historical influences on the teachers' perceptions of sustainability and sustainability education. It allows for the mediated action of teachers, and the meaning that they have made of sustainability and sustainability education, to be investigated and made sense of in the community of practice of the school they work in. Importantly, Cultural Historical Activity Theory also allows for the identification of conflicts that occur in the processes of meaning-making (Gedera, 2016).

As well as allowing for the investigation of teachers' personal constructs of sustainability and sustainability education, Cultural Historical Activity Theory facilitates the investigation of the meaning-making processes that occur in the context of the sociocultural setting of the school. It allows for the influences of the school culture to be recognised, as this culture influences curriculum development decision-making.

The study is also significant in that it adds to understandings of the ways teachers perceive and actualise notions of sustainability and sustainability education. These concepts are emergent in education and problematic, being perceived in multiple ways (Glavič & Lukman, 2007; Stevenson, 2013).

At a pragmatic level this research is also significant as it occurs in a time period between major redevelopments of the national curriculum in New Zealand. The implications of the research have the potential to inform the development of the next national curriculum with respect to the positioning and support of sustainability education. At the school level, the research has the potential to inform teachers and school managers about the practices that

enhance the development of local sustainability curricula. At an academic level this research adds to the developing literature on sustainability education with particular relevance to sustainability curricula in secondary schools. Lastly, the research also adds to the literature on research in education as it applies Cultural Historical Activity Theory as a methodological approach to sociocultural research and theorising.

1.5 The Research Problem

This research takes a sociocultural approach, through the use of Cultural Historical Activity Theory, to investigate the development of local sustainability curricula by some New Zealand secondary school teachers. The research, which was interpretive in nature, investigated sociocultural influences on the curriculum decision-making practices of six teachers in four secondary schools. These teachers were identified as early adopters in sustainability education, having developed a successful[2] sustainability education programme in their school.

In the context of the New Zealand education system, the research aims to answer the question of how secondary teachers develop local sustainability curriculum in response to the increasing presence of sustainability in the national curriculum. This question is important in two ways. Firstly, secondary teachers normally operate in curriculum subject silo areas such as science, technology, English and social studies. This siloed approach to curriculum is problematic when considering sustainability. Compared to existing curriculum subjects such as science and technology, sustainability is more holistic in nature drawing on environmental, social and economic issues simultaneously.

The second area of interest for the research is how secondary teachers develop local sustainability curricula in the absence of professional learning

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[2] As judged by peers and sustainability education researchers.

opportunities, which would normally be present with the development of a new curriculum initiative. Sustainability is an emergent area of the curriculum and in New Zealand much of its current development in schools has been without coordinated professional learning opportunities for teachers. Enthusiastic and interested teachers from a range of curriculum subject areas have begun implementing local curriculum in sustainability, making their own sense of the concept and how sustainability education can be enacted in the secondary school system.

In addressing these general aims, the research is guided by three main questions. The questions were developed by applying Cultural Historical Activity Theory to the practices of teachers creating local curriculum.

1.5.1 **Research Question 1: How do secondary teachers make sense of sustainability?**

Research question one focused on teachers' perceptions of sustainability. It acknowledges teachers' personal sociocultural histories, and their perception of the way sustainability is presented in the national curriculum. In the theorised activity complex for local sustainability curriculum development, question one focuses on the relationship between the subject (the teacher) and the mediating artefact (the national curriculum) used to define the concepts of sustainability and sustainability education.

Investigation of this question was facilitated through an initial interview where teachers were asked to discuss their perceptions of sustainability and the way they understood sustainability to be represented in the national curriculum. The guided interview covered topics which included; the meaning of the term sustainability, issues associated with it, how important it was and how they conceptualised sustainability in the curriculum. Initial interview data was supplemented with ongoing discussion responses throughout the year-long data collection phase of the research.

1.5.2 Research Question 2: How do secondary teachers make sense of sustainability education?

Research question two focused on teachers' perceptions of sustainability education. It acknowledges teachers' sociocultural histories and how they perceive sustainability in the curriculum, as addressed by research question one, and focuses on the way these perceptions affect teachers' perceptions of effective sustainability education. In the theorised activity complex for local sustainability curriculum development, question two addresses the relationship between the subject (the teacher) and the object of the complex (the teacher's perception of effective sustainability education).

Investigation of this research question was facilitated through the initial interview where teachers were asked to discuss their perceptions of sustainability education. The guided interview covered topics which included; their experiences in sustainability education, how they perceived their subject specialisation relating to sustainability, their view of the aim of sustainability education and views on assessment of learning in sustainability. Initial interview data was supplemented with ongoing discussion responses throughout the year-long data collection phase of the research.

1.5.3 Research Question 3: What are the practices of teachers when developing sustainability curricula in secondary schools?

Research question three focused on the sociocultural context of the school setting, and how this affects local sustainability curriculum development. It acknowledges the perceptions held by individual teachers on sustainability and sustainability education, and how these interact within the sociocultural setting of their school. Teachers' curriculum development practices operate within, and are affected by, the community of practice of their school. In the theorised activity complex for local sustainability curriculum development

question three investigates the relationship operating in the school between: the *community* (identified as the stakeholder groups with an interest in local sustainability curriculum); the *rules* (the cultural norms that govern what is appropriate in local sustainability curriculum within the school); and the *division of labour* (the curriculum development practices applied to local sustainability curriculum development in the school setting).

Investigation of this research question was facilitated through teachers' responses to questions in the initial interview. The semi-structured interview questions investigated their views and practices concerning local curriculum development focussing on the three theorised components of the activity complex; community, rules and division of labour. Initial interview data was supplemented with discussion responses gathered in focus groups held during the year-long data collection phase of the research. This data was supplemented with classroom observations and document analysis of teachers' planned local curriculum.

1.6 Overview of Chapters

Chapter two presents a literature review, discussing the major concepts underpinning the research. The first section discusses a sociocultural approach to meaning-making through the lens of Cultural Historical Activity Theory. The second section discusses a sociocultural view of curriculum. The third section discusses sociocultural views of the concept of sustainability and the fourth section discusses sociocultural views of sustainability education.

Chapter three positions the research methodologically. The research is framed socioculturally, viewing knowledge and meaning as subjective. In this research, meaning is seen as being constructed through people's lived experiences. Collaborative practical action research is presented as the way the research was structured, along with an account of the research methods used. This section includes details of research ethics, participant selection, data collection, data management and data analysis.

Chapters four through seven present the research findings. Chapter four present the findings associated with Sarah from South School. Chapter five present the findings associated with Wayne from North School. Chapter six present the findings associated with Greg from West School. Chapter seven presents the findings associated with Mary, Chris and Jenny from West School.

Chapter eight presents the research discussion, conclusions, limitations, and implications for practice and further research.

Chapter 2   **A Literature Review**

2.1 Introduction

Sustainability education is a recent phenomenon in New Zealand and when this research began a limited research literature existed on its development or implementation in New Zealand schools (Bolstad, Cowie, & Eames, 2004; Cowie & Eames, 2004; Eames, Cowie, & Bolstad, 2008; Eames, Roberts, Cooper, & Hipkins, 2010). Accordingly this chapter reviews literature around the four main concepts identified as important in this research: *sociocultural theorising*, *curriculum development, sustainability and sustainability education*. The development of local curricula is approached in this research as a sociocultural practice, and so the chapter begins with a review of the ideas and arguments surrounding sociocultural approaches to knowledge creation, meaning-making and learning (see Section 2.2). Cultural Historical Activity Theory, which was chosen as a sociocultural research tool to guide data generation and analysis in this research is discussed in this context (see Section 2.2.1).

The second part of the chapter reviews the concept of curriculum as a sociocultural construct, leading to a position being taken on local curriculum development as a sociocultural endeavour (see Section 2.3). This section concludes with a review of the theoretical understanding of the practices of teachers engaging in local curriculum development as an integral part of their professional learning in the developing curriculum area of sustainability education.

The third part of the review (see Section 2.4) focusses on sustainability and begins by discussing the meaning of the term sustainability as a conceptual placeholder, from its generic roots in the middle of the 20th century through to more contemporary environmentally-focused meanings. The term is then defined in the context of this research.

The fourth part of the chapter addresses the meaning of sustainability education (see Section 2.5). Its global expression as education for sustainable development is discussed and contrasted with the expression of sustainability education in New Zealand as education for sustainability. The meaning of sustainability education in this research is then defined.

The chapter concludes with a statement of the rationale for the research and an introduction of the three main research questions.

2.2 Sociocultural Theorising around Meaning Making

This research takes a sociocultural view of knowledge construction, meaning-making and learning to investigate the meaning held by teachers around the concepts of curriculum, sustainability and sustainability education. It investigates the way they use these concepts to develop new knowledge in the form of school-based sustainability curricula. Drawing on, and adding to, the work of Bell (2005), the sociocultural view of knowledge construction, learning and meaning making taken in this research can be defined as: Purposeful meaning-making through community participation in a situated context, involving the use of language and other physical and cultural tools, to communicate and negotiate meaning from an acknowledged historical perspective.

A sociocultural approach to understanding the development of knowledge, in this case the teachers' knowledge of sustainability and its application to sustainability education, views knowledge as being socially constructed within a community of practice. In this view of cognition and learning, the construction of new knowledge by individuals is acknowledged to consist of more than just the reception and retention of already packaged, codified knowledge. The development of new knowledge by the teachers in this research is understood as occurring through processes of individual sense-making with the individual teacher's learning being influenced by their social, cultural and historical setting.

Sociocultural learning theory draws from a number of perspectives of knowledge and learning, including approaches such as: mediated action (Vygotsky, 1978; Wertsch, 1991; Wertsch, Del Rio, & Alvarez, 1995), social cognition (Augoustinos & Walker, 1995; Resnick, 1991; Salomon, 1993; Salomon & Perkins, 1998), social constructivism (Bell & Gilbert, 1996; Driver, Asoko, Leach, Mortimer, & Scott, 1994), situated learning (Hennessy, 1993; Lave & Wenger, 1991), participatory appropriation (Rogoff, 1994, 1995), distributed cognition (Salomon, 1993), and discursive activities (Harré & Gillett, 1994). In this study, this rich conceptual landscape is focused on theorising the local curriculum development processes of teachers. Three conceptual approaches to understanding sociocultural theory in this context are identified and used to frame the discussion: mediated action (Wertsch, 1991), situated cognition (Lave & Wenger, 1991), and distributed cognition (Salomon & Perkins, 1998).

Mediated action (Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995) acknowledges that learning and meaning-making is mediated by the cultural tools that shape social and individual meaning. Learning is aided by the use of cultural tools and artefacts such as language, symbols and systems of communication (Wertsch, 1991). Learning is seen as the process of individual knowledge construction through interpreting and appropriating the *voices* of one's history, making sense of the messages through valued judgements, and formulating one's own meaning. In this process *echoes* of the voices that have spoken into our lives may be present, such as the political views of parents or the influence of early environmental experiences.

Distributed cognition (Harré & Gillett, 1994; Salomon, 1993), social cognition (Augoustinos & Walker, 1995; Resnick, 1991; Salomon & Perkins, 1998), and constructivism (Bell & Gilbert, 1996; Driver et al., 1994) recognise that the processes of mediated action do not occur in isolation. Knowledge construction, learning, and meaning-making within distributed cognition is shared among people through common activity and the use and development of common language. Distributed cognition recognises that learning and

meaning-making occur through iterative processes where meaning is negotiated between participants in a common activity.

Building on this theoretical framework, the concept of situated cognition (Hennessy, 1993; Lave & Wenger, 1991; Rogoff, 1994, 1995) recognises that this social activity occurs within a co-participation framework (Lave & Wenger, 1991) influenced by the sociocultural and historical situation in which it occurs. Knowledge construction, learning, and meaning-making occurs through legitimate participation in a community of practice sharing common goals and common cultural understandings (Salomon & Perkins, 1998).

Taking these three sociocultural constructs, mediated action, distributed cognition and situated cognition, as a theoretical basis for understanding the processes of local sustainability curriculum development, a number of assumptions can be made. Firstly, individual meaning making occurs as people interpret cultural tools such as language, and the codified use of language to communicate ideas and concepts. Codified language expressions such as a national curriculum therefore become important considerations for meaning-making. The national curriculum, for example, can be seen by some as a statement of clear educational intent for all schools where the meaning is codified, fixed, and expressed in a consistent manner for all schools. If we ignore sociocultural theory, a false assumption may be that all schools will read and make the same meaning from the national curriculum.

Sociocultural theory, however, suggests that the meaning that teachers make from, for example, the national curriculum statement, may be different in different situations. Sociocultural theory suggests that meaning is essentially derived as people interpret new information filtered through the experiences of their past (Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995) and make new meaning through iterative discursive practices (Harré & Gillett, 1994; Salomon, 1993), in communities of common endeavour (Hennessy, 1993; Lave & Wenger, 1991; Rogoff, 1994, 1995). In a sociocultural view of learning

and meaning-making language can be assumed to have no fixed meaning apart from within the context and community within which it is currently used. Furthermore, this meaning may change over time with changes in the sociocultural setting of the community of practice.

The sociocultural approach in this research therefore assumes that the meaning of concepts held by individual teachers may be different due to their differing sociocultural histories as well as their participation in different communities of practice within differing schools. Discerning the meaning held by teachers becomes an important part of the research, with their understandings made visible by the way people use word patterns associated with the concepts, as well as the way they actualise the concepts in the context of their activity in their school. In this research the word patterns of curriculum, sustainability, and sustainability education are all viewed as conceptual placeholders (Fairclough, 2013) with their associated meanings made visible by the way the teachers use them in action (Wertsch, 1991).

In the sociocultural approach adopted in this research, the teachers' use of concepts is not only taken as representing the meaning they hold for them, but also as an indicator of their thinking in action. The language used by the teachers is seen as vehicles for their thoughts. The teachers' perceptions of contexts are understood to be shaped by the language they used to describe the concepts, and the meaning held in the language they used (Habermas, 1972, 1976). It follows therefore that the discourses that surround concepts such as curriculum, sustainability, and sustainability education, whether by an individual or by a social grouping, become an important part of the framework of interpretation and meaning, with the success of these discourses dependent upon a shared meaning for the words being used (Fairclough, 2013; Harré & Gillett, 1994).

Sociocultural theorising in this research led to the adoption of *Cultural Historical Activity Theory* as a research tool with which to investigate, analyse and discuss the meaning-making processes undertaken by the teachers as

they developed local sustainability curricula in their school settings. Cultural Historical Activity Theory is a research tool that acknowledges the interactions between people and the sociocultural setting of their activity. It acknowledges the power of people to negotiate meaning in these situations and that people do not merely react to their life conditions, but that they have agency and therefore mediate their activities (Roth, 2004). Cultural Historical Activity Theory seeks to understand human activities in a non–reductionist fashion, accepting them as complex and socially-situated phenomena.

2.2.1 Cultural Historical Activity Theory as a Sociocultural Research Tool

Cultural Historical Activity Theory is a theoretical model for understanding social action with its roots in the philosophical ideas of Hegel and Kant, as well as the theory of dialectical materialism developed by Marx and Engels. Early articulations of the theory, as Activity Theory, can be traced from the work of Vygotsky and Leontiev (Leontiev, 1981; Vygotsky, 1978, 1981, 1997) on cultural-historical psychology.

In the mid-1980s, the concept of Activity Theory was picked up by Scandinavian researchers at the *Centre for Activity Theory and Developmental Work Research,* at the University of Helsinki and further developed into Cultural Historical Activity Theory (Engeström, 1999; Engeström & Miettinen, 1999).

Activity Theory and Mediated Action

Cultural Historical Activity Theory theorises an initial activity complex in which a subject, normally a person, addresses an object, or objective. It recognises that in order to address the object the subject works with tools. In the context of educational research these tools are psychological in nature.

Cultural Historical Activity Theory has its roots in the critique of behaviourism as an explanation for human behaviour (Leontiev, 1981; Vygotsky, 1997).

Behaviourism tries to explain behaviour without invoking the concept of consciousness by reducing all psychological phenomena to a series of stimulus-response reactions, such as typified in the story of *Pavlov's dog* where the salivation response was associated with feeding time (Pavlov, 1955). Pavlov was able to shift the stimulus to being the ringing of a bell, which the dog associated with feeding time.

Vygotsky's initial developments of activity theory were founded on the notion that individual meaning towards an objective is built from the outside through relations with others and that this meaning-making is mediated through the use of psychological tools (Wertsch, 1981, 1991). In Vygotsky's terms, the subject of the activity is a person engaged in an activity towards an objective (the object) which is valued by the subject and motivates the activity, giving it a specific direction and purpose (see Figure 2.1).

Psychological Tool
Language
Codified Expression
Schemata

Subject
Person

Object
Central
Issue to be
achieved
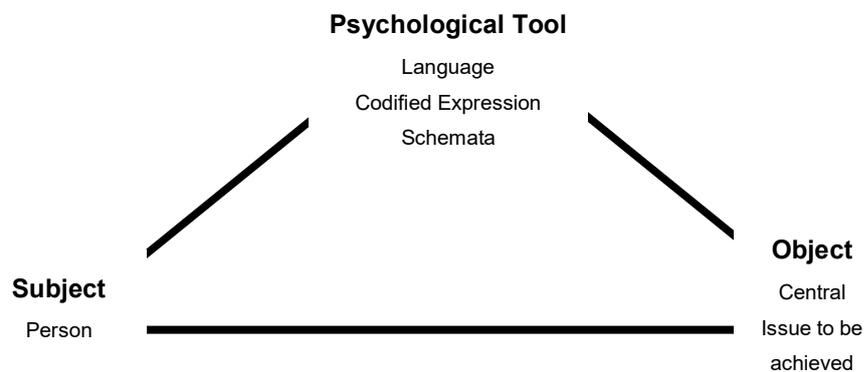
Figure 2.1: Activity Theory and Mediated Action (adapted from Engeström, 1999, p. 31)

In this research the subject of the activity complex is taken to be the teacher, inclusive of their sociocultural history, who is involved in local sustainability curriculum development. The object of the activity complex is theorised to be the teacher's perception of what is to be achieved; their perception of what sustainability education is.

Psychological tools, according to Vygotsky (1981), are artificial formations which are social and directed toward the control of behavioural processes, and include: " … language; various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes, diagrams, maps, and mechanical drawings; and all sorts of conventional signs etc" (Vygotsky, 1981, p. 137). In the context of this research the psychological tools that influence teacher's local sustainability curriculum development include the teachers' perception of sustainability and how they perceive it being represented educationally in the codified language of the national curriculum.

This initial activity complex provides a theoretical framework from which to investigate the meaning-making of teachers through the lens of mediated action (Wertsch, 1981, 1991). Teachers' perceptions of sustainability, sustainability education and how these are represented in the national curriculum are acknowledged in the Activity Theory framework constructed around developing effective local sustainability curricula. Furthermore, the influence of the teacher's personal sociocultural history is acknowledged in the Activity system as being a part of the definition of the subject and object, and the influence of these histories are acknowledged in the sense making activity of local curriculum development.

Activity Theory and Social Cognition

Cultural Historical Activity Theory consists of a second layer of theorised activity. Leontiev (1981), adding to the work of Vygotsky, theorised a second, socially-embedded, layer of organisation for the activity complex. He recognised the importance of the role played by others through social relations in coordinated activities. He extended the theory by adding several features that bring together individual mediated action and collective social activity linking the subject and the object.

Leontiev suggests (Leontiev, 1981) that people often engage in coordinated actions to reach objectives and that these actions may only make sense in

the sociocultural/historical context of a shared work activity. The actions performed by an individual may be interpreted as a part of a much larger coordinated social activity and the sociocultural activity takes into consideration the shared meaning of the individual actors (Tolman, 1999) (see Figure 2.2).

Psychological Tool

Language

Codified Expression

Schemata

Subject	**Objective**	**Outcome**
Person or	Central Issue to be	Expression of
persons	achieved	achieved issue

Rules	**Community**	**Division of Labour**
Social conventions	Stakeholder groups with	Coordination of activity towards
governing what can	an interest in the	reaching the objective
and cannot be done	objective	

Figure 2.2: Cultural Historical Activity Systems (adapted from Engeström, 1999, p. 31)

Cultural Historical Activity Theory acknowledges four further aspects of knowledge creation, learning and meaning-making. These social aspects of cognition acknowledge the community in which the activity between the subject, object and psychological tools occurs and recognise that the

21

outcome of the interactions creates a representation of the desired objective, the outcome of the activity system (Engeström, 1999).

The community of the activity system is defined as the presence of one or more people who share the objective with the subject. In the context of this research the community of the activity is defined as the stakeholders within, and related to, the school that share an interest in local curriculum development in sustainability education.

The first aspect of this sociocultural community acknowledged in the activity system is the rules that regulate actions and interactions within the community. Social interactions of the community are bound by cultural norms (Cobb, McClain, de Silva Lamberg, & Dean, 2003) and in the context of local sustainability curriculum development these include notions of what is appropriate curriculum and pedagogy to address learning in sustainability.

The second aspect of the sociocultural community acknowledged in the activity system is the presence of differing social groups that have a stake in successfully achieving the outcome. In the context of local sustainability curriculum development these groups can be theorised as including teachers from different subject curriculum silos, students, school managers, parents/caregivers and external stakeholders from the school such as environmental and sustainability practitioners.

The third aspect of the sociocultural community acknowledged in the activity system is the way labour is divided in the activities addressed in successfully reaching the objective. The division of labour in the context of local sustainability curriculum development is theorised as being represented by the work relations that exist between teachers, their colleagues within their curriculum learning area, department, teachers in different learning area silos, as well as school management and leadership. As well as recognising how tasks are divided horizontally between community members, this aspect also acknowledges the vertical division of power and status that are at work (Stetsenko & Arievitch, 2010).

The fourth aspect of the sociocultural community acknowledged in the activity system is the desired outcome of the communal activity. This outcome is the actualised expression of the object. The outcome differs from the objective due to the influences on decision-making occurring in the community of practice, with the objective acting as an intermediary step to the development of the outcome. In the context of local sustainability curriculum development, the objective is theorised as the teacher's perception of local sustainability education and the outcome is the actual planned local curriculum that is taught. Thus the activity system theorised for this research, focusing on teachers' local sustainability curriculum development, can therefore be theorised as follows (see Figure 2.3).

Psychological Tools

Sustainability in the national curriculum

Subject

Teacher's perspective of sustainability

Object

Teacher's perspective of sustainability education

Outcome

Local Sustainability Curriculum

Rules

Cultural norms that govern what is appropriate in local sustainability curriculum

Community

Stakeholders with an interest in local sustainability curriculum development

Division of Labour

Leadership, management and collegial practices applied to local sustainability curriculum development

Figure 2.3: The Theorised Cultural Historical Activity System for Local Sustainability Curriculum Development

Cultural Historical Activity Theory offers a tool to investigate the sociocultural practices of teachers as they develop local sustainability curricula in the complicated social setting of New Zealand secondary schools. Cultural Historical Activity Theory, as well as offering a tool to describe the activities occurring in the activity systems, the way teachers make sense of curriculum, sustainability, and sustainability education in their school setting, allows for the identification and articulation of conflicts within this system. It allows for the identification of political and power relations, and contradictions that may appear within the activity system (Fleer, 2016; Gedera, 2016; Yamagata-Lynch, 2010). The approach focuses on what people actually do within their sociocultural setting; the objects that motivate their activity, the tools they use, the community in which they are a part, the rules that pattern their actions, and the way they divide the task in activity (Roth, Tobin, Zimmermann, Bryant, & Davis, 2002).

2.3 Curriculum Development

Curriculum, at its simplest level can be thought of as: "a plan for learning" (Taba, 1962, p. 11) or a representation of the predetermined content knowledge to be delivered to learners (Gramsci, 1971). This conceptualisation of curriculum conveys the original Latin meaning of the word as a *course*, or a course of study. This conceptualisation of curriculum as a representation of the knowledge to be learned is however quite simplistic, as curriculum can be seen as being about far more than the delivery of subject content knowledge, including a recognition of its more general social and political aims (Marsh, 2009).

Those that see curriculum as more than just the representation of the content knowledge to be learned (Marsh, 2009; Pinar, 1995) recognise the concept as being problematic and non-neutral. For example, when considering the content knowledge component of curricula, value decisions have to be made about what content is to be learnt by learners. This raises questions about

24

what knowledge, whose knowledge, who gets to decide, and what knowledge should be left out (Pinar, 1998). In sustainability education these questions become important as it is an emergent concept in the curriculum open to political capture by a range of interest stakeholder groups.

When considering curriculum as a national or state agreement of what should be taught, curriculum can be interpreted as a socioculturally-constructed concept, influenced by political decision making processes and read critically from a number of different perspectives including political, racial and gender text (Pinar, 1995). As New Zealand moves from the current iteration of national curriculum (Ministry of Education, 2007), through a review process, the position and expression of sustainability in the national curriculum is subject to these forces.

When considering curriculum from a learning content perspective, the way knowledge is conceived is also problematic. The intended learning of the curriculum can also be argued to include things such as attitudes, values and skills (McGee, 2008). In this way curriculum can be understood to be influenced by sociocultural value positioning as well as ideological conceptions as to what counts as knowledge. Questions of what learning is expected from curricula leads to questions of the aim of education, and in this context the aim of sustainability education.

Curricula play a role in stabilising society (Wright, Cain, & Monsour, 2015). They can be *conservative* in nature, supporting the current social and cultural systems of society, in effect reproducing the status quo. The aim of intended learning in this conception of curriculum is to stabilise and reproduce the current structures of society. In the case of sustainability education, curriculum can be seen differently. Sustainability education, by its very nature, challenges the knowledge and values of society, rejecting the development paradigm of the 20th century to be replaced with a sustainability paradigm. Curriculum in this sense is *radical* and *critical* in nature seeking to transform society (Wright et al., 2015).

Curriculum is often formalised as an officially documented description of what should be taught in schools at a state or national level. This curriculum is a sociocultural construct, reflecting the values and ideologies of those that developed it. The curriculum policy, as outlined in the written document is interpreted by teachers and translated from the intended curriculum to the curriculum that is actually taught to students. This leads to a consideration of curriculum and its operation in New Zealand schools.

2.3.1 National Curriculum

New Zealand, a nation of 4.8 million people (Statistics New Zealand, 2017), has a national curriculum. This curriculum, published by the Ministry of Education, is under continual revision and republished from time to time. The most recent republication was in 2007 (Ministry of Education, 2007) for promulgation from 2010.

The New Zealand national curriculum statement describes the intended learning to be achieved by students, and therefore to be addressed by teachers, in state and integrated primary, intermediate and secondary schools from year 1 (age 5) to 13 (age 17 approx.).

The curriculum is structured around a series of interlinking components. The most influential of these for secondary schools are the eight curriculum *learning areas*: English, the arts, health and physical education, learning languages, mathematics and statistics, science, social sciences and technology. Within these learning areas, expected student learning is structured as a series of achievement objectives spanning years 1 to year 13.

The structure of the national curriculum also includes a series of overarching components, the *Vision*, *Principles*, *Values* and *Key Competencies,* which span, and are designed to have influence over, the curriculum learning areas. These overarching components provide a framework of intent, or aim for education.

The national curriculum (Ministry of Education, 2007) positions sustainability as an interdisciplinary concept to be addressed through the all learning areas. It is positioned within the overarching components of the curriculum; the Vision, Principles, Values, and Key Competencies (Ministry of Education, 2007).

The Vision presents the aim of the curriculum in developing confident, connected, actively involved, lifelong learners. Sustainability is expressed in this vision as:

> … young people who will …seize the opportunities offered by new knowledge and technologies to secure a sustainable social, cultural, economic, and environmental future for our country [and be] contributors to the well-being of New Zealand – social, cultural, economic and environmental (Ministry of Education, 2007, p. 8).

The Principles, including: high expectations, learning to learn, the Treaty of Waitangi, community engagement, cultural diversity, coherence, inclusion and future focus; are designed to scaffold teachers' curriculum decision making. One of the Principles is a future focus where students are encouraged to explore issues of sustainability, citizenship, enterprise, and globalisation. The curriculum encourages students to become future focused, acknowledging values inherent in sustainability when seeking solutions to issues:

> Students will be encouraged to value diversity as found in our different cultures languages and heritage, equity through fairness and social justice, community and participation for the common good and ecological sustainability which includes care for the environment, integrity which involves being honest, responsible and accountable and acting ethically and to respect themselves, others and human rights (Ministry of Education, 2007, p. 10).

Values are approached in the curriculum through exploration. Students are expected to learn about their own values, and those of others, in New Zealand society, identifying different kinds of values such as moral, social,

cultural, aesthetic and economic values. In dealing with values students are expected to develop the ability to identify and express their own values, and explore with empathy the values of others as they negotiate ethical solutions. The values to be encouraged and modelled in the process include; excellence, innovation, inquiry, curiosity, diversity, equity, community and participation, ecological sustainability, integrity and respect. Sustainability is inherent in this list of values as well as being expressed explicitly as ecological sustainability, focusing on care for the environment (Ministry of Education, 2007).

The fourth overarching component is the key competencies, which are suggested as important for living and lifelong learning. These competencies are: thinking, using symbols, language and texts, managing self, relating to others and participating and contributing. These competencies address sustainability through helping students to become people who:

> Participate and contribute in communities having a sense of belonging and the confidence to participate within new contexts. They understand the importance of balancing rights, roles, and responsibilities and of contributing to the quality and sustainability of social, cultural, physical, and economic environments (Ministry of Education, 2007, p. 13).

The position of sustainability in the national curriculum, expressed through the Vision, Principles, Values and Key Competencies, and not as a formally prescribed individual learning area, allows for it to be approached holistically, recognising its environmental, social and economic aspects without being captured by any particular learning area silo.

However, the corollary of positioning sustainability as non-learning area bound in secondary schools is that it runs the risk of being ignored, or marginalised, as it is not mandated in a strict sense through its expression as a series of achievement objectives. Without this direction and transparency

teachers can easily miss, or ignore, its presence in the curriculum (Bolstad et al., 2012; Dyment, Hill, & Emery, 2015; Hill & Dyment, 2016).

The second risk associated with positioning sustainability as non-learning area bound, and therefore having no expression as achievement objectives, is that secondary teachers who do address sustainability may miss its holistic nature. Their perspective of sustainability may be bound within their learning area silo and thus their perspective of effective sustainability education may also be limited to this perspective, which may constrain their local curriculum development in sustainability.

The positioning of sustainability in the national curriculum and the way teachers interpret its position influences their local curriculum development practices. The ways that local curriculum can be perceived are now discussed.

2.3.2 Local Curriculum

National curriculum can be positioned in different ways, ranging from prescribed content to be delivered through to educational policy. How the curriculum statement is positioned has implications on the degree of agency that teachers have to interpret and implement the curriculum. Where curriculum is positioned as a statement of the deliverable education content, teachers and schools act primarily as deliverers of that governmentally-defined and codified content (Pinar, 1995, 1998; Sabor, 1983). In this case teachers have limited agency to develop and adapt the curriculum to suit the perceived needs of the learners, or to tailor learning to be meaningful in the sociocultural setting of the school. Where national curriculum is positioned as a general policy of intended learning outcomes, such as in New Zealand, teachers and schools are seen as having greater agency in interpreting the national curriculum and developing local approaches to implement that curriculum in response to perceived local needs (Bell, 2005; Bell & Baker, 1997; Bell, Jones, & Carr, 1995).

In the New Zealand education system the national curriculum is used as a basis for developing a local, school based curriculum that tailors learning experiences for the students present in the school (Ministry of Education, 2007). This approach to curriculum is a well-established part of the educational landscape of New Zealand, where the intended learning for students is described as objectives to be achieved by students. In this approach to curriculum, the national curriculum is positioned as a guiding policy document with teachers having agency to decide how the policy aims are to be achieved.

The national curriculum describes itself as a: "framework rather than a detailed plan" (Ministry of Education, 2007, p. 37) which sets the direction for teaching and learning in schools. Teachers use the national curriculum as a basis for developing their intended local curriculum and are encouraged to draw on a wide range of ideas, resources, and models. This site-based practice of interpreting and implementing the national or state curriculum to arrive at a plan for teaching and learning is called *local curriculum development* (Ministry of Education, 2007, p. 37).

The local curriculum that is developed by teachers must be aligned with the national curriculum, however individual schools have considerable flexibility to determine the detail, addressing their individual community context (Ministry of Education, 2007). Teachers are instructed to interpret the national curriculum, and develop their own local curriculum to be implemented, in their particular school's sociocultural context. It is within this framework that sustainability education is being addressed through the development of local curriculum in secondary schools.

It has been common for New Zealand teachers to be involved in curriculum development, both nationally and locally (McGee, 2008). This pattern was particularly prevalent in the 1980's and early 1990's when it was common for New Zealand teachers to participate in national curriculum development through regional groupings to investigate issues in teaching and learning, and

their findings were used to inform national curriculum development (Bell & Baker, 1997).

Local curriculum can be described as the intended learning that a teacher plans to occur in their particular school setting for their students (Eisner, 1994). This *intended* curriculum is what teachers plan to teach to students. In the secondary school setting this iteration of local curriculum is often evidenced by formal schemes of work, unit plans and individual lesson plans, which include consideration of pedagogies to be used to promote student learning. This perspective of local curriculum as intended learning, from a research perspective, is easily accessible as it tends to be formalised in written form. However, local curriculum can also be theorised from a number of alternate functional perspectives (Begg, 2009; Bell & Baker, 1997; Eisner, 1994). These perspectives, though less easily accessible to research, offer valuable insights into local curriculum development.

A second functional perspective of the local curriculum is as the *operational* or *taught* curriculum (Eisner, 1994). This can be described as the activities that actually happen in the teaching of students. The concept of the taught curriculum differs from the intended curriculum in that it recognises students as having agency and that they are recognised as stakeholders in their own learning experience. It recognises them as active participants with their own practices of learning. Evidence of this curriculum concept at play can be seen as interactions by the teacher with students' ideas through questioning and perceptions of students' learning needs and preferences.

A third functional perspective of local curriculum is as the *learnt* curriculum (Begg, 1994). This expression of the local curriculum is the consequence of the teacher's teaching and can be thought of as the sense that students have made of the learning opportunities and experiences that they have had. This iteration of local curriculum can differ markedly from the taught curriculum. For example, Bell and Baker (1997, p. 2) point out that when secondary school science students are taught that water is made up of atoms of oxygen

and hydrogen, they may make sense of this information to explain that when they observe water boiling it is because they see bubbles of oxygen and hydrogen appearing. They have *learnt* that these two gases are what water is made of and so when they see gas bubbles appearing, this must be these gases.

A fourth functional perspective of local curriculum is the *assessed* curriculum, which may also differ significantly from the taught and learnt curriculum (Bell & Baker, 1997). Assessment practices require a choice to be made of what student learning a teacher or assessment schedule focuses on. This choice is only ever a sample of what a student has learnt and is inevitably a value judgement. By definition therefore, assessment of curriculum learning excludes some aspects of a student's potential learning from being assessed. In the world of secondary education, this assessed curriculum is often influenced by the choice of national assessment standards.

A fifth functional perspective of local curriculum is the *hidden* curriculum (Bell & Baker, 1997). The hidden curriculum can be described as the implicit learning that occurs for students. It is expressed not so much by what the teacher says or does through pedagogical approaches and content, but through how the intended curriculum is delivered; what is said and done, and what is not said and not done. At the whole school level the hidden curriculum can be thought of as not so much what the school says it does, but as what it actually does.

These different ways of perceiving local curriculum are important in local sustainability curriculum development when one considers what counts as the local curriculum. In this study the research methodology focuses on observing the intended and taught curriculum as indicators of the local sustainability curriculum that has been developed. Though not focused on by the research methodology, where aspects of the learnt, assessed and hidden curriculum appeared in the data, these are also identified and noted.

2.3.3 Local Curriculum Development

The development of local curriculum has been the focus of previous research and is thought to be influenced by a number of sociocultural factors. These include teacher perception of intended student learning (Taba, 1962; Tyler, 1949), teacher perception of student's learning needs (Bishop & Berryman, 2006; McGee, 2008), the sociocultural setting and context of the school (McGee, 2008; Nicholls & Nicholls, 1972), the normative influence of the teaching community (Bell, 2010; Bell & Gilbert, 1996), and the nature of curriculum decision-making practices within the school community (Cornbleth, 1990).

Teacher perceptions of intended student learning influence their local curriculum development practices (Taba, 1962; Tyler, 1949). One of the roles of the national curriculum is to describe intended student learning, and is achieved in the New Zealand context through descriptions of achievement objectives. Teachers interpret these statements through questions of content, purpose, and organisation of educational experience for students. As teachers develop local curricula they are guided by considering questions such as: What educational purpose is trying to be attained?; What educational experiences can be arranged to attain this learning?; What is the best way to organise these experiences?; and How can I tell if students have learnt what I thought they should learn? (Tyler, 1949).

In the case of local sustainability curriculum development in New Zealand, the national curriculum does not communicate detail of what intended student learning may be expected. In learning areas such as science or English this definition is expressed through achievement objectives. In contrast the goal of sustainability education is only described in general terms as an outcome of the exploration of the Vision, Principles, Values and Key Competencies. No further description is offered for teachers.

Teacher perceptions of students' learning needs also influence their local curriculum development practices (McGee, 2008). Teachers' develop local

curricula with their intended students in mind. Their understanding of the way their students learn, and what interests them, influences the way they structure intended student learning. These understandings of the learning needs of their students direct their decisions concerning development of local curricula, including content, context, pedagogy, and assessment (Bishop & Berryman, 2006). In sustainability education little is currently known about student learning needs with respect to sustainability or how teachers may recognise these needs.

The sociocultural setting and context within the school also influences local curriculum development as teachers consider issues of meaning within the school context (McGee, 2008; Nicholls & Nicholls, 1972). The influence of the school sociocultural setting is often approached through an analysis of the situation in which the learning is to take place. This includes recognising the influences of the learning environment, the students, the teachers, and the school. These considerations determine the learning and teaching activities that students will encounter, and the evaluation of teaching and learning to be carried out.

In the development of sustainability curricula the influence of the sociocultural and geographic setting outside the school may also be significant (McGee, 2008; Nicholls & Nicholls, 1972) . The socioeconomic status of the community that the school sits within, in New Zealand recognised through a decile rating, has the potential to influence the focus of curriculum. Moreover the geographical, place-based nature and historical setting of the school may have influence. Acknowledgement of these community and historical influences from the wider setting of the school can allow the holistic nature of sustainability to be expressed.

The normative influence of the teaching community has also been found to influence local curriculum development (Bell, 2010; Bell & Gilbert, 1996). Teachers work with their own socioculturally agreed and accepted knowledge of what constitutes the curriculum in action within their learning area. This

view extends to what constitutes appropriate and effective pedagogy. Within this sociocultural construct of what curriculum and pedagogy looks like, ideas and practices from other learning areas may be outside the pedagogical norms experienced by the teacher and therefore be rejected as ineffective. This normative influence can be seen, for example, in science, where there is tacit rule that a science lesson must have a practical component in it or else it is not a good one (Bell & Gilbert, 1996).

In the development of local sustainability curricula the potential of this influence is interesting as sustainability education does not yet have established classroom, or outside the classroom, pedagogical norms. The closest may be the *In, About and For the environment* (Barker & Rogers, 2004; Eames et al., 2006) pedagogical approaches inherent in environmental education. In the secondary school setting the influence of learning area curriculum norms may add to or constrain the development of these norms.

The nature of curriculum decision-making practices within the school community also influences local curriculum development practices (Cornbleth, 1990). Local curriculum development has been shown to be an iterative process, where teachers constantly review decisions to continuously improve the learning outcomes for students (Cornbleth, 1990). Local curriculum development is seen as an ongoing activity that involves continual interactions between teachers and their students as they respond to the contextual influences that affect them and their learning.

Curriculum review is important and for it to be effective teachers need to understand what they are trying to achieve. This practice has been made more difficult at the local level, and at the national level, due to poor opportunities to gain professional learning in sustainability and sustainability education. When local curriculum decision-making processes are restricted to something that occurs as a precursor to curriculum delivery, say at the beginning of the year or the beginning of a teaching cycle, and are not revisited during the teaching, curriculum development can be viewed as

somewhat static and technocratic, limiting its effectiveness for student learning.

2.3.4 Teacher Professional Learning

Teacher professional learning is an integral practice associated with local curriculum development (Bell, 2005, 2010). Local curriculum development is linked to teachers' perceptions and understanding of the curriculum they are working with. At the secondary level, teachers normally work within defined subject curriculum areas which have well established learning area traditions, including subject and teacher education pathways. In long established learning areas such as science, social studies, technology and English, teachers have well developed subject matter knowledge and pedagogical content knowledge (Magnusson, Krajcik, & Borko, 1999; Shulman, 1987). In sustainability education, which is a relatively new phenomenon, no such established learning area tradition exists. There is no specific learning area education pathway to become a sustainability teacher in comparison to, for example, a science teacher.

Teachers' knowledge, skills, attitudes, and dispositions have been shown to have implications on student learning (Timperley, Wilson, Barrar, & Fung, 2007), and moreover influence local curriculum development (Bell, 2005). In the case of sustainability education in New Zealand, where in most cases no formal pre-service education pathway exists, the importance of developing teachers' knowledge, skills, attitudes and dispositions is transferred to teacher in-service professional learning opportunities. These opportunities help teachers to enhance their knowledge and understanding of sustainability and sustainability education.

Practices

Teacher professional learning can be viewed as a sociocultural practice which complements local curriculum development (Bell, 2005; Bell & Baker,

1997; Bell & Cowie, 2002; Bell & Gilbert, 1996; Bell et al., 1995). As teachers develop local curriculum they develop their understanding of effective teaching and learning. This in turn affects their understanding of curriculum, its content and its intention for student learning. This reciprocal and interdependent relationship between teacher professional learning and local curriculum development has been theorised in the context of national curriculum developments (Bell, 2005). As teachers interpret and make sense of the national curriculum they develop local curriculum which expresses their understandings of the national curriculum. In reciprocal fashion, as teachers, and national curriculum leaders, reflect upon the local curriculum that is developed, new sense is made of the national curriculum and these reflections inform the revision and review of the national curriculum.

In this relationship teachers interpret the national curriculum and make sense of its intention, which is in itself an aspect of professional learning. In addition, teachers may look for other professional learning opportunities to support and enhance their knowledge and understanding of aspects of the national curriculum. In the context of this study of local sustainability curriculum development, teachers may seek opportunities to enhance their understanding of sustainability, and sustainability education, within the curriculum on which to base their local curriculum development. As teachers implement their locally developed sustainability curricula they then have the opportunity to reflect upon those actions and learn from their development activities. Where the outcomes of their local curriculum development activities do not meet their expectations they may then seek other professional learning opportunities to inform their interpretation of the national curriculum and intended learning in sustainability.

Teacher learning that empowers local curriculum development operates at personal, social and professional levels (Bell & Baker, 1997). Teacher personal learning often begins when teachers identify some aspect of their teaching that is problematic. This self-identification of their need to develop better understandings or practice in a particular area is evidenced through a

sense of dissatisfaction in their current teaching. This discord often manifested in a teacher's willingness to innovate in some area of their teaching and therefore be open to professional learning opportunities as a means of self-initiated growth (Bell & Baker, 1997).

Teacher social learning is important as teachers in classrooms are often isolated in their teaching practices (Bell & Gilbert, 1996). Teachers are often separated from peer feedback, critique and collegial pressures to change. Teacher learning is benefited through social opportunities for working as a team, discussing their teaching with colleagues and to negotiate collectively what it means to be effective (Bell & Gilbert, 1996).

Teacher professional learning is about teachers understanding and taking on other professional roles which test and affirm their concept of being an effective teacher; for example teacher as a co-researcher in a supportive learning environment (Bell & Baker, 1997). The opportunity to try new teaching activities in classrooms and the opportunity for shared professional discussion are also important (Bell & Baker, 1997).

Influences

The effectiveness of professional learning for teachers has been shown to be influenced by a number of factors, including: providing sufficient time for extended opportunities to learn and using the time effectively; engaging external expertise; engaging teachers in problematic discourses around their practice; providing opportunities to interact in a community of professionals; ensuring content is consistent with wider policy trends and in school-based initiatives; and having leaders actively leading the professional learning opportunities (Timperley et al., 2007).

Effective teacher professional learning has been shown to require an extended timeframe for professional development to occur (Timperley et al., 2007). Frequent contact and revisiting of new ideas within this timeframe also seems to be necessary as the process of changing teacher practice often

involves substantive new learning that, at times, challenges existing understandings, beliefs, and values that underpin teaching practice. An extended timeframe for learning gives an opportunity for teachers to work iteratively rather than linearly, as new ideas become revisited in terms of their implications on current teaching practice. This form of teacher professional learning has not been available in New Zealand to support the introduction of sustainability education but would seem to be important to support teacher meaning making around sustainability.

Engagement of external expertise, often researchers, is also a common feature of successful professional learning programmes, particularly where teachers are involved as co-researchers (Bell, 2005; Timperley et al., 2007). Effective teacher learning is often informed by current or concurrent research, with the most effective involving not just content knowledge experts but experts who can make the content meaningful to teachers and manageable within the context of teacher practice. In sustainability education it is important that this external expertise reflects the holistic nature of sustainability, addressing environmental, sociocultural as well as economic issues of sustainability.

The content and learning activities within professional learning programmes are important as these need to be meaningful and relevant to the teachers involved (Timperley et al., 2007). This factor is linked to teachers seeing their own practice as problematic and something worth investigating and improving on. Teacher development addressing their understanding of how to teach particular curricula effectively involves understanding curriculum content, teaching approaches and students' processes of inquiry and the development of students' conceptual understandings. The aspects and concepts that underlie sustainability thinking and decision making are important components of this understanding for teachers.

The presence of a professional learning community was also found by Timperley et al. (2007) to have a positive effect on teachers' professional

learning. They caution however that a professional learning community in itself does not necessitate positive professional learning outcomes. On the contrary there is evidence that if unaffiliated, the community may simply reinforce an infective status quo (Coburn, 2001). In New Zealand sustainability education does not have an identified association of teachers, such as the New Zealand Science Teachers Association, who advocate for teachers in that area of the curriculum. The New Zealand Association for Environmental Education is the closest educational community, meeting biannually and drawing an eclectic grouping of members.[3]

Effective professional learning communities were characterised by two conditions (Timperley et al., 2007). Firstly, professional learning was effective where participants were supported to process new understandings and their implications for teaching. This included challenging problematic beliefs and testing the efficacy of competing ideas. Secondly, professional learning was effective where a clear focus was established on what the purpose of the professional learning programme was about. This focus was assisted by grounding discussions in artefacts representing student learning and by teachers having high but realistic expectations of students and believing that they could make a difference.

Another factor found to be important in successful professional learning programmes was that messages need to be consistent with national policies and/or accepted research findings (Timperley et al., 2007). Where professional development sat outside of these wider accepted frameworks it was far less likely for effective professional development to occur.

The last element found to be important in successful professional learning programmes was the presence of effective leadership at the school level (Timperley et al., 2007). This occurred strongly when leaders supported the professional learning of their teachers and at times participated in the learning. Most frequently however, leaders ensured organisational

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[3] 211 members in 2017.

arrangements were put in place to provide teachers with the opportunities to learn, access to relevant expertise, and opportunities to meet to process new information. In some studies leaders went beyond supporting organisational issues and developed a learning culture in the school where they participated as learners rather than organisers. For school leaders to support the development of sustainability education they themselves need to understand and value it in the curriculum and value its development in the local curriculum.

These features of effective professional learning are important in this research as none of the teachers involved in the research had a formal educational background in sustainability or sustainability education. Although all of them were active local curriculum developers in sustainability education, they were on a journey in their understanding and implementation of sustainability education. The research approach, outlined in more detail in Chapter 3, was built upon these features.

Having identified and discussed the issues associated with teacher professional learning in the development of local sustainability curricula, the review now examines the concept of sustainability, the principle concept for teacher professional learning.

2.4 Sustainability

Sustainability is a term that exemplifies the notion that words are merely conceptual placeholders and that their meaning is socially negotiated over time (Fairclough, 2013). At one level sustainability as a concept seems very simple, yet upon deeper scrutiny seems difficult to define. For example, a survey of more than 500 New Zealanders found that over 80 percent agreed that sustainability was important, but three quarters of the people interviewed could not give a clear description of what sustainability was about apart from simply 'going on indefinitely' (Research New Zealand, 2007).

The etymological root of the word can be traced from the latin word *'tenir'*, meaning to hold, through French with the word 'sustinére', entering the English language as the Anglo-French word *so(u)stein,* and eventually embedding in middle English as the word sustain (Oxford English Dictionary, 2017). This historical meaning is exemplified in, for example, the 1951 fourth edition of the Concise Oxford Dictionary which lists *sustainable* as:

> To bear weight of, hold up …, enable to last out, keep from falling…, endure without giving way, … undergo experience, suffer …, allow validity of, give decision in favour of …, bear out, tend to substantiate or corroborate …, keep up or represent adequately …, keep going continuously, hence sustainable (adjective) (Fowler & Fowler, 1951, p. 1281).

This root meaning seems relatively easy to comprehend, being about keeping going continuously.

The socially negotiated meaning of sustainability, and the way the word is used, has however changed over time, most rapidly in the 20th century. A more contemporary meaning for the term can be seen for example in the 2017 online Oxford English Dictionary (2017) which gives a direct listing for the term *sustainability*, a term that was missing in earlier English dictionaries. It explains the term as: "…. (c) the property of being environmentally sustainable; the degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources". This environmentally based meaning, including the non-depletion of natural resources, has been layered on top of the base meaning about keeping going continuously and forms the basis of contemporary understandings of the way the term sustainability is most often used. In the New Zealand context, where this research is situated, this specific environmental meaning is held alongside an economic discourse. The New Zealand Oxford Dictionary lists both the words sustain and sustainable, with 'sustainable' again described as: "… of economic development or the

utilisation of natural resources, … able to be maintained at a particular level without causing damage to the environment or depletion of the resource" (Deverson & Kennedy, 2005, p. 1131).

The history of this change in meaning can be traced to the latter part of the 20th century. According to Dresner (2008), the term sustainability, with clear environmental links, was first used when considering the role of science and technology in human development. The term was conceptualised as a tool to negotiate tensions between the focus of developing nations on alleviating poverty and deprivation, and the focus of developed nations on environmental protection (Dresner, 2008).

The related term *sustainable development* soon appeared out of this discourse and can be traced to its adoption as a conceptual solution to the tensions between concern for the environment and development. It was first used internationally in 1980 by the International Union for Conservation of Nature and Natural Resources (IUCN, 1980) as concerns about the environment grew.

2.4.1 Environmental Care

The meaning of the term sustainability has been influenced over the last century by a growing concern for the state of the natural environment. Environmental campaigners of the 1960's and 1970's forged the beginnings of the environmental sustainability movement as an opposition to the environmental effects of the established Keynesian economic system, which stimulated economic growth through promoting increased consumer demand (Keynes, 1936). This opposition (for example, Meadows & Randers, 1992; Meadows, Randers, & Behrens, 1972) critiqued the notion that continued economic growth could ever be sustained or sustainable as there were natural limits to growth.

The feelings and arguments of the emergent environmental movement, which positioned itself as an *anti-movement*, are captured well in Rachel Carson's

classic publication, *Silent Spring* (1962). Her work epitomises this era with her warning of the potential disasters coming from the industrialised farming practices of the time with its associated widespread use of pesticides, particularly dichlorodiphenyltrichloroethane (DDT). Her work brought attention to these unsustainable practices and the long term impacts on the ecological systems that were being manipulated for food production. Her work, in the short term, sparked widespread debate about the use of agricultural pesticides and brought about tightening of rules around pesticide use, and federal action against air and water pollution. In the longer term it prompted the establishment of the United States Environmental Protection Agency and began an international discourse on the wider issues of sustainability and unsustainable industrial practices (Graham, 1970).

In the New Zealand context, the environmental movement has most often been expressed through public action when development plans threaten the natural environment. This pattern has occurred many times (O'Brien, 2012; Pawson & Brooking, 2002). The most celebrated example of this type of action was the protest taken in the early 1970's against the flooding of land alongside Lake Manapouri, in New Zealand's South Island. The proposed Manapouri hydroelectricity project would have raised the lake level by up to 30 metres. The environmental campaign successfully opposed the change, eventually gathering support from over 10% of the population (Peat, 1994).

This theme of environmental action continues in New Zealand with recent examples centred on restoration of native biodiversity. The establishment of islands, including mainland islands, where all introduced mammalian pests[4] have been removed have helped restore native bird and plant populations. These environmental movements, like the Manapouri one, are characterised by public leadership and participation through interest groups and the development of not-for-profit trusts such as the Maungatautari Ecological

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[4] E.g. Rats, Stoats, Weasels. New Zealand's only native mammal is a bat.

Island Trust (Maungatautari Ecological Island Trust, 2015) and the Supporters of Tiritiri Matangi (Supporters of Tiritiri Matangi, 2015).

By the early 1980's there was a growing international perception that the natural environment of the Earth was deteriorating due to widespread industrialisation, which was clearly linked to issues of social and economic development. As a response the United Nations General Assembly established the *World Commission on Environment and Development* which considered the interactions of human development on the Earth's environment. The commission's report, published as the book *Our Common Future* (World Commission on Environment and Development, 1987) is also referred to as the *Brundtland Report.*[5] The report sought to balance the demands of more and lesser economically developed nations and proposed the concept of *Sustainable Development* to do this.

2.4.2 **Sustainable Development**

The concept of sustainable development was defined within the Brundtland Report as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 43). Also referred to as the *Brundtland Definition*, it expresses sustainability as the interplay between care for the environment, and the development of social and economic wellbeing. Perhaps due to its simplicity and its ease of being conceptualised as the interplay between the environment, society and the economy, it was widely applied to refer to sustainability internationally, including becoming the standard for New Zealand (Ministry of Economic Development, 2000).

The concept of sustainable development builds on the ecological foundations established by the environmental movement but shifts the position to being far more anthropocentric. Sustainable development not only considers

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[5] Gro Harlem Brundtland was the chair of the commission.

humanity's effect on the environment, it adds considerations of the ways humanity engages with itself within the environment. Notions of physical or ecological sustainability become widened to include concern for social equity between generations, and further still to equity within each generation, including the effects of increasing population (Dresner, 2008; Thiele, 2013). Sustainability prior to the *Brundtland Report* had been influenced by reactions to unsustainable practices, particularly towards the local environment, with the response being to address these environmental problems. The move to considering sustainability through the lens of sustainable development marks a shift from thinking about sustainability through the negative effects that human economic development has had on the environment (past tense and looking backwards), to addressing ideas of human development in a more forward thinking manner, where planning for sustainability is the focus. This repositioning of sustainability as sustainable development situated the environment and development as linked entities and effectively redefined the concept of human development as sustainable development. In this way ideas of human wellbeing were intertwined with environmental wellbeing.

Sustainability as a concept, expressed through sustainable development, is built upon three intertwined sub-concepts. The first of these is *Environmental Care*. This is achieved when the processes used for meeting human needs from resources provided by the Earth's environment, both supply and recycling, do not impair the quantity or quality of the non-human part of the Earth's ecosystem (Arrow et al., 1995; Martin, 2001; Millennium Ecosystem Assessment, 2005; Redclift, 1987; UNESCO, 1992).

From a purely human perspective, this is about maintaining and enhancing the capacity of our natural resources to supply environmental goods and services for people. This includes the manipulation of ecosystems to provide renewable resources to replace non-renewable ones. Here issues such as increases in atmospheric carbon dioxide, overfishing of the oceans, land resource usage, deforestation, damage to fragile ecosystems, rural development, biodiversity loss, managing biotechnology, and the

management of toxic chemicals and hazardous wastes are considered relevant (UNESCO, 1992). Sustainable practices therefore, from a human centred perspective, include maintaining and enhancing the capacity of our natural resources to supply the environmental goods and services we require, in this generation and generations to come.

Environmental care recognises the importance of maintaining and enhancing biodiversity but positions this value, through actions such as manipulation and management of natural ecosystems and creation of modified ecosystems, to provide resources for human needs. This anthropocentric view of biodiversity can be compared with a more eco-centric view where environmental protection is about ensuring the continued existence of all biodiversity regardless of their perceived usefulness to humankind.

The second sub-concept within sustainable development, *Social Wellbeing*, is defined as being fundamentally about understanding and respecting the way different *people* view and experience their world and their political, cultural, ethical, religious and spiritual standpoints (Mirovitskaya & Ascher, 2001; Santone, 2010; UNESCO, 1992).The term *people* in this context refers to the democratic majority of people, but also includes the views of minority groups, for example, indigenous peoples.

Social wellbeing can be defined within sustainable development as being about how people interact with each other (Dresner, 2008; Thiele, 2013; UNESCO, 1992). Communities where relationships between different people groups are respectful, strong and enduring are more sustainable. Moreover, social wellbeing is about ensuring, as far as possible, all individuals are given the opportunity to participate in corporate[6] decision-making. This enhances their sense of belonging in their local community as well as the wider society in which they live. Social wellbeing that is sustainable therefore requires an absence of social exclusion and the provision of opportunities for work and involvement in the community. Consistent major stakeholder groups who are

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[6] Large group, e.g. democratic groupings.

influenced by, and influence, social sustainability decisions include; women, children, indigenous peoples, non-governmental organisations, local authorities, workers, business, industry, farmers, and the science and technology sector (UNESCO, 1992).

The third sub-concept in sustainable development, *Economic Development*, can be defined in 2 ways. Firstly, with a narrow focus concentrating on increasing the size of the economy. Here sustainable economic development is achieved through developing economic processes which continue to increase into the longer term, delivering quantitative year on year economic growth (Dresner, 2008; Thiele, 2013). The second approach is to define economic development in a more holistic way, where the notion of the quality of the economy is also recognised (Redclift, 1987). In this more qualitative approach, sustainable economic development is positioned as growth that occurs without degradation of the environment (Porritt, 2005).

Sustainable economic development, positioned as qualitative economic growth, can be measured through indicators such as; balanced and open trade (absence of a national trade deficit), low poverty levels, consumption patterns, demographics, human health and wellbeing indicators, human settlement patterns, the integration of environmental concerns in development decision making, low inflation, full employment, and equity in the distribution of income and wealth (Dresner, 2008; Thiele, 2013; UNESCO, 1992). Sustainable economic development is achieved when the development of human wealth and improvements in standard of living are considered along with issues of socio-cultural and ecological sustainability such that:

> In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet

human needs and aspirations (World Commission on Environment and Development, 1987, p. 46).

Sustainable development as a concept moves our understanding of sustainability from one that only considers care for the environment. By bringing social wellbeing and economic development into consideration as well it provides the potential for a more holistic notion of sustainability that can be used to consider human development practices and inform decision making in a coordinated way. This potential for informing sustainability decision making is an important aspect of sustainable development as a way of conceptualising sustainability. It is not unproblematic however.

Issues

The problematic nature of sustainable development stems from its propensity to be captured and interpreted in different ways (Summers, Corney, & Childs, 2003). Its strength as a simple concept becomes its weakness as people approach it from differing values positions. Those that value the natural environment, for example, approach sustainable development from this perspective while others facing the same context may approach things from a, say, economic perspective and draw quite different conclusions. The concept is therefore problematic and can be described as being values soaked. Its simplicity, a strength in its adoption, becomes its downfall as it can literally mean different things to different people, all arguing they are correct from their ecological, social or economic perspective (Summers et al., 2003). This ambiguity of meaning therefore can limit its practical value.

A second series of problems inherent in sustainable development is the way the word *development* is interpreted and used. In the concept of sustainable development, development is normally seen as a given. It is often interpreted as a fundamental aspect of human nature, something that all societies aspire to, and independent of economic rationality being described as: "Developed or developing, market-oriented or centrally planned" (World Commission on Environment and Development, 1987, p. 43). In this way development is

recognised as a fundamental aspect of being human; the desire to change and improve one's immediate environment. This aspect of humanity, which is at the heart of humankind's technological endeavour to create the humanly designed world, can be argued to be constant, independent of era, context or culture (Heard & Jamison, 2005; Kimbell, Stables, & Green, 1996). If the inevitability of development is accepted, sustainable development offers a way to direct this inevitable move in society to a more environmentally caring way.

In one school of thought development is not only inevitable it is actually the means by which environmental protection can be achieved (World Commission on Environment and Development, 1987). One of the outcomes of sustainable development through social and economic development is theorised to be greater human wellbeing, which in turn allows people greater choice and therefore the opportunity to protect the environment. According to the World Commission:

> A development path that is sustainable in a physical [environmental] sense could theoretically be pursued even in a rigid social and political setting. But physical sustainability cannot be secured unless development policies pay attention to such considerations as changes in access to resources and in the distribution of costs and benefits (World Commission on Environment and Development, 1987, p. 43).

This view that development, even sustainable development, will bring about an eventual improvement in the environment is not, however, universally accepted and has been heavily critiqued (Laessoe & Öhman, 2010; Selby, 2006; Selby & Kagawa, 2010). The counter argument challenges the notion that development, furthermore development expressed as quantitative economic growth, should be seen as normal and always expected. Central to the critique is the notion that development in many instances is the cause for

unsustainable actions and therefore having development as part of the conceptualisation of sustainability is problematic, if not counter intuitive.

A further problem associated with the term *development* comes when one considers the limits to human growth and development. Some argue that human development is limited by the finite nature of the Earth's resources, with humanity only developing further as long as we have the physical resources to develop with (Meadows & Randers, 1992; Meadows et al., 1972; Porritt, 2005). This *environmental limits* view of sustainability positions human development as a function within the limits set by the environment. When physical resources run out this will limit the development of the human population.

Some, however, argue for an alternate view to the issue of limits to growth, one where human growth and development is not bound by the finite nature of the Earth's resources. It was this view presented by the *World Commission* reasoning that, as the Earth's physical resources became scarce, improvements in the state of technology and social organization would create more efficient ways to use the environment's ability to meet present and future needs (World Commission on Environment and Development, 1987). This *techno-efficiency* view suggests that the limits of human growth and development are negotiable and may change as humanity improves social and technological capital (Porritt, 2005).

Another problematic issue with sustainable development as a concept is the intended audience with respect to economic development. The *World Commission* initially crafted the concept as a tool to consider the positioning of sustainability as an issue focussed on less economically-developed nations. Sustainable development has at its core the concept of needs, which for the *World Commission* meant the needs of lesser economically-developed countries: "… the needs of the world's poor, to which overriding priority should be given" (World Commission on Environment and Development, 1987, p. 43).

Throughout the latter part of the 20th century sustainable development became more widely adopted internationally, including in more economically developed nations, principally by the adoption of *Agenda 21* (UNESCO, 1992). This mandate was produced through the United Nations Conference on Environment and Development held in Rio de Janeiro. *Agenda 21* called for all nations to address issues of sustainable development, stating as a rationale that:

> Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. No nation can achieve this on its own; but together we can - in a global partnership for sustainable development (UNESCO, 1992, sec. 1.1).

The report represented a bold plan for a coordinated international approach to addressing the problems of sustainability. It called on governments to develop and implement contextually-relevant national strategies and plans of action to address issues of sustainability, engaging local government, non-governmental organizations and public interest groups (UNESCO, 1992). The effect of this contextualisation of sustainability was the development of hundreds of working definitions of sustainability (Dobson, 1996; Marien, 1996), for example:

> Sustainability is achieved when organisations, businesses, communities and individuals all take responsibility for the amount of resources they use and the energy they consume, the waste they produce and the impacts they may have on biodiversity within a

supportive and responsive policy framework (France, Compton, & Gilbert, 2011, p. 17).

In New Zealand, for example, the Ministry for the Environment responded to *Agenda 21* by publishing over 40 documents addressing sustainability, defined in terms of the interplay between economic growth, social equality and environmental protection, in locally relevant contexts such as freshwater use and management, building design, waste management and disposal, and ocean management (Ministry for the Environment, 2014). This response was mirrored in other government and non-government agencies, developing discussion documents such as *Sustainable Development* by the Ministry of Economic Development (Ministry of Economic Development, 2000) and *See Change: Learning and Education for Sustainability* (Parliamentary Commissioner for the Environment, 2004).

Sustainable development, as proposed by the *World Commission* and championed through *Agenda 21,* had at its heart the goal of influencing the production and distribution of wealth and wellbeing so that it was more equitable across all peoples through raising the environmental, social and economic wellbeing of less economically developed nations. It may be argued, however, that this ideal of sustainable development has not been achieved, with the gap between the rich and the poor actually becoming more pronounced (Dresner, 2008; Nagel, 2000; Neumayer, 2010; Redclift, 1987; Thiele, 2013).

A contributing factor to this failure in wealth distribution has been the rise of neoliberal economic ideology which has privileged economic growth over community wellbeing and environmental care (Saad-Filho & Johnston, 2005). The rise of neoliberal economics has promoted economic growth through a model where development is directed, and checks and balances are afforded, entirely by the rules of supply and demand, shunning government policy intervention. This dominant economic and social agenda of the late twentieth and early twenty-first centuries has acted against achieving the goals of

sustainable development and created a climate of economic thinking which it has been argued has impeded the development of sustainable economic thinking including the conceptualisation of sustainability education (Hursh, Henderson, & Greenwood, 2015). Under the ideology of neoliberalism, developments in sustainability education are more likely to be influenced by concerns for sustaining economic growth and human development than environmental protection.

Sustainability decision-making in the paradigm of sustainable development weighs the perceived importance of environmental, social and economic aspects of the decision (Parliamentary Commissioner for the Environment, 2002, 2004, UNESCO, 1992, 1997, 2005). This is most often visualised graphically as the intersection of these three spheres of concern (see Figure 2.4). Decisions that are deemed to be most sustainable balance equally environmental care, social wellbeing and economic development.
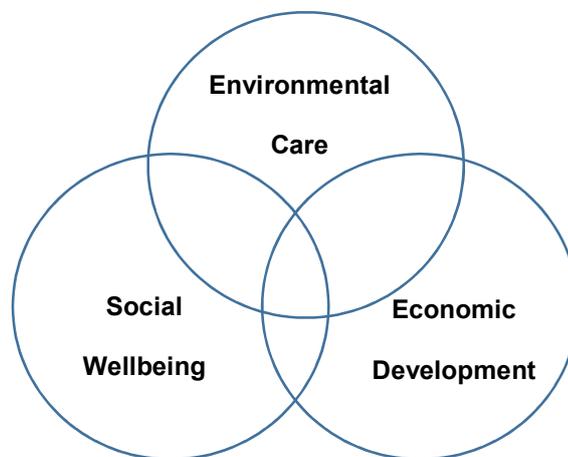
Figure 2.4: Conceptualisation of Sustainable Development (adapted and redrawn from Parliamentary Commissioner for the Environment, 2002, pp. 34–35)

This model depicts sustainability as occurring only within the intersection of ecological, social and economic aspects of sustainability, suggesting that sustainability will only ever be an optional consideration in human

development as issues of environmental care, societal wellbeing and economic development are traded off against each other. This conceptualisation of sustainable development as a model can be critiqued as a weak model of sustainability (Ayres, van den Bergh, & Gowdy, 2001; Ministry of Economic Development, 2000; Moore, 2008; Parliamentary Commissioner for the Environment, 2002). Its values soaked nature leaves it open to wide interpretation and manipulation (Summers et al., 2003), which leads to consideration of models of more sustainable living.

2.4.3 Sustainable Living

An alternative conceptualisation of sustainability, which links environmental care, social wellbeing and economic development, positions these aspects of sustainability as sub-sets, rather than as interlinking and competing as described in sustainable development. In this strong sustainability model (Collados & Duane, 1999; Glavič & Lukman, 2007; Heideger, 1999; Neumayer, 2010; Parliamentary Commissioner for the Environment, 2002, 2004), which this research argues is a way of describing sustainable living, economic development is positioned as a sub-set of social wellbeing. In this model issues of economic growth are conceptualised as being dependent upon the wellbeing of society, as opposed to competing with it. Furthermore, many important aspects of society are recognised as being not actually involved in economic activity.

Likewise, issues of social wellbeing, including economic development, are conceptualised as being a sub-set of environmental care. Human society and economic activity are totally constrained by the natural systems of our planet. In a strong sustainability model it is argued that a healthy environment is a prerequisite to social wellbeing (see Figure 2.5).

In this conceptualisation of sustainability as sustainable living the finite nature of non-renewable resources is acknowledged, with importance placed on the efficient use of these resources while substituting them with renewable

resources where possible. The limits of natural life-supporting systems (ecosystems) to provide these resources, such as food, fibre, building materials and stored energy, and to absorb the effects of human activities that produce pollution and waste, are also acknowledged. Furthermore, sustainability is seen as being achieved through democratic processes with dependence upon peace, justice and equity and an acknowledgement of basic human rights issues (Collados & Duane, 1999; Glavič & Lukman, 2007; Heideger, 1999; Neumayer, 2010; Parliamentary Commissioner for the Environment, 2002, 2004).

The concept of sustainability as sustainable living has the potential to decouple sustainability from the issue of development. When, for example, applied to more economically developed nations it places a mandate on all, regardless of economic status, to live sustainably by balancing care for the environment with social and economic development, within their own context.

Living sustainably, irrespective of development, recognises social wellbeing from a qualitative perspective. Porritt, for example, argues that sustainability can be conceptualised as "a dynamic process which enables all people to realize their potential and to improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems" (Porritt, 2005, p. 22). He argues that achieving sustainability is not simply about managing development in a sustainable way, for example by using resources more effectively, while people pursue their business as usual. He argues for sustainability to be seen as a much wider process: a social and economic project as much as an environmental project, with the objective being the optimisation of human wellbeing.
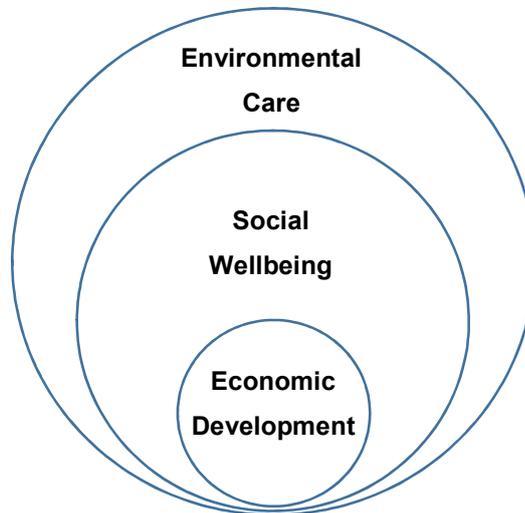
Figure 2.5: Conceptualisation of Sustainable Living (adapted and redrawn from Parliamentary Commissioner for the Environment, 2002, pp. 34–35)

This goal of living sustainably is significantly different to simply optimising development in a sustainable way through sustainable development. By considering the goal of sustainability as the optimisation of human wellbeing in a qualitative way, the concept of sustainability becomes de-coupled from sustainable development. Within this framework, living sustainably becomes the focus, which according to Porritt can be guided by five principles: living within environmental limits, ensuring a strong healthy and just society, achieving a sustainable economy, promoting good governance, and using sound science responsibly to inform decision making (Porritt, 2005).

This re-centring of thinking about sustainability in terms of living in a sustainable way has led to the development of a number of programmes, particularly in business, designed to assess sustainable living practices. Some programmes such as the Enviro-Mark programme (Enviro-Mark Solutions Limited, 2014) focus on environmental sustainability, while others, for example the G4 Sustainability Reporting Guidelines (Global Reporting

57

Initiative, 2013), are more holistic in also acknowledging the socio-cultural aspects of sustainability.[7]

2.4.4 **Sustainability Decision Making**

Sustainable living as a concept differs subtly from the concept of sustainable development in that the emphasis is taken away from development and placed on making lifestyle choices that are sustainable. A corollary of this change is that the emphasis also shifts subtly from decisions made at the community level to individual decision making, where these decisions are influenced by a number of conceptual drivers (Bagoly-Simó, 2013; Glavič & Lukman, 2007; Lockley & Jarrath, 2013; McKenzie, 2004; Tremmel, 2003).

In this model of sustainability decision making aspects of sustainability, environmental care, social wellbeing and economic development interact with concepts that drive sustainable decision making to provide a way to judge the value of interactions and possible future actions (Bagoly-Simó, 2013; Tremmel, 2003). These interactions can be conceptualised as a matrix which inform sustainable thinking and decision-making, leading potentially to living more sustainably (see Table 2.1).

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[7] Within the G4 reporting guidelines sustainability has been defined in pragmatic and measurable terms through the development of a sustainable living index, identifying 46 aspects of sustainability to be reported upon within economic, environmental and social categories.

Table 2.1: Conceptual Framework for Sustainability Decision Making (adapted and redrawn from Lockley & Jarrath, 2013; Ministry of Education, 2015)

Concepts of Sustainability			
	Equity	**Interdependence**	**Responsibility for Action**
Environmental Care	**Respect** e.g. • For other people • For all living things	**Biodiversity Ecosystem Function** e.g. • Water • Materials • Energy	**Towards the Environment** e.g. • Protection • Restoration • Guardianship • Activism
Social Wellbeing	**Social Justice** e.g. • Intergenerational • Intra-generational • Human rights • Cultural diversity	**Participation** e.g. • Family • Community • Nationally **Political Decision Making** e.g. • Democracy • Global agreements	**Towards Others** e.g. • Citizenship • Leadership • Advocacy and activism
Economic Developme nt	**Resource Use** e.g. • Goods and services • Renewable/non-renewable materials • Finance	**Trade** e.g. • Local goods and services • Fair trade • Globalisation	**Consumerism** e.g. • Lifestyle choices **Technological Development** e.g. • Creation of more efficient and less toxic goods and services • Enterprise & entrepreneurship

The left side of the table is labelled vertically: **Aspects of Sustainability**

There is some evidence that conceptual drivers that encourage sustainable decision making include: *equity*, including intergenerational equity; *interdependence;* and *personal responsibility for action* (Lockley & Jarrath, 2013; Ministry of Education, 2015b). Though little research has been carried out in this area it is theorised in this research that these concepts do not operate in isolation and counter conceptual drivers may exist that act against sustainability, such as the concept of greed.

Garrett Hardin (1968) over a generation ago[8] suggested that it is a part of human nature that every person seeks to maximise their individual gain. He argued, drawing on the mathematical modelling of William Forster Lloyd (as cited in Hardin, 1968), that in managing common spaces the benefit to an individual of increasing their use of the resource is the entire worth of that extra use. In comparison, the cost to the other shareholders in the common space is minimal and proportional to the number of people using the space. In his example of a common pasture land used for grazing cattle, the benefit to a farmer for adding one extra cow to the pasture land is the entire value of the animal. In comparison, the effect of overgrazing on the environment, and the potential shortage of food caused by the additional animal is shared by all of herdsmen grazing their animals. In this way, the benefits of the action are privatised to the individual, and the negative effects are socialised, spread across the entire community.

In Hardin's analysis there is within some cultures, particularly in western cultures, a view that humanity has a human desire to maximise private gain. This conceptual driver runs counter to conceptual drivers of sustainable decision making such as equity, interdependence and responsibility for action. This desire to maximise private gain is what he argues lies at the heart of what he terms the *tragedy of the commons* where: "Each man (sic) is locked into a system that compels him to increase his herd without limit – in a world that is limited" (Hardin, 1968, p. 1244).

2.5 Sustainability Education

Sustainability education is an emergent phenomenon. It was established internationally at the 1992 United Nations conference on environment and development, which took place in Rio de Janeiro. The conference moved to

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[8] In his address to the Pacific division of the American Association for the Advancement of Science in the context of arguing that unchecked population growth was the most important issue facing humanity.

integrate environmental education and development education, arguing that "education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues" (UNESCO, 1992, para. 36.3, p. 2). *Agenda 21*, the conference report, called for the re-orientation of environmental education towards sustainability, establishing an international call for sustainability education.

In many countries sustainability education is an emergent curriculum area growing out of traditions of environmental education (Gough, 2013; Sauvē, 1996), itself a relatively recent addition to the educational landscape. This development path of environmental education to sustainability education is mirrored in the New Zealand context.

The first international conference focusing specifically on environmental education was held jointly by UNESCO and the United Nations Environment Programme (UNEP) in 1977, which resulted in a call for the development and implementation of an international environmental education curriculum. Known as the *Belgrade Charter* (UNESCO, 1977), the goal of environmental education was defined as the development of a population of people:

> Aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (UNESCO, 1977, p. 15).

Further refinement of the aims and goals of environmental education as a concept occurred a year later at the world's first Intergovernmental Conference on Environmental Education in Tbilisi, in 1977, where educational objectives and pedagogical considerations were defined for an emergent international curriculum (UNESCO, 1978). Environmental education was defined as having five aims, the first of which was the development of a greater public awareness of, and sensitivity to, the total environment and its allied problems. The second aim was to develop the public's understanding of

relevant knowledge about the environment and its associated problems. Thirdly, environmental education aimed to help social groups and individuals acquire a set of values and feelings of concern for the environment leading to increased motivation for actively participating in environmental improvement and protection. The fourth aim was to help social groups and individuals acquire the necessary skills for identifying and solving environmental problems. The fifth and final aim was to provide social groups and individuals with an opportunity to be actively involved, at all levels, in working toward the resolution of environmental problems (UNESCO, 1978, pp. 26–27).

Sustainability education, though linked to environmental education, differs in important ways. For example:

> [Sustainability education] includes many of the founding principles of environmental education but it is broader in scope. It has more of a human focus and recognises that fundamental human rights and social justice are just as essential to sustainable development as environmental sustainability …. [Sustainability education] also tends to take a more explicit socially critical perspective (Parliamentary Commissioner for the Environment, 2004, p. 39).

2.5.1 Sustainability Education Principles

The aims and objectives of environmental education focus on the environmental care aspect of sustainability. Sustainability education differs from environmental education, however, by being more holistic and socially critical in intent (Barnes, 2013; Horvath, Stewart, & Shea, 2013; Tilbury, 1995). The move from environmental education to sustainability education, as is occurring in New Zealand, requires cognisance of these differences to be appreciated and recognised in curriculum development.

Though sustainability education is a relatively new phenomenon and is continuing to emerge, the difference between it and environmental education have been noted in the literature by a number of authors (Barnes, 2013;

Horvath et al., 2013; Medrick, 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978). A review of this literature suggests a number of principles that define sustainability education (see Table 2.2).

Table 2.2: Sustainability Education Principles

Sustainability Education Principles	
Socially Critical and Informative; acknowledging the power relationships in decision making processes.	(Barnes, 2013; Horvath et al., 2013; Tilbury, 1995)
Issues based; having relevancy and authenticity for learners addressing what might be described as 'real world' issues, engaging in meaningful social or team collaboration with peers and/or society members.	(Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978)
Problematic, future focused and improvement oriented; through personal and group action.	(Barnes, 2013; Medrick, 2013; Tilbury, 1995; UNESCO, 1978)
Socio-culturally / Historically Bound; place, community, experiential and/or expedition based.	(Medrick, 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978)
Systems focused; appreciating the interrelationships between humans and the systems of the natural world.	(Barnes, 2013; Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978)
Transformational; for both individuals and society through personal responsibility and action, affecting attitudes and values, developing a deeper sense of moral responsibility to the Earth and the ability to make ecologically sensitive lifestyle and behavioural choices.	(Barnes, 2013; Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978)
Values Soaked; acknowledging a moral and ethical obligation and motivation to participate in environmental and socio-cultural stewardship.	(Barnes, 2013; Horvath et al., 2013; Tilbury, 1995)

The emergent nature of sustainability education, the varied influence of environmental education on its development, and its marginalised status, has led to the creation of a wide number of alternate conceptions and labels for

sustainability education. Examples include education for sustainable development, environmental education for sustainable development, environmental education and sustainable development, education about sustainable development, education for sustainability, education for sustainable living, education for sustainable futures, sustainable development as a frame of mind, and learning for a sustainable environment (Fien, 2000; Sauvē, 1996).

The differences in these expressions can be accounted for by different authors conceptualising the boundaries and relationships between sustainability and environmental education in different ways as well as the weighting of social and educational goals. Some see these differences as important while others argue that these boundaries are artificial and it is unhelpful to differentiate our understanding of the environment from our social and economic interactions (Gough, 2013). The most common expression of sustainability education internationally is as education for sustainable development, linked to the expression of sustainability as sustainable development (discussed in section 2.4.2). In the New Zealand context sustainability education is referred to at school level as education for sustainability.

No matter where one sits on this spectrum of the importance of the label used to describe sustainability education, it can be argued that whichever term is used, it is open to appropriation by others who were not involved in its formation and used in ways not originally intended by the original author (Stevenson, 2013). In this study the term sustainability education is adopted as a generic term, the meaning of which is discussed in the next section.

2.5.2 **Education for Sustainable Development**

The most dominant international expression of sustainability education is as Education for Sustainable Development (Wals, 2009). This expression of sustainability education was suggested in *Agenda 21* (UNESCO, 1992) and

many European nations, for example England, responded to this call for sustainability education by developing curriculum guidance for schools in education for sustainable development (Council for Environmental Education, 1998; Qualifications and Curriculum Authority, 2003).

This expression of sustainability education has held a central place in thinking about sustainability education for two decades and can be defined in the following way:

> Education for sustainable development enables people to develop the knowledge, values and skills to participate in decisions about the way we do things individually and collectively, both globally and locally, that will improve the quality of life now and without damaging the planet for the future (Summers et al., 2003, p. 3).

Education for sustainable development is based on the principles and values that underlie sustainable development, dealing with environmental, socio-cultural and economic aspects of sustainability (UNESCO, 2014). Moreover, it is consistent with the principles of sustainability education established in Table 2.2, advocating a variety of pedagogical techniques that promote participatory learning and higher-order thinking skills. According to UNESCO education for sustainable development, which is interdisciplinary in nature, builds greater civil capacity for community-based decision-making, social tolerance, and environmental stewardship (UNESCO, 2014).

Despite holding a hegemonic position in thinking around sustainability education, progress towards sustainability education in the form of education for sustainable development, or in fact any form, has proved to be problematic and slow. Ten years after *Agenda 21* was published, concerns over its slow implementation prompted the United Nations to invoke an international focus on education for sustainable development declaring a decade of education to run from 2005-2014. The stated goal of this decade of education for sustainable development was to: "Create a better world for this

generation and future generations of all living things on planet Earth"
(UNESCO, 2014).

Given the issues already mentioned (see Section 2.4.2) with the concept of
sustainable development, it is not perhaps surprising to find there are a
number of tensions in the concept of education for sustainable development
(Rauch, 2002; Summers et al., 2003). These tensions can be summarised as
stemming from firstly, the ways the concept of development is interpreted
within the term, and secondly, the problematic nature of describing education
as for a predetermined social and environmental outcome, in this case
sustainable development.

The Issue of Development

The first tension, the place and expression of *development* in the term, can
be exemplified when considering the difference between environmental
conservation and human development. For example, from a purely
environmental education perspective, it could be argued that sustainability
can be achieved without needing to engage concepts of human development
at all. Indeed, some may argue that sustainability may be achieved more
readily by having less human development, and thus the term development is
not needed in an expression of sustainability education.

Excluding the term development from the concept of sustainability education,
however, marginalises the position of less economically-developed nations,
where decisions about sustainable behaviour rest on having the resources to
act in sustainable ways. According to Sato (as quoted in Stevenson, 2013, p.
149), the term sustainable development, and therefore education for
sustainable development, was conceptualised as a compromise between
these two positions, with the argument that less economically-developed
nations required development to allow them to achieve a position where they
no longer have adverse effects on their natural environments.

Because of these different conceptions of *development*, education for sustainable development as a concept is open to widely different interpretations. Where development is interpreted as being the central concept in sustainable development, and likewise within education for sustainable development, it becomes possible to position sustainability education as having a focus on continued human social and economic development, divorced from its relationship with the natural environment (Stevenson, 2013). In this situation the term sustainability is captured and can be used to support, for example, arguments for continued economic growth at the cost of environmental degradation.

2.5.3 The Aim of Sustainability Education

A second tension within the expression of sustainability education as education for sustainable development, and a tension in all forms of sustainability education, is the perceived goal of sustainability education. In education for sustainable development this tension is represented in the term *for*. The tension here is linked to the goals and purposes of education in its widest sense and the difference between educational goals and social goals.

It could be argued that the goal of sustainability education, like environmental education, is to bring about a change in society towards appreciating and acting more benevolently towards the environment and living in a more sustainable way (Kopnina, 2012). Within this view, curriculum within sustainability education can be conceptualised as the delivery of a preconceived body of codified knowledge and skills concerning living sustainably.

This somewhat technicist approach to curriculum focuses on the delivery of known knowledge and best practice transforming individuals and their sustainability behaviours, with this change in behaviour generally regarded as the ultimate goal (Ferreira, 2013). This transformation of individuals into informed and active sustainable citizens, it is assumed, leads to: "…

transformation of the behaviour of whole communities and whole societies" (Ferreira, 2013, p. 63).

This notion of education being for a predetermined social and environmental outcome does not sit easily, however, with some education philosophers. It has been challenged in the literature (Scott, 2002) with the argument against positioning education as *for* predetermined outcomes exemplified by Jickling's thought piece: "Why I don't want my children to be educated for sustainable development" (Jickling, 1992). Jickling's argument rests on the premise that education should focus on educational goals, not social goals. The idea that education is about persuading people to think in predetermined ways, even sustainable ways, contradicts his, and others from a western perspective, view of the real purpose of education, which is to teach people how to think for themselves (Jickling & Spork, 1998; Wals & Dillon, 2013).

An alternative to positioning sustainability education as addressing predetermined social and environmental outcomes is to position it as emancipatory with educational goals. If sustainability education is positioned in this way, curriculum becomes positioned as focused on students exploring the concept of sustainability and its implications in ways that help them to consider how they might change the ways in which they live to act more sustainably in their own context (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013).

The goal of this view of sustainability education is to help individuals think critically and autonomously about issues of sustainability, recognising their own and others' social orientations and value positions (Jickling, 1992; Scott, 2002; Wals, 2010). In this critical and emancipatory view of sustainability education, behavioural change still remains the ultimate goal but it is arrived at through empowering students to democratically transform society, not just apply predetermined behaviours (Gough, 2013; Huckle, 2014). This emancipatory view of sustainability education is structured in the New Zealand national curriculum, the details of which are discussed next.

2.5.4 **Sustainability in the National Curriculum**

Sustainability education has been researched in New Zealand primary (elementary, years 0-6) and secondary schools (years 9 – 13) with the greatest uptake being shown to occur in primary schools (Eames et al., 2008). The greater uptake in primary schools is thought to be consistent with teachers having greater freedom to create local curriculum that addresses the holistic nature of sustainability as well as the interdisciplinary nature of sustainability in the curriculum. Despite its inclusion in primary schools it is still, however, emergent, and has been described as "a grass roots initiative driven by enthusiastic teachers with support from community groups, local government agencies, and non-governmental organisations" (Eames et al., 2008, p. 35).

At the secondary education level sustainability education has had less success (Cowie, Eames, Harlow, & Bolstad, 2004). Reasons for the difference have been attributed to differences between the educational philosophy and operation of primary and secondary schools, with secondary schools having a far more siloed and assessment driven approach to curriculum (Cowie et al., 2004).

The implementation of sustainability education through the development of local curricula is a recent phenomenon with concepts of sustainability first appearing formally as part of the New Zealand national curriculum in 2000. Sustainability education was initially positioned as environmental education. A set of *Guidelines for Environmental Education for New Zealand Schools* (Ministry of Education, 1999) was produced in response to *Agenda 21* (UNESCO, 1992). These guidelines, grounded in the principles of environmental education as laid out in the Tbilisi (UNESCO, 1978) and Belgrade (UNESCO, 1977) (see Section 2.5) gatherings defined environmental education as "a multi-disciplinary approach to learning that develops knowledge, awareness, attitudes, values and skills that … enable

individuals and the community to contribute towards maintaining and improving the quality of the environment" (Ministry of Education, 1999, p. 9).

New Zealand's educational response to *Agenda 21* (UNESCO, 1992) through environmental education came at the time when many countries were positioning their response to *Agenda 21* as education for sustainable development. The United Kingdom for example[9] responded by creating a more sustainability focused curriculum focused on knowledge, values and skill development for sustainability decision making aimed at improving the quality of people's lives without damaging the planet any further (Council for Environmental Education, 1998).

The curriculum defined sustainability holistically, identifying seven dimensions: interdependence; citizenship and stewardship; needs and rights of future generations; diversity (cultural, social, economic, and biological); quality of life, equity and justice; sustainable change; and uncertainty and precaution in action. The curriculum expression of education for sustainable development is consistent with the principles of effective sustainability education established in section 2.5.1, expressing a broad socially critical view of sustainability where fundamental human rights and social justice are equally important as environmental sustainability. Moreover, it positions sustainability education as emancipatory as opposed to technicist, focussing on students exploring the concept of sustainability and its implications in ways that help them to consider how they might change the ways in which they live to act more sustainably in their own context (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013). This curriculum was widely accepted and became part of the United Kingdom curriculum landscape (Summers, Childs, & Corney, 2005).

The development of sustainability education in New Zealand has taken quite a different route with sustainability education far more centred on

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[9] This example is presented as a relevant comparison to New Zealand, given the strong language and educational relationship.

environmental education. In comparison to the United Kingdom's sustainability education curriculum, New Zealand's *Guidelines* expressed sustainability narrowly as ecological sustainability. It did not reflect the same degree of social criticality and balance of human rights and social justice with environmental sustainability. This positioning of sustainability as a sub issue of environmental education is what Tilbury (1995) describes as an approach that can be labelled environmental education for sustainability.

The reasoning for New Zealand's initial response to sustainability education being positioned as environmental education is a matter of conjecture, and is unstated in the *Guidelines*. Factors that may have contributed, though, include contextual issues such as New Zealand having a small population and with a high proportion of endemic species. New Zealand has only approximately five million people in a geographical area similar to the United Kingdom and was one of the last island countries to be populated by Europeans. These contextual issues may have influenced the positioning of the curriculum to be far more environmentally focused.

Secondary School Specialisation

After the data for this research was generated in 2010 and 2011, sustainability education was formally recognised in 2012 as a *subject* approved for credit towards university entrance at secondary schools and labelled Education for Sustainability. Curriculum support material was produced in the form of a *New Zealand Curriculum Guide for Senior Secondary in Education for Sustainability* (Ministry of Education, 2015a) and included on the Ministry of Education's web based support material for teachers, Te Kete Ipurangi (Ministry of Education, 2015c). The introduction of the new curriculum support material was not, however, accompanied by any formal, or informal, professional development to alert teachers to its presence or to help develop consistent meaning from the support material.

Education for Sustainability is positioned within this web based material as part of the social sciences curriculum subject area. It is defined through a

number of concepts, namely; sustainability, equity, interdependence and responsibility for action. These concepts interrelate and are seen to operate within the commonly accepted aspects of sustainability; environmental, sociocultural and economic (Ministry of Education, 2015b).

The nature of sustainability presented within the senior secondary guidelines (Ministry of Education, 2015a) addresses sustainability in a far more holistic manner than did the *Guidelines* for Environmental Education. The environmental aspect of sustainability is described as being about maintaining the integrity of the life support systems of the Earth. It incorporates notions of biodiversity and ecosystem services. The sociocultural aspect of sustainability is described as being about equity within and between generations, and within and between ethnic and social groups. It is inclusive of people's mental and physical well-being and the cohesion of their communities based on the fair distribution of natural resources. Furthermore, clarity is offered around the meaning of cultural sustainability where it is referred to as the nourishment and sharing of attitudes and values that represent diverse ways of viewing the world. It includes notions of sustainable collective decision-making processes where all citizens have the opportunity to express their views freely and participate in decision-making. Finally, the economic aspect of sustainability is described as being about using resources to provide necessary and desirable products and services for the present generation without compromising the ability of future generations to do the same.

The nature of sustainability is represented as the interaction of the aspects of sustainability; environmental, sociocultural and economic, and the identified concepts; sustainability, equity, interdependence and responsibility for action. These interactions are used to inform sustainable decision-making. For example, when the concept of equity is applied to thinking about the environmental aspect of sustainability issues of biodiversity and species loss may be highlighted. Alternately, if equity is applied to the social aspect of sustainability questions of social justice and intergenerational equity may

arise. These aspects and concepts of sustainability form a matrix from which sustainability can be considered.

The interplay of these aspects and concepts that inform sustainability decision-making are then further expressed in the curriculum support material through a series of learning objectives for curriculum levels seven and eight (years 12 and 13). These learning objectives link to the assessment standards framework for education for sustainability on the New Zealand Qualifications Authority framework (New Zealand Qualifications Authority, 2017).

The achievement standards for education for sustainability reflect the principles of effective sustainability education as shown in Table 2.2, addressing student learning of knowledge, skills and experience. For example, at level 8 (year 12, 17 year olds) students involved in education for sustainability should be able to:

- Evaluate social, economic, and technological measures that could be taken to sustain natural resources and improve biodiversity now and for the future.
- Analyse the impact of strategies and initiatives for a sustainable future.
- Analyse the values of different groups of people, how these values are expressed in various practices, and the present and future consequences for sustainability.
- Analyse actions necessary for sustainability and plan, implement, and critically evaluate personal action for a sustainable future (Ministry of Education, 2017).

These achievement descriptors and the associated assessment standards now effectively define sustainability education in the secondary sector in New Zealand. Furthermore, the assessment descriptors, such as evaluate and analyse, indicate the perceived approach to sustainability education in New Zealand is an emancipatory one, where students have the opportunity to

explore the concept of sustainability and its implications in ways that help them to consider how they might change the ways in which they live in order to act more sustainably in their own context (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013).

This guidance and assessment material forms the effective curriculum at the secondary school level in the New Zealand context to address learning in sustainability. This curriculum, though not presented as a mandated learning area, addresses the principles of sustainability education established in Table 2.2, namely: social criticality; relevance; authenticity; issues focus; problematic in nature; future focus; improvement orientation; sociocultural / historical bound nature; systems focus; transformational intent; and valued nature. It creates a framework from which teachers can plan their local curriculum. This framework for sustainability education for New Zealand secondary schools provides a level of scaffolding and guidance from which teachers have the opportunity to develop local curriculum to address local school preferences and student learning needs.

2.6 Chapter Summary

This chapter has reviewed literature around the four main concepts of this research; *sociocultural theorising*, *curriculum development, sustainability and sustainability education*. The reviews of each section indicated directions appropriate for this research.

The development of local sustainability curricula by teachers was investigated in this research through a sociocultural approach to knowledge creation, meaning making, and learning (Lave & Wenger, 1991; Salomon & Perkins, 1998; Wertsch, 1991). Teachers meaning making practices are seen as being mediated through the practice of social interaction in a community of practice. This research acknowledges the interactions of teachers in their school communities as well as the interactions of the teachers as research participants and co-labourers in local sustainability curriculum development.

In addition, Cultural Historical Activity Theory is adopted as a theoretical lens in this research to investigate the practices of teachers as they develop new knowledge and meaning, creating local curriculum in sustainability education. Cultural Historical Activity Theory theorises two interacting layers of organisation expressed as an activity system. The first layer is theorised as the interactions of the *subject*, *object,* and *psychological tools* that inform understanding between the subject and the object (Engeström, 1999; Vygotsky, 1981). In the context of local sustainability curriculum development, the subject of the activity system is theorised as the teacher and their sociocultural understandings of curriculum, sustainability, and sustainability education. The object of the activity system is theorised as being the local sustainability education curriculum that the teacher develops. The psychological tools used to influence understanding between the subject and object is theorised as the teacher's perception of sustainability in the national curriculum.

The second layer of the activity system is theorised as the meaning-making practices that occur within the collective social activity of a community of practice (Engeström & Miettinen, 1999). The activities of the community, made up of stakeholders in the objective, are related and motivated by the object, or objective, and mediated by perceived rules and the way the community divides and organises the tasks required to achieve the desired outcome. In the context of local sustainability curriculum development, the sociocultural community of the activity system is defined as the people who have an interest in the development of local curriculum in the school. This includes school teachers, school leaders and managers, students, their parents and guardians, and external organisations with an interest in sustainability education. The rules that influence the activity system are theorised to be based on the educational values expressed in the school, including subject teaching values and school wide values. The division of labour aspect of the activity system is theorised as being represented by the way curriculum decision-making happens within the school setting.

Curriculum is positioned in this research as a socioculturally-constructed concept representing what knowledge is to be learnt (Taba, 1962), with the concept of knowledge including consideration of attitudes, values and skills (McGee, 2008). This position acknowledges the subjective, sociocultural, valued, and ideological nature of curriculum.

Local curriculum development is defined as the school based practice of interpreting and implementing the national (or state) curriculum to arrive at a plan for teaching and learning. Local curriculum can be understood from a number of different operational perspectives (Eisner, 1994) including the intended, operational, learnt, assessed and hidden curricula.

Local curriculum development practices are theorised to involve a number of sociocultural factors such as teachers' perceptions of intended student learning (Taba, 1962; Tyler, 1949), teachers' perceptions of their student's learning needs (Bishop & Berryman, 2006; McGee, 2008), the sociocultural setting and context of the school (McGee, 2008; Nicholls & Nicholls, 1972), the normative influence of the teaching community (Bell, 2010; Bell & Gilbert, 1996) and the iterative nature of curriculum decision making within that community (Cornbleth, 1990).

Local curriculum development is acknowledged as being interconnected with teacher professional development (Bell & Baker, 1997). In long established learning areas where clear education and teacher training pathways exist, teachers have well developed subject matter and pedagogical content knowledge (Magnusson et al., 1999; Shulman, 1987). This is not the case in sustainability education. No such established learning area tradition exists and teacher professional development has been limited and focussed primarily on environmental education. In this research the reciprocal and interdependent relationship between local curriculum development and teacher professional development is acknowledged (Bell & Baker, 1997).

The socially negotiated meaning of the term sustainability has changed, most rapidly in the 20th century, from its Latin root of 'being able to go on

indefinitely' (Fowler & Fowler, 1951) to a more environmental meaning (Deverson & Kennedy, 2005). This change has been influenced by increasing concern for the environment in response to industrialisation in the early 20th century (Dresner, 2008).

The concept of sustainability is built upon three intertwined sub-concepts; Environmental Care (Arrow et al., 1995; Martin, 2001; Millennium Ecosystem Assessment, 2005; Redclift, 1987; UNESCO, 1992), Social Wellbeing (Mirovitskaya & Ascher, 2001; Santone, 2010; UNESCO, 1992), and Economic Development (Redclift, 1987; Santone, 2010; UNESCO, 1992).

Sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 43), has become a foundational construct of sustainability. Sustainable development, as a concept, is however problematic, being prone to capture and interpretation regarding the meaning of development (Summers, Corney, & Childs, 2003, Sauvé, 1996; Bonnett, 1999; Scott & Reid, 2001) and debate around the limits to growth (Meadows & Randers, 1992; Meadows et al., 1972; Porritt, 2005).

Living sustainably (Bagoly-Simó, 2013; Glavič & Lukman, 2007; Lockley & Jarrath, 2013; McKenzie, 2004; Tremmel, 2003; T. Wright, 2002) is an alternate model of sustainability to sustainable development, and positions ecological concerns as paramount and as both enabling and constraining to socio-cultural and economic aspects of life. In the living sustainably construct of sustainability, the optimisation of both environmental and human wellbeing is theorised as being attainable through ensuring a strong, healthy and just society (Collados & Duane, 1999; Glavič & Lukman, 2007; Heideger, 1999; Neumayer, 2010; Parliamentary Commissioner for the Environment, 2002, 2004).

Sustainability, as conceptualised as living sustainably, requires the development of the capacity to make sustainable life choices, and shifts the

emphasis subtly from focusing on decisions made at the community level to individual decision making. Sustainable decision making, as part of living sustainably, is theorised as being influenced by a series of conceptual drivers including; equity, interdependence and responsibility for action (Bagoly-Simó, 2013; Lockley & Jarrath, 2013). These conceptual drivers influence decision-making in the interdependent areas of; environmental care, social wellbeing and economic development. Where these conceptual drivers are well developed sustainable decisions are more likely to occur.

The development of sustainability education in New Zealand follows national development of environmental education. Sustainability education is understood to be broader in scope than environmental education, with a greater human, sociocultural and historical focus (Parliamentary Commissioner for the Environment, 2004) that includes the following characteristics: Socially critical and informative (Barnes, 2013; Horvath et al., 2013; Tilbury, 1995); issues based (Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978); problematic, future focused and improvement oriented (Barnes, 2013; Medrick, 2013; Tilbury, 1995; UNESCO, 1978); socio-culturally / historically and place bound (Medrick, 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978); systems focused (Barnes, 2013; Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978); values soaked (Barnes, 2013; Horvath et al., 2013; Tilbury, 1995); and transformational (Barnes, 2013; Horvath et al., 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978).

Sustainability education is positioned in the New Zealand curriculum (Ministry of Education, 2007) in an interdisciplinary, socially critical manner that links environmental care, sociocultural wellbeing and economic development. This positioning is consistent with an emancipatory view of sustainability education that focuses on individuals exploring the concept of sustainability and its implications in ways that help them to consider how they might change the ways in which they live to act more sustainably in their own context (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013).

Sustainability education is a relatively new addition to the curriculum in New Zealand and secondary teachers, who this research focuses on, have not had formal subject education in sustainability, nor teacher education in sustainability education. Moreover, New Zealand secondary teachers have had few coordinated professional learning opportunities to help them understand either sustainability or sustainability education.

Secondary teachers now have the responsibility to create local curriculum to address sustainability education. It can be argued that the curriculum positions sustainability as a holistic concept, consisting of environmental care, social wellbeing and economic development. Furthermore, it positions sustainability education as interdisciplinary and emancipatory in nature.

In summary, given the limited research done prior to this research (Bolstad et al., 2004; Cowie & Eames, 2004; Eames et al., 2008; Eames et al., 2010), the key issue for this research is how secondary teachers develop local sustainability curricula in their school contexts. The research presents the argument that the successful implementation of sustainability education in New Zealand secondary schools is dependent upon, among other things: Teachers' perceptions of what sustainability is; their perceptions of what effective sustainability education is; and the practices teachers employ to develop local curricula in the sociocultural context of their school.

The research asks three major questions. Firstly, how do secondary teachers make sense of sustainability? Secondly how do secondary teachers make sense of sustainability education? And thirdly, what are the practices of teachers when developing local sustainability curricula in secondary schools?

Chapter 3   Research Methodology

3.1 Introduction

The landscape of social science research is a continuously evolving one and even during the period of this study changes in appreciation, expression and even language to describe the field have evolved (Erickson, 2018; Lincoln, Lynham, & Guba, 2011, 2018; Onwuegbuzie, 2002). This development has challenged established ways of thinking and conceptualising the elements of research within the social sciences, and at the same time opened conceptualisation within the field to the possibility of a mixture and blurring of meaning when considering the theoretical constructs for research (Dillon & Wals, 2006).

In this research, however, an approach was taken to the consideration of the theoretical constructs of the research framework that was in keeping with the somewhat conservative milieu of a schooling system, but in which the teacher voice was recognised as key to exploring new perspectives. In conducting the study, four elements were considered: the research paradigm, ontological and epistemological assumptions, research methodology, and the choice of particular data generation methods used to generate and interpret data related to the research questions. These four elements represent ways of viewing and positioning the research, from the macro scale of considering the philosophical standpoint of the research and how it relates to the development of what counts as new knowledge in the field, through to micro and technical scale considerations of how data might be best generated given the circumstances of the research. This chapter presents the case for, and details of, the way these four elements were considered in this research of local sustainability curriculum development by secondary school teachers.

This research was done in the interpretivist paradigm so as to investigate the sociocultural practices of teachers as they create new knowledge, make meaning and learn as they develop local sustainability curricula in their

schools. What counts as new knowledge is approached from a constructivist epistemology and interpretivist ontology. This constructivist / interpretivist paradigm is taken to frame the assumptions underlying the nature of knowledge in the research.

The methodological approach taken in the study is action research with Cultural Historical Activity Theory guiding the approach to data collection and analysis. The research methods employed include guided interviews, collaborative discussions, participant observations and document analysis. Each aspect is now discussed in turn.

3.2 A Sociocultural Interpretive Paradigm

This research is framed within a sociocultural interpretivist paradigm. Paradigms are a way of looking at or approaching research from a particular perspective and can be described as a worldview which includes assumptions of what counts, or is accepted as new knowledge (Cohen, Manion, & Morrison, 2011a). Furthermore, a paradigmatic view of the world sets out a shared belief system or set of principles, a way of pursuing knowledge which is supported through the development of a community of research practice. This research was positioned within the community of practice of sociocultural theorists (Augoustinos & Walker, 1995; Bell & Gilbert, 1996; Driver et al., 1994; Harré & Gillett, 1994; Hennessy, 1993; Lave & Wenger, 1991; Resnick, 1991; Rogoff, 1994, 1995, Salomon, 1993, 1993; Salomon & Perkins, 1998; Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995).

The sociocultural interpretivist paradigm differs from the positivist paradigm of the natural sciences, where knowledge is seen as being independent of people and experience, existing externally to peoples' lived experiences and waiting to be discovered (Cohen et al., 2011a). In a sociocultural interpretivist paradigm the researcher seeks to interpret the social world from within the culturally-derived and historically-situated setting of the research. The

paradigm assumes that knowledge and meaning exist internally within people, constructed through their interactions with others and their social worlds and it is through these interactions that knowledge and meaning are formed (Cohen et al., 2011a).

The sociocultural interpretive paradigm adopted in this research positioned the subject of the research, the teachers, and their social settings as partners with the researcher in the generation of knowledge and meaning (Crotty, 1998). In this way, knowledge and meaning are seen as being derived from culturally and historically-situated interpretations of the social world. The behaviour of the research participants is seen to consist of actions that are meaningful to them and understandable by them, and the researcher, with reference to their situated cultural and historical setting.

A tenet of the sociocultural interpretive paradigm is that the meaning of people's actions may only become intelligible to others who observe them, in this case the researcher, through reference to the meaning that the individual actor constructs for their actions. That is, the observation of a person's action does not in itself create meaning (Cohen et al., 2011a).

An observed behaviour may convey a range of meanings depending upon the contextual setting in which it is acted. For example, the simple act of drinking a glass of wine may be interpreted in a number of ways. The meaning of the act can range from an act of self-indulgence to a religious communication depending on the cultural and historical context (Carr & Kemmis, 1986). Of interest to a researcher is the understanding of the social world from the standpoint of the individual or individuals who are part of the action being investigated (Cohen et al., 2011a).

The sociocultural interpretivist paradigm adopted in this research acknowledges that the actions of the research subjects, in this case teachers, are best interpreted with reference to the known motives, intentions and purposes they have in performing these actions. In this research concerning the development of local sustainability curricula, knowledge is seen as

contextual and subjective, being the reality that exists in the situations that the teachers find themselves. The reality of local curriculum development for one teacher in a particular school may be quite a different reality to that experienced by another teacher in a different school. Moreover, the experience of one teacher in a particular school may be quite different to another teacher in the same school due to their different sociocultural historical experiences. Notwithstanding this, however, the experiences of all the teachers in the research can be expected to share commonalities given their shared cultural, historical and institutional knowledge and practices (Cohen et al., 2011a). The sociocultural interpretivist paradigm taken in this research acknowledges that these potentially different views of reality by teachers can exist simultaneously whilst being valid and count as knowledge in their specific sociocultural and historical contexts, which is their lived reality in their particular school setting.

New knowledge creation and meaning-making in this research paradigm requires not only taking note of the teachers' conversations and actions, it requires co-construction interpretation by the researcher. The interpretation process in this research is underpinned by the notion that wherever possible it is the research participants who define the meaning of their actions through opportunities to explain and comment upon their actions. The teachers' own interpretations bring meaning to the observations (Carr & Kemmis, 1986).

Theorising within this research paradigm stresses the way individuals construct, modify and interpret the world in which they live (Cohen et al., 2011a). Emphasis is placed on explanation and understanding of the unique and particular individual case, rather than trying to generalise universal relationships. Therefore theory is emergent and arises from particular situations giving generating diverse representations of meaning. The experiences and meaning-making practices of the teachers in this research are interpreted as being indicative of the sorts of practices that may be experienced by teachers when developing local sustainability curricula.

Hence the research is specific to these teachers and their contexts and not generalisable or causative or co-relational, as in the positivist paradigm.

3.3 Ontological and Epistemological Assumptions

Questions of ontology and epistemology are considered together in this research. Ontological questions address the nature of reality and the nature of things (Cohen et al., 2011a, p. 3), and epistemological questions address the nature of knowledge as seen in the research, what counts as knowledge, its forms, how it can be generated and communicated.

In the social sciences a number of different onto-epistemological viewpoints have been described. For the purposes of grounding this research in an onto-epistemological framework, the discussion has been kept to considering the differences between the objectivist view and the constructivist view of social reality and their implications on the research. This is done to keep the account uncomplicated, and these two views have the most bearing on this research.

3.3.1 Objectivism

The objectivist view of knowledge and knowing positions reality as something which is external to individuals, imposing itself on their consciousness, where "objects have an independent existence and are not dependent on the knower" (Cohen et al., 2011a, p. 6). Thus the objectivist onto-epistemological view of knowledge is that it is seen as existing outside of human cognisance, independent of context and human experience, bound to objects and waiting to be discovered.

The objectivist onto-epistemological position expresses the assumptions about knowledge and knowing that are inherent in the positivist paradigm. This positivist, natural science view of knowledge, where knowledge is value free, is most often researched through methods of detached observation,

where the researcher seeks to find universal features that offer explanations and hence control and predictability. In an objectivist / positivist view of reality therefore:

> That tree in the forest is a tree, regardless of whether anyone is aware of its existence or not. As an object of that kind (objectively therefore), it carries the intrinsic meaning of 'tree-ness. When human beings recognise a tree, they are simply discovering a meaning that has been lying there in wait for them all along (Crotty, 1998, p. 8).

An objectivist onto-epistemological view of knowledge suggests that knowledge is discovered. Once discovered, it can be abstracted and codified as models of the world within which we interact. In the natural sciences these models can be represented in abstracted terms such as in mathematical formula with input and output characteristics, for example the equation for predicting the acceleration of a mass when a given force is applied ($f = ma$). In an objectivist view this relationship applies in all situations as a universal function of mass, force and acceleration. It is useful when predicting things to come in the future, and useful when applied to analysing events. Hence, for example, equations of kinetic energy ($Ek = \frac{1}{2} mv^2$) in this way can be used to influence the design of motor vehicles as well as to predict the consequences of motor vehicle accidents, independent of the context in which they occur. At a more grand scale these abstracted models can be communicated and given the status of laws of nature and held to be universally applicable.

In the objectivist onto-epistemological view of reality, the assumption can be made that research in the social sciences is essentially the same as research in the natural sciences. In this view, the purpose of research is to discover and explain the natural and universal laws that regulate and determine individual and social human behaviour, emphasising the features that people and groups have in common. Research methods within this framework focus on gathering quantitative data, from which cause and effect relationships are

sought. Data analysis and interpretation is then directed towards the generation of universal models, theories and laws.

The objectivist / positivist view of knowledge and knowing has been argued to hold limited value in trying to understand human systems (Cohen et al., 2011a; Flick, 2014a; Lodico, Spaulding, & Voegtle, 2010a), a position this researcher agrees with. This shift in thinking away from positivist / objectivist views of knowledge and knowing in the social sciences is mirrored by an increasing focus on the socially constructed versus the discovered worlds which emphasises the role of language in the construction of knowledge and meaning. This move to go beyond the research boundaries offered by an objectivist view of reality has given rise to the consideration of alternate onto-epistemological frameworks along with a plethora of research perspectives and their allied methodologies in the social sciences. One of these is constructivism, which is adopted in this research.

3.3.2 Constructivism

Within a sociocultural interpretive paradigm, a constructivist view of reality claims that phenomena exist as the product of individual consciousness where "objects of thought are merely words, and that there is no independently accessible thing constituting the meaning of a word" (Cohen et al., 2011a, p. 6). Moreover, in this view meaning ascribed to objects or situations is derived out of interplay between the subject and object, the person and the phenomenon they interact with (Piaget, 1955).

In this constructivist view of knowledge it is perfectly acceptable for different people to construct meaning in different ways in relation to the same phenomenon (Lave & Wenger, 1991). Knowledge in this setting is not seen as objective, universal or something that can be identified and codified with precision, nor can it be expressed as laws or truths. On the contrary, knowledge is seen as tentative and contextual, generated in social settings through shared experience and connected through shared understandings.

These shared understandings create limits, defining what is, and what is not, acceptable knowledge in any situation. In the world of teachers, shared understandings of what is acceptable knowledge and what is not define the boundaries of practice. For example, science teachers share an understanding of what acceptable classroom practice is, and what sits outside acceptable practice (Bell, 2005).

In the constructivist onto-epistemological view, the aim of research is to describe and interpret individual and social human behaviour. Research within this framework emphasises how people differ from each other, as opposed to trying to draw summative statements of universal application. Research methods within this framework tend to generate qualitative and descriptive data which is interpreted and understood in contextual situations. The value of such knowledge is that it helps the actors involved in the research understand their own contextual situations as well as allow sociocultural theorising to occur. What counts as evidence in the research is the words spoken by the teachers as research participants and their co-constructed meaning with the researcher.

Objectivism and constructivism take quite different views of reality, and therefore what counts as knowledge, its nature and its forms, including how knowledge can be acquired and communicated. In an objectivist view knowledge is real and is described as the truth, a unitary entity. It is able to be acquired, codified and transmitted in tangible forms. In a constructivist view knowledge is more personal, subjective, and unique being gained through personal and social experience and insight (Cohen et al., 2011a).

In this research a constructivist sociocultural onto-epistemological position is taken because it is this type of personal, subjective knowledge, gained through personal and social experience, which is believed will best inform the research and answer the research questions. This view assumes that social structures and their meaning within the social world are humanly constructed. In this constructivist view, knowledge resides in individuals and comes into

existence through people's interactions in the world they experience. Knowledge construction occurs through individual meaning making as well as co-construction through social interaction in communities of practice. The corollary of this view is that knowledge associated with these social structures does not exist in its own right. It is not something that exists waiting to be discovered through experience or research; it is humanly constructed, subjective and moderated through the development of shared social meaning.

3.4 Methods

The research approach taken in this study, though not formally following the methods of action research, were based on the principles of action research (Kemmis & McTaggart, 1992; Kemmis & McTaggert, 2000, 2005; Kemmis, McTaggert, & Nixon, 2014; Kindon, Pain, & Kesby, 2007; Zeller-Berkman, 2014). This approach was chosen to reflect and empower the constructivist, onto-epistemological position assumed in the research and to position the research participants as co-researchers. The methods that were adopted allowed the research participants to communicate the knowledge and meaning they constructed around local sustainability curriculum development in such a way that made it accessible to each other, as well as the researcher as a co-labourer and co-constructer of knowledge. The knowledge that was constructed was of value to the research and also for the research participants for their own aims, that of improving their own practice. The principles of action research were used to design the interactions between the teachers and the researcher giving the researcher access to the teachers' thinking and meaning-making practices.

3.4.1 Action Research

Action research can be described as a collaborative process of inquiry operating at individual, interpersonal and group levels of organisation. In this

research, action research was used to form the orientation to inquiry rather than to dictate a particular set of methods and predetermined cyclical timeframes (Kagan, Burton, & Siddiquee, 2008). In the context of this study, action research is expressed in the form of the collective, self-reflective inquiry, undertaken by the researcher and the teachers as co-researchers, motivated by each participant's desire to improve educational practices, as well as understand these practices and the situations in which they are carried out (Carr & Kemmis, 1986; Kemmis & McTaggart, 1992).

The action research approach taken is pragmatic. The approach seeks to improve teaching practice by changing it, requiring authentic participation by the research participants to achieve this aim. It is by nature collaborative, requiring participants to look at their own practice objectively and allows participants the opportunity to provide a reasoned justification to others for the meaning of their actions (Cohen, Manion, & Morrison, 2011b).

The generation of new knowledge in this research is built upon assumptions that are inherent in the research approach, including what constitutes the social world, who the researchers are, and the relationship between them. Issues of power and legitimacy arise from these relationships including who directs the research and who poses the research questions.

In this research, the direction of the research and the construction of the research questions were directed by the researcher, with an understanding of curriculum and local curriculum development, in collaboration with the teachers as co-researchers. The action research approach to data generation allowed the research participants to discuss their meaning-making process around local sustainability curriculum development with the researcher as well as other teachers involved in the same process. This approach allowed the teachers to use the new knowledge gained to reflect upon their own teaching and local curriculum development practices and improve them. This approach combined professional practice, research, and reflection on one's own practices (Lodico, Spaulding, & Voegtle, 2010b).

Educational action research has wide appeal as an interpretive and critically conscious methodology as it can be applied at a personal level. It can be described as: "… a kind of disciplined inquiry, in which a personal attempt is made to understand, improve and reform practice" (Hopkins, 1985, p. 32) as well as educational settings and outcomes (Lodico et al., 2010b).

This approach to research shares power with the participants in the research allowing the participants, in this case middle management classroom teachers, control over their local sustainability curriculum development practices, within a defined research framework. In this way the action research approach taken can be described as a type of self-reflective inquiry, which was as much about researching individuals as it was about researching situations.

Action research offered a methodology that gives value to both the researcher and the research participants. The researcher in this case gained an insight into the cultural historical activity system of local sustainability curriculum development in the different school settings. The research participants, that is the teachers, gained the opportunity to better understand both their situation, themselves as teachers as well as to bring about change and improvement in their own teaching.

Applied in the school setting, action research can be "concerned equally with [understanding and] changing individuals, on the one hand, and, on the other, the culture of the groups, institutions and societies to which they belong" (Kemmis & McTaggart, 1992, p. 16). The culture of a group can be defined in terms of the "characteristic substances and forms of the language and discourses, activities and practices, and social relationships and organisation which constitute the interactions of the group" (Kemmis & McTaggart, 1992, p. 16). Furthermore, Zuber-Skerritt suggests "the aims of any action research project or program are to bring about practical improvement, innovation, change or development of social practice, and the practitioners' better understanding of their practices" (1996, p. 83). This research adopts this

broad aim of practical, classroom based improvement for the teachers involved, through their participation as co-researchers. The position of the researcher in this study is as co-constructor of knowledge participating in the construction of knowledge with the teachers.

The approach to action research taken in this study can be categorised as participatory practical action research. In this methodological approach the research participants, and the researcher, work together as co-labourers to generate data, make meaning and gather evidence in the research. The new knowledge that is created is available and communicated to all and able to be used to improve practice at the local contextual and theoretical levels. Participatory practical action research is a focus designed to promote teachers' professionalism by drawing on their informed judgement (Grundy, 1987, p. 154) and has similarities with Schon's concept of reflection on action (1987). Its approach is hermeneutic in nature, aiming for the participants themselves to understand and interpret the social situation in which they find themselves with a view to their improvement (Cohen et al., 2011a, p. 231).

3.4.2 Participatory Practical Action Research

The participatory practical action research methodology adopted in this research positioned the research participants as co-researchers working collaboratively alongside the researcher. In this team approach the principle researcher and the teacher practitioners came together to identify potential problems, their underlying causes and possible changes that could improve their practice in sustainability education (Kagan et al., 2008). They worked as co-labourers, researching together with the researcher to improve practice through the generation of new knowledge and understanding in their school contexts.

As co-researchers, the teacher practitioners took on a new professional role as researcher, promoting their professional understanding through giving them opportunity and experience to act as co-researchers (Timperley et al.,

2007). In the design of the research, a final interview was scheduled which focused on generating data that was primarily relevant for each teacher. The interview generated knowledge about their own teaching and learning practices in sustainability education and gave them the opportunity to reflect on the ways they might change their practices as a result of participating in the research. This knowledge is not reported in this thesis.

Management of the research process was approached as a guided democratic activity, where decision making was guided by the researcher and actioned by the group on a consensus model, empowering the participants through collective action (Elliott, 1991; Nolen & Vander Putten, 2007). In this way, the research participants become part of the decision making process in the research. Specialisation of roles within the research team is however acknowledged in participatory practical action research with the principle researcher adopting roles to guide the research process, for example "facilitator and guide, formulator and summariser of knowledge, and raiser of issues" (Cohen et al., 2011a, p. 230) in sustainability.

Participatory practical action research allows reflection in action to occur (Cohen et al., 2011a) with reflection in action including reflection upon action, and critical reflection (Cohen et al., 2011a; Genat, 2009). This reflective affordance of the research methodology is seen as important in the meaning-making process examined in the research approach, with the teacher participants identifying and reflecting upon issues which are to them problematic yet capable of being changed (Elliott, 1991).

The notion of reflexivity is central in participatory practical action research because the researcher is also deemed to be one of the participants and practitioners in the action research. The researcher becomes part of the social world that they are studying. Moreover, the construction of knowledge in participatory practical action research takes as its epistemological basis the view that the data is authenticated as new knowledge and evidence through the experiences and shared reflection on those experiences by all

participants, through the democratic relations that occur between all participants. In this way the researcher's views, which may be theory laden, do not hold precedence over the views of the participants.

3.5 Research Data Generation Methods

The methods employed in this research were chosen to generate the data required to answer the research questions. The methods employed to generate data included semi-structured interviews, focus group discussions classroom observations and document analysis.

Semi-structured Interviews

Semi-structured interviews are one of the most commonly used data generation methods in the social sciences (Brinkmann, 2018) and can be defined as the use of a set of prepared, yet open ended, questions to guide the interview and the interviewer (Flick, 2014b). In this interview technique, the interview schedule is applied flexibly with room for the interviewee's perspective and additional topics to be raised. This semi-structured and fluid nature of the interview allows for rich knowledge-producing dialogues to occur where the researcher has the opportunity to follow up on whatever themes appear in the interview (Brinkmann, 2018). Semi-structured interviews also facilitate the opportunity for the interviewer to check for the meaning being conveyed by the interviewee during the interview process. The prepared set of research questions give a structural framework to the interview, chosen by the researcher, but within that framework the interviewee is free to wander as the conversation unfolds. This framework of questions however acts as a scaffold to refocus the discussion on aspects of interest predetermined by the researcher.

Two semi-structured interviews were conducted between the researcher and individual research participants. The first was conducted at the beginning of the data generation period, generating data of interest to this research

project. The second interview was conducted at the end of the data generation period and generated data that was of primary interest to the research participants themselves as participant researchers in the research. This data informed the research participants in their own action research outcomes. The data generated in this second interview is not focused upon in this thesis.

Both interviews were guided using an interview schedule written by the researcher where the researcher posed each question, and then prompted the participant to talk about, and around, the issues raised. The interview schedule consisted of a set of questions, in four sections, that the researcher posed (see Appendix A).

The first section of questions was the most structured,[10] generating data on each teacher's demographic details. All the research participants were asked the same basic questions in the same order to minimise the risk of bias as the researcher gained contextual knowledge as the research progressed. Within this structure the participants were encouraged to tell their own stories with the researcher prompting during the interviews for further information and clarification where it seemed appropriate. The interviews, which took the form of guided discussions, typically lasted an hour. They were audio taped and at a later date transcribed by the researcher to text.

Focus Group Discussions

Focus groups, as a data collection method, are used in a wide range of disciplines in various forms of discursive activity and can take a variety of forms dependent upon what the researcher expects from them (Kamberelis, Dimitriadis, & Welker, 2018). A focus group can be defined as a small group of people focused on a specific topic, brought together to discuss collectively

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[10] If presented as a separate interview schedule these questions may be classed as structured.

their sphere of life, and probing into it as they meet one another's understandings and disagreements (Flick, 2014c).

In this research the focus groups consisted of the teacher participants as well as the researcher and at times an external expert. The focus group acted as a form of group interview where the group discussed topics supplied by the researcher (Flick, 2014b). The researcher guided the discussions through prompts and reflective practices and ensured that all participants were prompted to contribute to the dialogue (Cohen, Manion, & Morrison, 2011c).

The focus groups were held during the normal school day with the teacher participants released from their normal work duties. This was arranged to allow them to focus on the discussions of the day without having other professional work considerations to concentrate on. The focus groups took place in a setting conducive to discussion, away from their schools (Cohen et al., 2011c).

Four, day long, focus group discussions took place as part of the research. These focus group discussion days were structured (Flick, 2014c) around a number of pre-planned topics. The first focus group discussion day was structured around the participants discussing their perceptions of sustainability and sustainability education. The second focus group discussion day was structured around the participants discussing their perceptions of curriculum and local curriculum development. The third focus group discussion day was focused around the participants discussing their local curriculum development practices in their core subject learning area as well as in their various sustainability education programmes. The fourth focus group discussion day was focused around the participants continuing their conversations around local sustainability curriculum development as well as actively and collaboratively planning for student learning in sustainability, discussing what learning in sustainability looked like and what teaching approaches they felt suited sustainability education (see Section 3.7.2 for details).

Classroom Observations

Classroom observations can be defined as looking at and noting things systematically, such as people, events, behaviours, settings, artefacts and / or routines (Cohen, Manion, & Morrison, 2011d). The researcher arranged two visits to the teacher participant's classrooms while they were involved in sustainability education and gathered unstructured field notes. The observations focused on the taught curriculum, as a comparison to the planned curriculum that the teachers had talked about in interviews and focus groups.

These visits gave the researcher access to classroom interactions in the social contexts being addressed in the research and further opportunities to make meaning of the teacher's comments during discussions. These observations were recorded as field notes and were used to complement the other forms of data generated (Cohen et al., 2011d) and allowed the researcher the opportunity to enter and better understand the context of each teacher participant's sociocultural situation, including the opportunity to discuss their classroom practice in context and co-construct the meanings they attributed to their actions (Cohen et al., 2011d). The researcher scheduled time with each teacher to discuss their taught curriculum following each class session observed. This discussion also included the opportunity to discuss planned curriculum documentation.

Document Analysis

A document can be defined as a record of an event or process produced by individuals or groups (McCulloch, 2011). In this research the documents that were of interest as data were the representations of the teacher's planned local sustainability education curriculum. This documentation included both written and digital representations of their planned local curriculum.

On the occasion of the classroom observation, the researcher observed and collected, with permission, copies of the planned local sustainability

curriculum that had been developed by the research participants. As noted above, at the conclusion of the classroom practice sessions the researcher took time to have the teacher participant explain their local curriculum documentation so that a shared meaning could be established. Field notes of these discussions were taken and included as part of the classroom observations.

Other Methods Considered

A number of other methods were considered including video observation during classroom visits and focus group sessions, and having teachers keep reflective journals or digital blogs of their thoughts during the research process. Video observation within classrooms was rejected as this would generate additional data around student learning, which was outside the scope of this research. Video observation of focus group sessions was likewise rejected as a data generation method. It was deemed difficult to set up in a way that would give all participants equal focus, as participants sat in a circle, and would produce no further useful data than audio recording and note taking of the sessions. Teacher journals or blogs were also not considered useful data collection methods for this research as the focus group discussions made this redundant. These sessions gave the research participants the opportunity to express their thinking in a summative fashion, bringing together the formative thinking that it was deemed would likely be the focus of journal or blog entries.

3.6 Participant Selection and Ethics

This research was approved by the University of Waikato Human Research Ethics Committee in early 2010. The research was conducted in the second half of 2010 and 2011.

Participants identified for this research were secondary school teachers that were currently involved in sustainability education within their schools. They

were invited from a pool of teachers that were identified by the researcher as having the following characteristics. Research participants:

- Were experienced, secondary school teachers with at least five years teaching experience.
- Held a middle management position where they have responsibility for the development of their own classroom curriculum and pedagogy, as well as the development of curriculum and pedagogy at a department level or above.
- Were recognised by the sustainability teaching community as having already developed and implemented a successful sustainability education programme in their school (NB: the characteristics of what counted as successful was not suggested by the researcher, this perception was left entirely to the teaching community).

These criteria were used because the research required the involvement of research participants who were actively involved in creating local sustainability curricula. It is the depth of the teachers' experience, thinking and reflection upon their practices that forms the data for this research.

To identify a list of potential research participants the researcher made enquiries through phone and email contacts with local secondary school teachers to identify individuals who were considered to meet the list of potential research participant characteristics. The researcher also consulted with other researchers in the field for the identification of any teachers who met these criteria.

This purposive sampling process provided a pool of 13 possible participants, nine female and four male from 10 schools covering a geographical area of up to 100km from the researcher's base. All of the potential participants were contacted by email with a description of the intended research and asked if they would be willing to participate. If they indicated a willingness to be

involved, they were then sent a letter which more fully explained the intended research and the implications of their involvement (see Appendix B).

Not all teachers replied to this invitation. A group of nine teachers, six female and three male, from six schools did reply. All of these teachers met the criteria of potential participant characteristics and were willing and available to participate. This potential research participant group was then further analysed for the details of which curriculum learning area the teachers worked in, the type and decile[11] rating of the school they worked in and their gender so that as far as possible the research was not biased towards any particular school type, curriculum learning area, school decile rating or gender.

From this potential research participant group, a final participant research group was established. Six teachers, giving coverage of school types (single sex / coeducational, state, integrated, urban / rural), socioeconomic situation (decile rating), and an equal mix of female and male participants were chosen. A formal letter of invitation (see Appendix B) which explained the ethical considerations of the research as well as a participant consent form was sent, completed and returned by each of these participants indicating their informed consent to participate in the research. The letter also informed the participants of their right to withdraw from the research at any stage as well as contact details for a research supervisor to contact should any conflict of interest appear during the research process.

The principal of each school involved in the research was also contacted by phone and the research explained and discussed. A formal letter outlining the research and the implications for the school was sent to each principal along with a school research consent form (see Appendix B). All of the principals consented to the research and consent forms were gathered for each school

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[11] The New Zealand Decile rating system identifies the socioeconomic conditions in the community surrounding the school for the purposes of applying a funding formula to assist schools in a low socioeconomic community. Decile one is the lowest socioeconomic situation with decile ten being the highest.

involved and filed along with teacher consent forms. Participants and participating schools were then assigned pseudonyms to be used in data generation, analysis and presentation.

The teachers that did not become part of the research group were thanked personally by the researcher for their willingness to be involved in the research. The reasons for their exclusion were explained in terms of the need for a coverage of school types, learning areas, school decile ratings and gender balance so that they were not left with an impression that they did not get chosen for the research because of any perception of their teaching or other professional ability.

The research participants were assigned pseudonyms to protect their anonymity in the research. The process for pseudonym choice was collaborative with the researcher discussing the choice with each participant individually. The researcher ensued that none of the names chosen were too close in pronunciation so that the chance of confusion was minimised when working with the data. Details of the teacher pseudonym names, their main learning area, teaching experience and middle management position are given in Table 3.1.

Table 3.1: Participating Teacher Details

Participant Name	Gender	Learning Area	Years Teaching	Management Position	School Name
Wayne	Male	Technology (Design and Graphics)	21	Head of Department	North
Sarah	Female	Science (Biology)	7	Head of Subject	South
Greg	Male	Technology (Hard Materials – Wood)	13	Head of Department	West
Mary	Female	Science (Biology)	8	Head of Department	East
Chris	Male	Social Studies	9	Head of Subject	East
Jenny	Female	English	6	Assistant Head of Department	East

The schools that were represented in the research were also assigned pseudonyms to protect their anonymity. The names assigned to the schools were chosen by the researcher. Details of the schools' pseudonym names and their demographics are presented in Table 3.2.

Table 3.2: Participating School Details

School Name	Roll	Decile	Years	Gender	Urban / Rural	State / Integrated
North	400	1	9-13	Co-educational	Urban - town	State
South	700	7	9-13	Single Sex - Boys	Urban - City	Faith Based
West	400	4	1-13	Co-educational	Rural - town	State
East	650	10	9-13	Single Sex - Girls	Urban - City	Faith Based

3.7 Research Phases

A research timeline was designed for the study which acknowledged the schedules of the research participants working in secondary schools. The New Zealand school year begins in February and runs through a series of four, approximately ten week, terms ending the academic year in mid-December. The timeline also acknowledged the scheduling constraints of the researcher working in the tertiary education sector (see Tables 3.3 and 3.4).

The research began in July 2010, after ethics approval had been granted, with participant selection. Data generation began in August 2010 and was managed in four phases. The first phase consisted of an initial interview with each of the research participants occurring in August and September 2010. Phase two consisted of a number of collaborative focus groups with all teachers participating together, discussing their perspectives around local sustainability curriculum development. The first of these was held in November 2010 and the rest held in 2011, at least five weeks apart to allow teachers time to process thinking between each workshop. Phase three consisted of the researcher visiting teachers in their classrooms and observing classroom practice and local curriculum planning documentation. This took place in May and June 2011. The fourth phase consisted of a final interview with each research participant. This interview occurred in August 2011. The data generation phase of the study spanned a period of 12 months. Details of the way the research phases, school terms and university semesters worked together is shown in Tables 3.3 and 3.4

Table 3.3: Data Collection Timeline for 2010

2010				
Research Phase	Beginning Monday	University Semester	School Term	Data Collection Periods
	21/06/2010	Teaching Recess		
	28/06/2010	Teaching Recess		
	5/07/2010	Teaching Recess	non teaching break	
	12/07/2010	Semester B	Term 3	Research Participant Selection
	19/07/2010	Semester B	Term 3	Research Participant Selection
	26/07/2010	Semester B	Term 3	Research Participant Selection
	2/08/2010	Semester B	Term 3	Research Participant Selection
	09/08/2010	Semester B	Term 3	
	16/08/2010	Semester B	Term 3	
Phase 1	23/08/2010	Teaching Recess	Term 3	Initial Teacher Interviews
Phase 1	30/08/2010	Teaching Recess	Term 3	Initial Teacher Interviews
	6/09/2010	Semester B	Term 3	Initial Teacher Interviews
	13/09/2010	Semester B	Term 3	Initial Teacher Interviews
	20/09/2010	Semester B	Term 3	Initial Teacher Interviews
	27/09/2010	Semester B	non teaching break	
	4/10/2010	Semester B	non teaching break	
	11/10/2010	Semester B	Term 4	
	18/10/2010	Teaching Recess	Term 4	
	25/10/2010	Teaching Recess	Term 4	
	1/11/2010	Teaching Recess	Term 4	
	8/11/2010	Teaching Recess	Term 4	
Phase 2	15/11/2010	Teaching Recess	Term 4	Research Workshop One
Phase 2	22/11/2010	Teaching Recess	Term 4	Research Workshop One
Phase 2	29/11/2010	Teaching Recess	Term 4	Research Workshop One
Phase 2	6/12/2010	Teaching Recess	Term 4	
Phase 2	13/12/2010	Teaching Recess	Term 4	
Phase 2	20/12/2010	Teaching Recess	non teaching break	
Phase 2	27/12/2010	Teaching Recess	non teaching break	

Table 3.4: Data Collection Timeline for 2011

2011				
Research Phase		Beginning Monday	University Semester	School Term	Data Collection Periods
Phase 2		3/01/2011	Teaching Recess	non teaching break	
		10/01/2011			
		17/01/2011			
		24/01/2011			
		31/01/2011		Term 1	Research Workshop Two
		7/02/2011			
		14/02/2011			
		21/02/2011			
		28/02/2011	Semester A		
		7/03/2011			
		14/03/2011			
		21/03/2011			
		28/03/2011			Research Workshop Three
		4/04/2011			
		11/04/2011			
		18/04/2011	Teaching Recess	non teaching break	
		25/04/2011			
	Phase 3	2/05/2011	Semester A	Term 2	Classroom Observations
		9/05/2011			
		16/05/2011			
		23/05/2011			
		30/05/2011			
		6/06/2011	Teaching Recess		
		13/06/2011			
		20/06/2011			
		27/06/2011	Semester B		Research Workshop Four
		4/07/2011			
		11/07/2011			
		18/07/2011		non teaching break	
		25/07/2011			
	Phase 4	1/08/2011		Term 3	Final Teacher Interviews
		8/08/2011			
		15/08/2011			

3.7.1 Phase 1 - Initial Interviews

The first phase involved the researcher conducting an initial semi-structured interview with each of the six research participants. The interviews were scheduled at a time that suited each research participant during the period August / September 2010. The interviews, which typically lasted an hour, were scaffolded using an interview schedule. The schedule consisted of 33 questions arranged into four sections: Demographics – gathering background data on the participants; Sustainability, the participant's perceptions and views of sustainability; Sustainability education, the participant's perceptions of education for sustainability; and curriculum development, the participant's perceptions on how curriculum development occurs. The first section of the interview schedule, Demographics, was the most structured with the researcher gathering data about the teachers' teaching careers, length of service and management experience. The remainder of the questions framed the landscape for wider discussion with less structure (see Appendix A for the interview schedule).

Generated data were recorded by the audio taping of the interview. A digital audio file was recorded for later transcription and the researcher took field notes regarding the interview situation including which teacher was being interviewed, audio file identification, time of commencement, and duration of the interview.

3.7.2 Phase 2 Focus Group Discussion Days

The second research method employed in the study was a series of focus group discussion days. These were designed to offer the participants an opportunity to generate data through discussing issues of sustainability, sustainability education and curriculum development where the researcher and the research participants, as co-researchers, generated the data together.

At times within the focus group discussions the researcher took on an alternate role to that of researcher. At times the researcher took on the role of professional developer, sometimes aided by other experts. This multiple role for the researcher, in the research process, was managed with the researcher aware of this multiple role, being reflexive and thoughtful of the way they positioned themselves as knowledge creation participants at times within the research. The researcher's background as tertiary education lecturer, professional developer and national curriculum developer influenced this position, with the researcher aware that at times they were both teacher and learner (Lincoln et al., 2018). This reflexive stance was taken throughout the research as a way of recognising and acknowledging the complexity and uncertainty in dealing with the interpretive research paradigm (Boström, Lidskog, & Uggla, 2017).

Four, one day long, focus group discussions were held that gave opportunity for different concepts within the research to be addressed. Focus groups one and two addressed concepts of sustainability, sustainability education and curriculum development. In these focus groups the format included discussion of the concepts being initially led by an expert in the field. This expert led a research informed discussion around each concept which then led to the research participants further discussing their perceptions of these concepts.

The data that was generated in these discussions was digitally recorded and then transcribed at a later date. The researcher also took field notes during the workshops noting the flow of the discussion and tracking which participant was speaking at different times during the discussion. This minimised the chance of assigning transcribed comments to the wrong participant.

The audio files were transcribed by the researcher at the earliest convenience in consultation with the field notes to maximise fidelity of the data and minimise the risk of data transcription error.

Focus Group Discussion Day One

The first focus group discussion day was held during a school day in term 4, 2010, with the participants gathering in a seminar room at the Faculty of Education, University of Waikato from 9am till 3pm. The day consisted of three specific discussions which were scaffolded by predetermined prompts, and led through presentations by Dr Chris Eames of the Technology, Environmental, Mathematics and Science Education Research Centre, a researcher in the area of environmental and sustainability education.

The discussions began with the researcher introducing the concept to be addressed. In the first discussion, the question: "What is Sustainability?" was addressed with a general discussion by the participants, sharing and discussing their understandings and views. This was followed by a research informed presentation aimed at informing the participants and developing consistent ways of communicating around the topic. Following the presentation another general discussion occurred with teachers reflecting on the new information, and again discussing the meanings they had associated with the concept.

The structure of the other specific discussions for the day followed the same format, with introduction and then opportunity for the participants to discuss their perceptions and meanings. The format for the three other, day long, focus group discussion days were similar. The specific discussions in the first focus group discussion day were as follows:

Discussion 1: What is Sustainability

- o Participant discussion
- o Presentation: A review of the literature on Sustainability (Dr Chris Eames)
  - What does sustainability mean to New Zealanders?
  - Models of sustainability from the literature
- o Participant discussion

Discussion 2: What is Education for Sustainability?

- o Participant discussion
- o Presentation: The development and place of Education for Sustainability in the New Zealand Curriculum (Dr Chris Eames)
  - ▪ The guidelines for environmental education in New Zealand Schools
  - ▪ The New Zealand Curriculum (2007)
  - ▪ The senior secondary guidelines
  - ▪ NZQA assessment opportunities in sustainability education
- o Participant discussion

Discussion 3: What do we make of the big ideas of sustainability and the opportunities in the curriculum?

- o Participant discussion

Focus Group Discussion Day Two

The second focus group discussion day was held during a school day early in term one, 2011, with the participants gathering in a seminar room at the Faculty of Education, University of Waikato from 9am till 3pm. The day followed the same format as described for discussion day one, though this time consisting of four specific discussions. The first discussion focused on the question: "What is the curriculum and where does it come from?". It was introduced by a presentation by Associate Professor Beverley Bell, a researcher in the field of curriculum and curriculum development. The discussions, as in workshop one, began with an introduction by the researcher setting the theme, with the participants then sharing their experiences and views on the issues.

The structure for the four specific discussions in workshop two were as follows:

Discussion 1: What is the curriculum and where does it come from?

- o Participant discussion
- o Presentation: A look at the development of the national curriculum in New Zealand (Associate Professor Beverley Bell)
  - ▪ Curriculum as; national policy, school scheme, teacher intended, teacher actual, student received, assessed.
  - ▪ Teacher development as curriculum development.
  - ▪ Curriculum as a negotiated understanding
- o Participant discussion

Discussion 2: How do you plan for teaching and learning (local curriculum development) in your learning area?

- o Participant discussion
- o Introduction
  - ▪ What are the key ideas of curriculum?
  - ▪ What do you think about when you are planning for teaching and learning in education for sustainability?
- o Participant discussion

Discussion 3: What are the key ideas of sustainability education to acknowledge in local curriculum?

- o Participant discussion
- o Introduction
  - ▪ What "shape" should a curriculum in sustainability take?
- o Participant discussion

Discussion 4: Who are the potential stakeholders in curriculum development?

- o Participant discussion
- o Introduction
    - How do we contact them?
    - What information do we need to know from them?
- o Participant discussion

Focus Group Discussion Day Three

The third focus group discussion day was held in the latter part of term one, 2011, during a school day with the participants gathering in a seminar room at the Faculty of Education, University of Waikato from 9am till 3pm. The day was structured around the participants actively talking about and planning local sustainability curricula, giving each participant a personal context to the discussion. These local curricula were to be taught in term two of 2011.

The discussion was scaffolded around six topics which the researcher introduced sequentially throughout the day. Each discussion topic was managed so that all of the participants were able to contribute, with their contributions typically in the form of a narrative of their experiences and views on local sustainability curriculum development. The format allowed the participants to draw comparisons and contrasts between approaches being developed by other group members, and explain and exemplify their thinking in the context of their own local sustainability curriculum developments.

The flow of the discussions for the day were as follows:

Discussion 1: How do you plan for teaching and student learning in your learning area of the curriculum?

- o Participant discussion

Discussion 2: How do you plan for teaching and student learning in sustainability from different learning areas?

   o Participant discussion

Discussion 3: How do you structure classroom practice (pedagogy) in sustainability education?

   o Participant discussion

Discussion 4: What do you think about when planning for classroom practice in sustainability education?

   o Participant discussion

Discussion 5: What learning outcomes are appropriate for sustainability education?

   o Participant discussion

Discussion 6: What are the issues of assessment in sustainability education?

   o Participant discussion

Focus Group Discussion Day Four

The fourth focus group discussion day was held at the end of term 2, 2011, during a school day in a seminar room at the Faculty of Education, University of Waikato from 9am till 3pm. The day consisted of four specific discussions which focussed around the participants recounting their thoughts and experiences having taught the local sustainability curriculum that they had discussed and developed during focus group discussion day three.

The flow of the discussions for the day were as follows:

Discussion 1: What does student learning in sustainability look like?

- Participant discussion
  - Examples?
  - Anecdotes?
  - Learning outcome / Expected learning / Indicators?

Discussion 2: What teaching approaches suit sustainability education?

- Participant discussion

Discussion 3: What changes happened in your planning and teaching of sustainability?

- Participant discussion
  - Examples?
  - Enablers?
  - Barriers?

Discussion 4: What opportunities do you see for teaching sustainability within the curriculum in the future?

- Participant discussion
  - Within your subject area?
  - Across subject areas?
  - Across the whole school?

3.7.3 **Phase 3 Classroom Observations**

The third research data generation method employed in this research was classroom observations. The researcher visited the classroom of each of the six research participants twice in term two, 2011, during the period May through June. The visits coincided with the teacher teaching sustainability. The specific timing of each visit was suggested by each teacher to allow the researcher to observe what the teacher thought was indicative of their local sustainability curriculum in action.

Data was generated during these visits through the researcher taking unstructured field notes. The researcher observed the teacher and students engaged in classroom practice.

3.7.4 **Phase 4 Final Interview**

The fourth research data generation method utilised in this research was a semi-structured interview with each research participant at the end of the research. This final interview was designed to inform the teachers about their own practice in keeping with the approach to the research reflecting the principles of action research. The interview was conducted at the end of the data collection phase of the research, in August 2011 and consisted of seven open ended questions that sought to investigate the participant's experiences of having been involved in the research (see Appendix 1). The questions gave the participants the opportunity to further co-research their own practices and formally articulate any changes that they planned for their local sustainability curricula in the future.

Data generated in the form of the teacher's comments were digitally recorded and later transcribed. The researcher also took field notes regarding the interview situation including; which teacher was being interviewed, audio file identification, time of commencement, and duration of the interview. This data was passed to the teachers as individual research outcomes to inform their own teaching practices.

3.8 Data Management

The data generated within the research was managed in the following ways.

Audio Taping and Transcription

The research generated more than 45,000 words of transcribed data. The interview and workshop audio files were taped using an iPod mini and then transcribed by the researcher using iTunes as the playback medium. This process was carried out in the researcher's office with them listening to the audio file through headphones so that the data could not be overheard by any third party.

The transcription process of the focus group discussions was carried out with the researcher referring to field notes to check for the identity of the participants to minimise the chance of transcription errors occurring. The transcribed data was then stored as a digital research folder in Drop Box requiring username and password access, and accessed only by the researcher.

A paper copy of each participant's transcript was prepared and given to them to read and check for accuracy of transcription and where ambiguity existed as to the meaning of the data, the participant was asked to clarify their intended meaning. Any changes or alterations to the transcripts were noted and changes made to the stored transcript files. The paper copies of the transcripts were offered back to the research participants and, where not collected, were destroyed. The authenticated transcripts were then used for data analysis.

Document Analysis

Where permission was given for documents to be collected for the purpose of this research, digital copies were made and stored in a research folder in Drop Box requiring username and password access, and accessed only by

the researcher. Any paper copies of documents once digitised were destroyed.

3.9 Data Analysis and Interpretation

Data that was generated in this research, in the form of teacher comments, was interpreted and made meaningful through processes of co-construction as the researcher worked with the teacher participants in the participatory practical action research approach taken in the research. Analysis of the meaning of the data was then undertaken with reference to Cultural Historical Activity Theory to inform the three research questions established for the study. Firstly, how do secondary teachers make sense of sustainability in the national curriculum? Secondly how do secondary teachers make sense of sustainability education? And thirdly, what are the practices of teachers when developing local sustainability curricula in secondary schools?

Three theoretical constructs established in the literature review were used to analyse the data from the researcher's perspective, and establishing meaning with relevance to the research questions. The first construct was the matrix of aspects and concepts of sustainability established in section 2.4.4. This was used to interpret the meaning of the data associated with the teachers' perceptions of sustainability, the subject of the activity system and the focus of question one. The second construct used was the principles of sustainability education established in section 2.5.1. These were used to interpret the meaning of the data associated with the teachers' perceptions of sustainability education, the object of the activity system and the focus of question two. The third construct used to interpret the data was the Cultural Historical Activity System theorised for local sustainability curriculum development established in section 2.2.1. This was used to interpret the meaning of the data associated with teachers' practices when developing local sustainability curricula. Each of these is now discussed in more detail.

Teacher Perceptions of Sustainability

Teacher's perceptions of sustainability were analysed with reference to the matrix of aspects and conceptual drivers for sustainability decision making that was established in the literature review of this research (see Section 2.4.4). Teachers' comments about the way they viewed sustainability were analysed thematically for the presence of the expression of the concepts and aspects of sustainability represented previously in Figure 2.6.

Due to the conversational nature of the data generation methods, semi-structured interviews and focus group discussions, transcribed teacher comments typically contained more than one reference to an aspect or conceptual driver of sustainability. Teacher conversation was often fluid and unstructured as they expressed their views and reflected in action upon their words. In analysing the teachers' comments where this complexity of meaning was found, care was taken to look for the multiple ways that sustainability may be being expressed in their utterances and note taken of these multiple meanings. For example, in a comment by Mary talking about her perceptions of sustainability and the issues that surround it in New Zealand, she remarked:

> We are consumers. I like toys. But it is producing those in a way that is not producing the kinds of wastes that the Earth can't deal with. Without species becoming extinct or ecosystems being negatively affected (Initial Interview).

Mary's quote about her perception of sustainability was analysed with reference to the matrix of aspects and conceptual driver's for sustainability decision making and interpreted to reflect Mary's perception of sustainability including:

1. "We are consumers". Economic equity – Resource use of renewable / non-renewable materials.

2. "Producing those in a way that is not producing the kinds of wastes that the Earth can't deal with". Economic responsibility – The creation of more efficient and less toxic goods and services.

3. "Without species becoming extinct and ecosystems being negatively affected". Environmental interdependence - Maintaining biodiversity.

Likewise in a quote from Chris talking about his perception of sustainability he reflected:

It means leaving something for other people. Acting in a way that the planet can withstand. Giving them the ability to enjoy the same standard of living that we enjoy. It is all relative. I think in order to do that we are going to have to change our standard of living (Initial Interview).

Chris's quote was analysed with reference to the matrix of aspects and conceptual driver's for sustainability decision making and interpreted to reflect his perception of sustainability including:

1. "Leaving something for other people". Economic equity – Resource use of non-renewable materials.

2. "Acting in a way the planet can withstand". Ecological interdependence – Ecosystem function.

3. "Enjoy the same standard of living that we enjoy". Sociocultural equity – Intergenerational equity and social justice.

4. "Change our standard of living". Sociocultural equity – Intragenerational equity.

All of the data generated by the teachers with respect to their perceptions of sustainability were analysed in this way and for each teacher their comments were coded as showing environmental, sociocultural, or economic. A table was collated for each teacher and this data used to create a visual representation of their perceptions of sustainability using a radar diagram.

Teacher Perceptions of Sustainability Education

The teacher's discussions of sustainability education and the local sustainability curricula they produced were analysed for the presence of the principles of sustainability education established in section 2.5. These included: a socially critical and informative nature; being issues based; problematic and future and improvement oriented; socio-culturally / historically, place, community or experientially bound; systems focused; values soaked; and transformational, for both individuals and society. This analysis was used to interpret the aim of the local sustainability curriculum and the degree to which it reflected an emancipatory approach to sustainability education.

The Practices of Teachers When Developing Local Sustainability Curricula.

The practices of teachers involved in local sustainability education curricula were analysed with reference to the Cultural Historical Activity System for local sustainability curriculum development established in section 2.2.1. This activity system theorises the interactions of the teacher's perceptions of curriculum, sustainability and sustainability education as interacting with their perception of sustainability in the national curriculum to affect their development of their local sustainability education curriculum. Moreover, the activity system theorises a number of socioculturally bound influences upon their local sustainability curriculum development practices due to their school context. These influences are theorised to be associated with the cultural norms operating in the school, the interplay and power positions of stakeholder groups with an interest in local sustainability curriculum development and the way the task of local curriculum development is led and managed in the school setting. The teacher generated data was analysed for the presence of these themes and teacher comments coded as representing these different influences.

Quality Assurance and Trustworthiness

Data generation and meaning making in this research was approached in a collaborative and participatory action research approach where meaning-making was a process of co-construction involving the researcher as practitioner, and the teacher practitioners as co-researchers. This approach meant that data generation and meaning-making were an ongoing reflective and reflexive process giving opportunity to correct misinterpreted data.

Data generation in this study occurred over a year-long period. During this time the research participants commented upon their views and experiences in developing and teaching sustainability education on five separate occasions. The longitudinal nature of the study, with participants commenting on the same things over a period of time, allowed for comparison in the meaning associated with teacher's words to be questioned and clarified a number of times. This also gave the opportunity to identify and correct misinterpreted data.

The data generated in the research was checked for consistency. This was done by comparing comments from each research participant from the beginning of the research with comments received at the end of the year-long period. Consistency was judged where the teachers spoke generally about issues in the same way. However, differences were noted as patterns of views which changed over time. Where these changes in views were seen as consistent with the known narrative of the teacher this was interpreted as reflecting changes in the teacher's view due to their development of new knowledge and understanding as an outcome of their co-research activities. In one instance this quality assurance check identified a radically different view expressed by one teacher on one occasion. No explanation was found for this and since no pattern emerged to support this radically different view, it was interpreted by the researcher as an outlier and rejected from the data set for analysis.

A second quality assurance feature of the design of the data generation methodology was that a number of different data generation methods were used, giving the opportunity to compare the 'text' of the teachers' stories in different settings. Individual interviews with the research participants gave an opportunity for teachers to express their views in private. Collaborative focus group discussions also captured teachers' views. However in this setting their views were expressed in the company of other teachers and in the context of other teachers' views. Classroom observations also gave the researcher the opportunity to look at the expression of the local sustainability curricula the teachers had been talking about in interviews and discussions. This gave the opportunity to compare teacher classroom behaviour with what was expressed in discussion. This also gave the opportunity to see student activity in response to the sustainability curricula being implemented, allowing this to be compared with what the teachers expressed about their classroom practices. This allowed the researcher to judge the coherence between the spoken text expressed by the teachers and the actualised text expressed in their actions in the classroom practices.

The final data triangulation opportunity in the data generation design was the document analysis of the teachers' planned local sustainability curriculum. This gave a further opportunity for the researcher to look for congruence between the views expressed by the teachers and the planned local curriculum that they intended to teach.

3.10 Chapter Summary

The research was positioned in a sociocultural interpretivist paradigm taking a constructivist onto-epistemological approach to assumptions around knowledge and meaning-making. The research was approached through participatory practical action research where the researcher co-laboured and co-constructed meaning with the teacher practitioners involved.

Data, in the form of teacher transcribed comments, was generated through the use of semi-structured interviews and focus group discussions, and augmented with classroom observations and document analysis. Data analysis and meaning-making was guided by the co-construction of meaning by the researcher with the teacher practitioners and, secondly, by reference to theoretical frameworks established in the research, namely the nature of sustainability decision-making, the principles of sustainability education and the cultural historical activity system theorised for local sustainability curriculum development.

Data generated in the research was transcribed and checked by the research participants for authenticity. The data was generated over a year long process involving 4 phases of data collection utilising a range of collection methods. The validity and trustworthiness of the data was assured by the use of these differing methods as well as the length of the study and the position of the researcher as co-constructor of meaning through participatory practical action research.

The findings of this data collection are presented in the next 4 chapters as cases within each of the four schools. The data for each school, including representation of each of the teachers involved, is presented through the lens of cultural historical activity theory.

Chapter 4   Research Findings at South School

4.1 Introduction

In this chapter data are presented to describe the influences upon Sarah's local sustainability curriculum development in South School. The data, which are socioculturally and historically bound within the school setting, are presented following the cultural historical activity system theorised with respect to her school (see Figure 4.1).
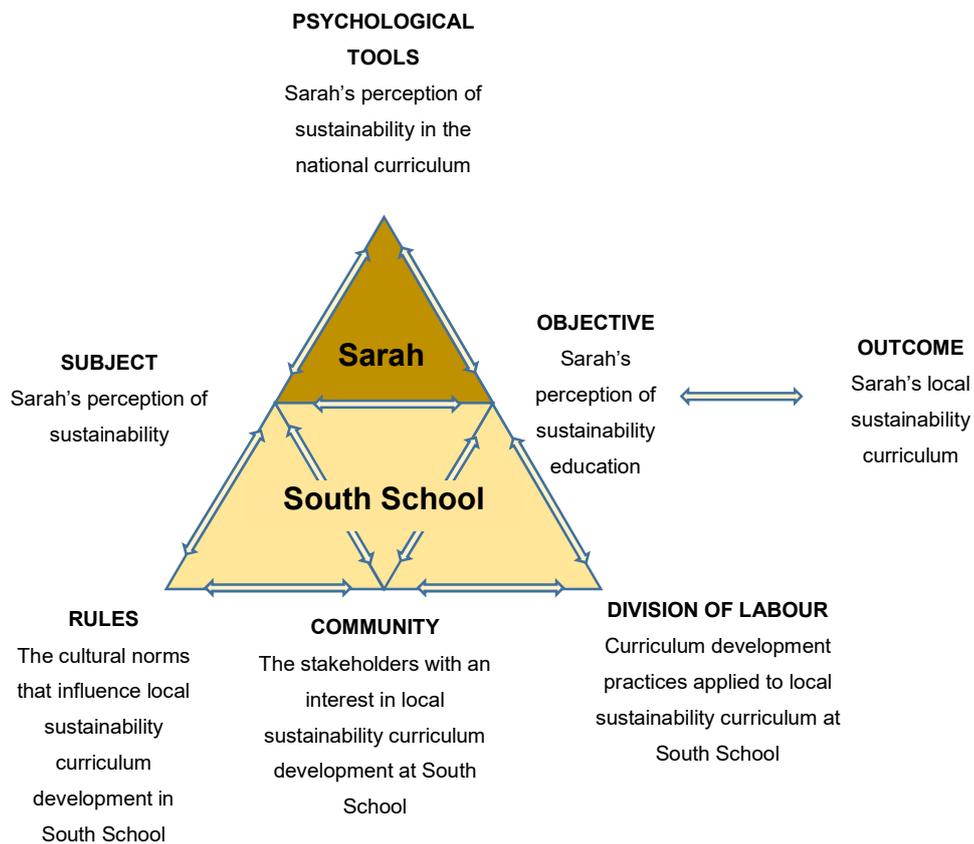
Figure 4.1: The Cultural Historical Activity System of Sarah's Local Sustainability Curriculum Development at South School.

The first four sections report upon the findings associated with the mediated action aspect of the activity system, represented in Figure 4.1 as the darker shaded upper section. Section 4.2 describes the sociocultural context for Sarah and her teaching. Section 4.3 reports upon Sarah's perceptions of sustainability as the subject of her local curriculum development, acknowledging the influences of her personal and professional background. Section 4.4 reports upon Sarah's perceptions of sustainability education, her views of its nature and its aims. Section 4.5 reports upon Sarah's view of sustainability in the national curriculum; what counts as the curriculum for her when planning sustainability education and how she used this to guide her local sustainability curriculum development.

The next three sections, 4.6, 4.7 and 4.8, report upon the influences of the sociocultural historical setting in South School, represented in the activity system shown in Figure 4.1 as the lower, lighter shaded, section; the interactions of the rules, community and division of labour surrounding local curriculum development. Section 4.6 reports upon the influences of South School's academic and wider culture on local sustainability curriculum development. Section 4.7 reports upon the way South School defined, through operation, the community of people that influenced the development of local sustainability curriculum, that is the stakeholders. Section 5.8 reports upon the way local sustainability curriculum was developed in the sociocultural historical setting of South School and how Sarah developed her local sustainability curriculum within this context.

The last section, 4.9, reports upon the outcome of the activity system, the local sustainability curriculum that Sarah developed in her school setting.

4.2 Setting

Sarah, who was in her forties, was an experienced teacher, having taught for seven years in her current school. She taught mainly in junior science, senior science and biology, but did some work in mathematics from time to time. Her

middle management responsibility was to design and implement a programme of general science for year 11 to 13[12] students who do not opt to take a specialist science course such as biology, chemistry or physics. It is in this context that Sarah had been developing her local sustainability curriculum.

The school she worked in, South School, was a mid-sized (650 student), city based, decile[13] seven, single sex boys school catering for years nine to 13.[14] It had a student population comprising 59% New Zealand European and 16% New Zealand Maori,[15] and the remainder varied. It is a faith-based, state-integrated, secondary school where families pay fees for their children to attend. The school expressed its faith character through reference to caring relationships amongst staff and students, the curriculum, environment, and in school protocols and ceremonies (Education Review Office, 2012).

4.3 Sarah's Perception of Sustainability (subject)

Sarah held a strongly environmental and ecological view of sustainability, epitomised by her comment: "When we talk about sustainability, it reminds me of the environment, environmental issues. Whether or not it's a problem or an asset doesn't really matter, it just strikes me as being something of the environment rather than anything else (Initial Interview).

This environmental view of sustainability was consistent with the view held in her family situation where her husband worked as a national senior technical

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[12] 15 to 18 year olds, last 3 years of high school.

[13] A schools decile rating is an indication of the socioeconomic conditions of its community. Decile 1 is low socioeconomic, decile 10 is high.

[14] Ages 13 years – 18 years.

[15] According to the New Zealand census figures of 2013, 15% of people usually living in New Zealander belong to the Māori ethnic group.

officer for the Department of Conservation[16] involved in pest management in native forests. This ecologically focussed view of sustainability formed the basis of many of their family decisions, for example when talking about her home life and her preschool children, Sarah explained:

> We have just got ourselves a worm farm. The kids are now able to talk a bit more and we are able to interact a little bit more with them. We have taken them out to look at the worms and tried to get them to touch [them], but they are a bit off that still yet, so it has become quite a family thing. We are quite excited about that. We love the outdoors and now that the children are a bit older we are a bit more mobile and we go out and just experience it (Initial Interview).

Sarah's environmentally focused view of sustainability was deeply engrained, with her talking about it as an unconscious attitude expressing itself through everyday decisions about things such as travel, energy use and purchasing, saying for example:

> We like to cycle to work, providing it is not too dark and the weather isn't too bad. It is not really a conscious thing where we feel we have to cycle to save petrol and help the environment, which is a side effect of doing it. The main reason is we like being outdoors. We like cycling and we are getting the kids into that, and the side effect is that you are healthier, and you feel a bit better and as a result you tend to eat better as well (Initial Interview).

Sarah's environmental view of sustainability showed a degree of sophistication as she acknowledged the importance of underlying concepts such as material flows and biodiversity. The importance of biodiversity was a concept she expressed strongly, for example, in the context of her own home:

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[16] Department of Conservation (DOC); the purpose of which is to provide conservation leadership through managing healthy functioning ecosystems, recreation opportunities and some heritage sites.

We have a reasonable sized garden [at home and] we have introduced more native species into it. That hasn't really been a conscious choice as such, it just seems like a natural choice. We've now got a Tanekaha[17] tree in the front garden and a lot of the birds use it and we've got a Kowhai[18] tree as well. We have noticed in the past year and a half a lot more Tui[19] around. We like that and whenever we see them in the garden we drag the kids out and show them" (Initial Interview).

Though the majority of Sarah's comments about sustainability are clearly environmentally and ecologically based, and about enhancing the natural environment, she also recognises an understanding of the economic and sociocultural aspects of sustainability, often related through considering environmental issues. For example, when talking about sustainability issues in her home:

We have just re-planted the vegetable patch and that is quite pertinent with GST[20] increasing and the debate about whether to take GST off fruit and vegetables. We try to reduce our power consumption, but living in the damp Waikato I think it is really necessary to have a clothes dryer. That is not really being sustainable, but then if you didn't, you'd have very few clothes to wear, especially with having a young family (Initial Interview).

When she talked about sustainability in the wider community Sarah also acknowledged a wider sociocultural understanding of sustainability. She acknowledged that living sustainably is problematic and involves making personal lifestyle decisions and that these decisions are value judgments played out in context, for example:

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[17] Phyllocladus trichoanoidies - native tree.

[18] Sophora microphylla – native tree.

[19] Prosthemadera novaeseelandiae – native bird.

[20] GST – Goods and Service Tax. Increased from 12.5% to 15% on 1st October 2010.

I would love to live in a sustainable community. That is something that is getting more and more important to me as I learn more about sustainability. It is becoming a big thing now with the answer [for most people] being about money, [for example] if they can save money on their power bill. Just one simple strategy, it will change their attitude, just like that, a bit of economics (Initial Interview).

Sarah was confident in her view of sustainability which she had developed through personal experience. She considered herself an active learner and added to her understanding through self-selected professional development and learning opportunities, such as networking through her husband and colleagues at the Department of Conservation, and the internet.

In summarising Sarah's view of sustainability, when all of Sarah's comments about sustainability are compared, they show a perception that is heavily weighted towards ecological sustainability. Of the 21 comments Sarah made about sustainability, 14 expressed concepts associated with an environmental view, four indicated an understanding of sociocultural nature of sustainability, two expressed concepts associated with economic perceptions and one was associated with the generic understanding of sustainability as carrying on indefinitely. This spread[21] of perceptions is represented in Figure 4.2.

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[21] Expressed as the percentage of each perception represented in Sarah's comments.
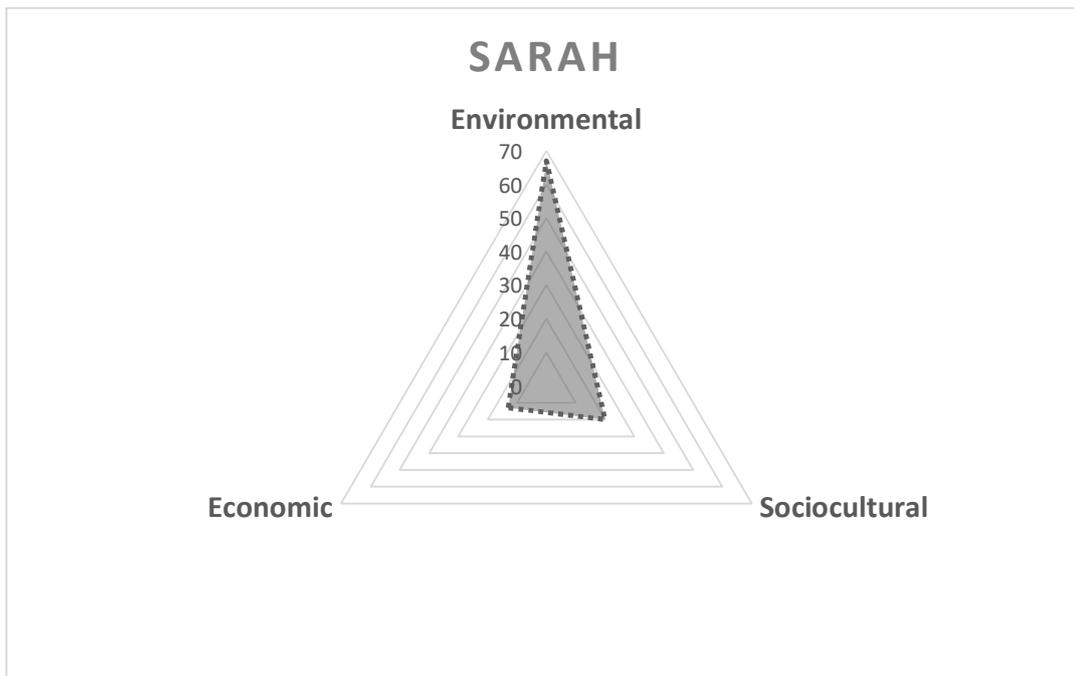
Figure 4.2: Visual Representation of Sarah's Perception of Sustainability

4.4 Sarah's View of Sustainability Education (object)

Sustainability education, in Sarah's view, was mainly about developing students' understanding of the nature of sustainability. She spoke strongly about developing her students' literacy in the area of sustainability, explaining:

> They have got to understand what the key terms are. So for example the term sustainability … and then you have things under that like what does biodiversity mean, what does environment mean? They have got to understand the language, because if they do not [they] are not going to get anywhere (Initial Interview).

Closely associated with this aim, however, was her desire to develop students' ability to think and to identify their own positions when considering issues of sustainability. Here she acknowledged the role of values working alongside literacy, expressing this succinctly as: "[Take] the term

sustainability. We are all individuals [and] each person is going to have their own perspective on it, but essentially they are all saying the same thing" (Initial Interview).

A third aim of sustainability education identified by Sarah was the development of student's action competence, their ability and willingness to take critically informed action towards more sustainable conditions (Jensen & Schnack, 2006). She expressed this saying: "[Sustainability education] has to have some focus to it, otherwise it just dissipates out. Some benefit to the environment or community, an end goal that is linked to taking action, a target for creating change, an end benefit" (Initial Interview).

In considering the place of sustainability in the curriculum, Sarah expressed a view that sustainability education was contained holistically as "an overarching theme running right through it" (Initial Interview). She did not expand upon this statement or give reasons for this view, though she expressed that, compared to the previous curriculum (Ministry of Education, 1993) where sustainability was confined to environmental education, there was a greater emphasis on sustainability and "[Sustainability education] could be covered in all the curriculum areas now" (Initial Interview).

This change in the way sustainability education was presented in the curriculum was seen by Sarah as developing in response to the way sustainability was increasing in importance in the world, and that both sustainability and sustainability education would continue to develop in meaning:

> You can see that there is way more consideration about sustainability in the current curriculum. They have used the old curriculum as a basis and gone 'there isn't much of it in there'. You see [sustainability] on the news all the time, various aspects of it. Perhaps there will be a different perspective on it in a few years' time and [sustainability in the curriculum] will have to be changed again" (Initial Interview).

Sarah was not aware of many successful examples of sustainability education being implemented in secondary schools apart from a recycling programme in her own school. She expressed a view that there was a slow uptake of teachers and schools around sustainability education due to there being a lack of understanding about sustainability. Sarah summarised the situation as: "A lot of people see sustainability education as an airy fairy thing, [from] a lack of knowledge. They say 'oh I already recycle at home', it is that sort of attitude" (Initial Interview).

Sarah's view of sustainability education was linked to her view of sustainability as being environmentally and ecologically focused. In her teaching practice, sustainability education was expressed through her year 12 science programme, with her seeing that: "Ecology is a part of sustainability and it is part of science" (Initial Interview). She expressed the aims of her programme as being about: "Trying to get across to the students an overall perspective about sustainability … to have an understanding about their environment in terms of the particular species they have chosen to study" (Focus Group Discussion day 3).

For Sarah, sustainability education had implications for her classroom teaching practices. For her, learning experiences in sustainability education demanded aspects of pedagogy that link classrooms with the natural world outside of the classroom. She argued for example:

> Sustainability education is also about getting kids out of the classroom so there is a diverse range of learning experiences, it is EOTC[22] as well. You are opening up a door for the students in an area that they might not be familiar with, getting them to think outside their normal range and opening up new experiences for them (Initial Interview).

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[22] Education Outside The Classroom.

Having students involved in learning experiences outside the classroom had been a part of Sarah's classroom practice for a long time, connected to her personal view of sustainability. She expressed her view of learning outside the classroom as an integral part of sustainability education and that: "Getting kids out of the classroom [is important] so [they have] a diverse range of learning experiences. There is a lot more out there than they see sitting in front of the TV" (Initial Interview). She expressed her view of learning outside the classroom as being integrated with her in-class programme, for example visiting sites such as Mount Pirongia and Mount Maungatautari.[23] She argued this was important as "the students experience it not only as class work but as field and practical work. They see the environment in action" (Initial Interview).

Sarah also acknowledged that her classroom pedagogies associated with sustainability education were changing. What she saw as appropriate pedagogy had widened, with her now mixing more student-centred, inquiry based pedagogies into her classroom practice. She recounted:

> The work used to be very classroom based. There was a lot of note taking, and to a degree there still is, but now we can hook up to the internet and show stuff using the data projector. We can book into the computer labs or go down to the library (Focus Group Discussion Day 3).

The thinking that Sarah had done for her local sustainability curriculum, based around endangered species, had prompted an increased focus on sustainability throughout her work in other curriculum learning area teaching. For example, Sarah identified two other field based science units where she thought she could address sustainability education; her *Rocky Shore* and *River Study* units:

> We go out to the Rocky Shore in the morning and then do a River Study in the afternoon. The learning in sustainability will be species

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[23] Extinct volcanic cones with native forest remnants.

identification and why the species are there, and how many of that species are there. On a basic level that is about the food web; the idea [being] that if you take some species off the web, then [there] is that flow on effect for the whole ecological system. It is both biology and sustainability education, they both support each other [but] the topic is about sustainability (Initial Interview).

Another important aspect of the nature of sustainability education for Sarah was the way sustainability education might be assessed. For her, learning in sustainability was a potential change agent for her students' behaviour in the future, and as such the educational outcomes may not be measurable in the short term through normal school assessment structures, such as end of unit tests. She argued:

Who knows, it could be years later when I am an old lady, maybe. There is a school reunion and I am there and up walks this student and they say; 'Do you remember me?' And they say; 'Well I now do bla bla bla', and it is something in sustainability … maybe not necessarily even to do with the topic I had taught (Initial Interview).

4.5 Sarah's View of Sustainability in the National Curriculum (psychological tool)

Sarah had identified that sustainability education was a part of the national curriculum, however when it came to planning her local sustainability curriculum, which was part of her senior year 12 science programme, she did not draw on the national curriculum for her planning. She instead drew upon the national assessment framework as her default curriculum. She explained her approach saying: "I went straight to the NZQA[24] website and looked at the assessment matrix to see what achievement standards were available. I decided that I could do these ones AS90771 and AS90772" (Initial Interview).

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[24] New Zealand Qualifications Authority.

133

Sarah used these assessment standards to structure a unit of work in sustainability education that had her students research New Zealand endangered species and identify the reasons for their endangered status. In this way her local sustainability curriculum was embedded within her science programme as a sustainability education topic. She described her approach to sustainability education in this manner as:

> I couldn't really do sustainability as a whole programme, but there are certain assessment standards that I can put into my senior science programme where I can address sustainability. So my [local sustainability curriculum] is based around achievement standards 90771, 'Research Information to Present a Scientific Report' and 90772, 'Describe the Factors and Processes Involved in the Evolution of New Zealand Plants and Animals' (Focus Group Discussion Day 3).

When it came to planning her local sustainability curriculum, Sarah didn't use any formal template or planning scaffold to aid her planning. Instead she developed information and guidance material for her students that scaffolded their learning, focussing on the information that she wanted them to cover. These documents represented her planned local curriculum.

In Sarah's science based local curriculum, these planned curriculum documents often took the form of factual, information rich, digital resources and this pattern was followed in her sustainability curriculum. For example, she recounted an example of a resource she valued, explaining her reasoning: "There is a really good DVD on marine environments for the level two biology programme; Rocky Shore Study. It has a Rocky Shore PDF document [as well as] an online modular system that gives the students background information" (Initial Interview).

For Sarah, factual information supporting learning in different contexts was important and the internet was also seen as a valuable source for this, particularly for the endangered species work. She valued this approach as

she felt this was an effective way for students to do their own research, commenting for example:

> If you go onto the DOC website it is very tied into the curriculum and specific standards. This year I am incorporating that into the level two programme adding different media. It is not all just going into the classroom, we are going to use computers and the kids love using the computers; they love the online stuff (Initial Interview).

4.6 South School Culture (rules)

South School, a faith based, state-integrated secondary, expressed its values through reference to five core values and attitudes based on the Marist (Catholic) pillars. Through the promotion of these values the school articulated its vision as being preparing young men for life (Education Review Office, 2012). Sarah explained her understanding of these values and vision as:

> It is about simplicity; keeping things simple. Why reinvent the wheel. It is about family spirit, looking out for one another, being in the way of Mary, the mother figure; the go to person. It is about presence, being at school for more than just lessons. It is about the spirit of work, applying yourself to all things, not just the ones you find easy; that give it a go attitude. And lastly, it is about solidarity, the coming together in a family spirit where we are there for each other (Focus Group Discussion day 3).

As well as valuing these virtues, the school expressed a focus on academic achievement for its students. Student achievement was monitored through whole school systems that linked student achievement with individual teachers. Sarah talked about the way this process worked and how the effectiveness of her teaching was assessed and monitored. She accepted this monitoring as normal practice in an uncritical way and used the

information that was generated to reflect upon her own teaching, describing the process as:

> The head of department gets all the results for each class and teacher, [but] what happens after that ….. I don't actually know. I get, and like to see the anonymous written comments by the kids, like; 'She talks too fast and I can't copy it down' (Focus Group Discussion Day 2).

The school focus on academic achievement, though accepted by Sarah, was something she identified as detrimental to the development of her local sustainability curriculum. She explained: "I would love to have more of a focus on sustainability but feel the pressure to get the students some credits"[25] (Focus Group Discussion Day 3).

Within this culture Sarah was experimenting with ways of delivering sustainability education as a topic within her science programme. She reflected on the changes that she had noticed in her classroom practice:

> I used to be quite academically focused, very much to do with the credits and literacy push. It still is to a degree, but what I do now is more about how the students see it. It [used to be] like being on a manufacturing line, a conveyer belt. You have to get them in and out, material covered, credits at the end, job done, big tick (Focus Group Discussion Day 3).

4.7 Curriculum Stakeholders (community)

Sarah expressed a view that, in her school the community of curriculum development shareholders was limited. Local curriculum was often initiated in a top down manner, with new initiatives coming from the school management. Teachers were very much left to develop the detail at their own discretion. For

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[25] Credits on the NZQA assessment framework.

example, Sarah was delegated the level two programme to work with by the School Curriculum Committee, as school management had identified a need for a new science programme at that level. It was within this context that Sarah decided to develop her local sustainability curriculum.

Sarah sought formal advice and connection with other colleagues in her department to help with her local curriculum development. She found, however, that in South School: "There is not a lot of sharing of information [amongst colleagues]" (Initial Interview). As Sarah looked for other opportunities for collegial support for her local sustainability curriculum developments she experienced the siloed cultural nature of her, and many other, secondary schools in that professional knowledge and many practices that she eventually found helpful were hidden. This reinforced her view that local curriculum development was an individual teacher responsibility. For example:

> I talked to other staff that had more teaching experience about where to look for information and any kind of guidance. I discovered there is this process where they buy in exams. So where do I get those from? No one told me about that. I just don't get that. Why? It is to no-one's benefit (Initial Interview).

In comparison to formal stakeholder connections, Sarah found informal connections with colleagues across departments far more important for supporting her local sustainability curriculum development. These connections were found to be influential and effective with her commenting, for example:

> I go outside my department, very much. Sometimes when you are talking about something in your area, for example with a good friend I have in the maths department, although it isn't [directly] related, you go, oh, I never thought about that. That's a really good idea, I can apply that to ... (Initial Interview).

The second effective influence on her local sustainability curriculum development was her perception of her students. Sarah acknowledged that her students were stakeholders in local curriculum development recounting that her curriculum development decisions in her sustainability programme had been influenced strongly by her perception of her students; what they liked and what they were capable of. For example, she expressed a clear understanding of the expectations of her year 12[26] students with regard to pedagogy. She summarised her students approach to learning as: "The kids come into the room asking three questions: Are we doing a practical today? Can we blow things up? Can we set fire to something?" (Initial Interview).

Decisions about the structure and level of her local sustainability curriculum had been influenced by her understanding of her students, for example the choice of placing her sustainability education topic within her year 12 science programme. When asked why her sustainability education programme was at this level and not say at a more junior level, she argued: "Sustainability education lends itself to the level 2 programme because these students have a better understanding. Juniors' heads are generally all over the place and the seniors are more able to take [issues] on-board and argue a point" (Initial Interview).

Sarah argued that her understanding of her students had developed informally by talking to her students throughout the year, as well as formally through whole school initiatives such as:

> We have a new online survey for the students to complete via the school's Moodle site. I normally select a class and get them to fill out a survey, say 5 questions, to get them to tell me what they didn't like and why, [as well as] if they liked things, why they like it (Initial Interview).

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[26] 16 and 17 year old boys.

This formal understanding of her students was also supported by information gained by a school wide initiative consisting of written surveys where students were asked to comment on curriculum delivery as well as the personal teaching style of their teacher. Sarah found this to be useful, arguing that it allowed her to: "Look at her [taught] curriculum in a formal capacity and identify things that needed to change for the following year" (Focus Group Discussion Day 2).

4.8 Curriculum Development Practices (division of labour)

Sarah's experience of local curriculum development at South School is that curriculum innovations are considered and initiated from the whole school / middle management level: "Consisting of the heads of department of each curriculum area" (Initial Interview). Decisions made at this level were communicated to departments, and then further down the management chain to individual classroom staff to implement.

This top down approach in Sarah's experience left few formal dialogue opportunities with school management or senior colleagues in her curriculum area within her own school. Additionally, Sarah had no opportunity to seek support and guidance from Ministry of Education funded support networks, such as curriculum advisors, as these did not exist at the time of the research. To meet her needs for formal support, Sarah proactively looked outside of her own school and approached other experienced teachers who had done similar curriculum developments for support and guidance. Sarah reflected pensively on those experiences recounting:

> It was recommended that I contact a head of department at another school. But I didn't get much help from them at all. I got told; 'It wasn't <u>my</u> job to write <u>your</u> level two programme'. But that was not what I was asking. I was just asking for a little bit of guidance. I later got in touch with another head of department at a different school who was

139

extremely helpful and we then exchanged a number of different resources (Initial Interview).

Within this context, Sarah worked as a solo-developer, creating her level 2 sustainability education topic based around the theme of Endangered Species within her science programme. To achieve this she worked individually in her own classroom with little formal support. This was a time and energy consuming process which left her feeling: "Like I am the only person doing this" (Focus Group Discussion Day 2).

Sarah reflected upon her journey and identified that she would have liked to have been working on developing her sustainability curriculum with others. She acknowledged the importance of developing a critical mass of like-minded colleagues to support the change and rationalised this as being about balancing the effort and work required, and the payoff in terms of having the initiative succeed. In describing this thought she commented: "Sometimes there is the enthusiasm of the individuals and if you get enough individuals, with enough enthusiasm, then it can work" (Initial Interview). Later, she reiterated this view, explaining: "It takes a lot of time to plan. I would love to focus on [just one thing], but that is unrealistic isn't it, in the nature of teaching" (Focus Group Discussion Day 3).

4.9 Sarah's Local Sustainability Curriculum in South School (outcome)

Sarah worked as an individual teacher within the science department in South School and established a unit of sustainability education within her level 2[27] senior science programme, focusing on native endangered species. Her

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[27] NZQA level 2. Year 12 students, aged 16-17.

sustainability education programme was aligned to two national achievement standards.[28] Sarah described her local sustainability curriculum as:

> It is based around two [science] achievement standards 90771, 'Research information to present a scientific report', and 90772, 'Describe the factors and processes involved in the evolution of New Zealand plants and animals'. I use elements of New Zealand's flora and fauna because it encompasses evolution and Darwin's theories of heredity, predators and so on (Focus Group Discussion Day 3).

In Sarah's sustainability education programme, students investigated the environmental status of native species to determine whether they were extinct, threatened, endangered or critically endangered and investigating the reasons why they were classified at this status. She described the detail of her programme:

> It lends itself really well to the aspects of sustainability and environment. [The students] go out and experience what is on their doorstep. We use Pirongia and Maungatautari so not only is it [based on] class work, we can use practical work in the field to see the environment in action (Initial Interview).

Sarah's local sustainability curriculum was stand-alone and not connected to any other sustainability initiatives in the school. She was aware of some other small initiatives in sustainability education but did not see any obvious connections between her work and these, acknowledging:

> We have a class recycling programme going on for paper and that has been set up through the auspices of the Duke of Edinburgh awards. I know they do a lot of environmental type activities. That is great because not only do the students get those experiences, they get an award as well. We have paper recycling bins in all the classrooms now, so that is certainly school wide (Initial Interview).

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[28] National assessment descriptors.

Sarah's approach to sustainability education can be described as a topic based approach, where she had identified a topic within her normal scheme of work that lent itself to learning in sustainability. In her case the choice of the topic was influenced heavily by the national assessment framework. Her choice of the particular topic, Endangered Native Species within her science programme, in which to develop her local sustainability curriculum indicated that she viewed that some science topics are more suited to sustainability than others, and perhaps that some do not have any links with sustainability at all. Her choice of topic in which to develop sustainability education seemed consistent with her view of sustainability as environmentally and ecologically based.

Sarah formalised her local sustainability curriculum in the form of a handout for her students that detailed the work to be done. The handout material explained the links between the work to be achieved and the national assessment standards, detailing the meaning of the standards as well as outlining the assessment requirements.

Sarah's approach to the standard, *Research Information to Present a Scientific Report* exemplifies her approach to her local sustainability curriculum. In this example her planning, which followed a logical and sequential approach, began with the achievement standard and built upon a generic template to scaffold her students to choose their own endangered native species to study and then follow their own inquiry into the reasons for that species being endangered. In this way Sarah argued that her students would encounter the fundamental idea of Biodiversity as an aspect of sustainability in their work.

The students' inquiry was scaffolded by a *Student Learning Guide* that guided their progress through the unit of work. The guide listed a number of different species that were suitable for the inquiry, as well as the criteria that must be included in their reports for assessment (see Figure 4.3).

Scientific Report

Criteria you **MUST** include in your report:

1. State the name of the flora or fauna: common name and scientific name
2. You should classify your chosen organism as: extinct, threatened, endangered, or critically endangered **AND 'why'**.
3. Give the location or locations of the species
4. Approximate species numbers, if possible (you may include reproductive cycles)
5. Species description
6. A description of their habitat
7. Explain the factors and process involved in the evolution of that species (how have they developed from their ancestors)
8. Factors involved in the development of NZ flora and fauna: geological movement; changing sea levels; climate changes; predation; competition
9. Other changes that may have affected their development: mutations; genetic variation; genetic isolation; founder effect; bottleneck effect
10. List all your sources of reference: websites (date & time of access); books; periodicals; magazines

Figure 4.3: Example of Student Learning Guide for Sarah's Local Sustainability Curriculum (Document Analysis)

An analysis of Sarah's local sustainability curriculum documentation showed that much of the intended student learning addressed the science curriculum with ideas of taxonomy, ecology, reproduction, speciation and evolution being prominent throughout the students' intended work. Though Sarah had indicated that biodiversity as a concept of sustainability was important in her programme, document analysis showed no references to this concept in the student instructions. The student guide ended with a clear articulation of the

intended learning for students through a marking schedule that likewise had no direct reference to sustainability, or sustainability decision making concepts such as biodiversity (See Figure 4.4).

New Zealand Natives Report Marking Schedule

From the given list of native species, you are to choose ONE species and write a **Scientific Report** on your chosen species.

1. State the name of the species: Scientific name, common name, Maori name (if possible)
2. Give location of species in NZ (you may include a map to enhance your figures)
3. Approximate species numbers
4. Include reproductive/gestational information.
5. Species description.
6. Habitat description.
7. Explain the factors & processes involved in the evolution of that species (how they developed from their ancestors).
8. Factors involved in development of NZ flora & fauna; geological movement; changing sea levels; climate change; predation; competition, isolation.
9. Environmental impacts which have affected the species, and the current environmental status.
10. List all references:
    • www.doc.govt.nz – access date + time, books, magazines, periodicals
    • Interviews with people: peoples name, date, time (summary of interview)

Figure 4.4: Assessment Schedule for Sarah's Local Sustainability Curriculum (Document Analysis)

In Sarah's teaching pedagogy, her students' learning was supported by a variety of resources such as web pages and information CD's, as well as web search time for student centred, independent research. She balanced this teaching approach with direct teaching scaffolded through a PowerPoint presentation of more than 50 pages. She presented this to her students in sections, covering much of the scientific knowledge such as speciation and evolution, that she wants her students to understand.

The classroom practice observed during the classroom observations was based on a teacher-directed, student self-inquiry approach where students referred to the learning guides supplied by Sarah. These were pasted into the front of students' research journals to guide their progress. In the observed classes, the students used computers to search information about their chosen endangered species.

When asked about how her local sustainability curriculum reflected the aspects and conceptual drivers of sustainable decision making as established in section 2.4.4, Sarah acknowledged that it addressed ecological interdependence and responsibility for action only. Her plans for ongoing development of her local sustainability curriculum were to increase the coverage of aspects and conceptual drivers of sustainability decision making though continuing with her topic of endangered species.

When analysed with respect to the principles of sustainability education developed in section 2.5.1, Sarah's approach to sustainability education, as a topic within her subject curriculum area of biology, was technicist in nature. It addressed students' knowledge of a small range of ideas in sustainability such as biodiversity, ideas that are grounded in environmental education. Her local sustainability curriculum did not appear to include many of the principles of sustainability education such as; social criticality, relevance, authenticity, problem and future focus, improvement orientation, sociocultural / historical boundness, systems focus, transformationalist or values acknowledgement.

4.10 Chapter Summary

Sarah expressed an environmental view of sustainability that derived from her personal background where the natural environment, the outdoors, native plants and animals and a conservation ethic are important to her and her family. Sarah's enthusiasm for all things natural and sustainable was translated from her personal life to her professional life and was expressed through her approach to sustainability education in her school.

Sarah's view of sustainability, as being about the natural environment, influenced her view of sustainability education. Though at an academic level she identified sustainability education as something that was interdisciplinary that could be linked across the whole curriculum, she chose to implement sustainability education as a topic within her normal curriculum area of science. Sarah's choice of the particular topic to address sustainability within

science was influenced heavily by her understanding of the national assessment standards. She identified two science standards that she felt allowed her to develop her students' learning in sustainability; AS90771 - Research information to present a scientific report' and AS90772 - Describe the factors and processes involved in the evolution of New Zealand Plants and Animals. Within this topic, Sarah had her students cover all of the normal learning that was required to successfully gain the credentials of the science assessment standards, something that is important to her as her students' grades are monitored through the school's assessment structures and are used to measure her teaching success. Embedded in this work was her emphasis on learning in sustainability, focusing her students on the issue of biodiversity.

Sarah had adjusted her normal classroom pedagogy to accommodate the sustainability education component of her topic, increasing the amount of student self-directed inquiry. Additionally, in response to her view that sustainability education was more values soaked than her normal area of science, Sarah increased the amount of time students spent outside the classroom experiencing the natural environment.

Sarah had developed her local sustainability curriculum on her own with little support or guidance from within her school. In the absence of any formal Ministry of Education curriculum development support, she had also sought assistance from outside her school by connecting with other teachers involved in similar curriculum developments, but again did not receive significant support or guidance.

The major influence on Sarah's local sustainability curriculum decision making became her understanding of her students and their learning strengths and weaknesses. This understanding she developed through her informal interactions with her students as well as through formal, whole-school, student feedback mechanisms.

The local sustainability curriculum that Sarah produced was environmentally focused, addressing a small number of concepts in the ecological aspect of sustainability, such as biodiversity. Sarah viewed learning in sustainability as something that might not be immediately obvious, but be expressed through thinking, behaviour, and life choices that may be expressed months or even years after teaching had been completed.

Sarah's local sustainability curriculum in South School positioned sustainability education as a topic within an existing curriculum area. When analysed with respect to the conceptual framework developed for sustainability education in section 2.4.4 and the principles of sustainability education established in section 2.5.1 Sarah's local sustainability curriculum in South School addressed a small number of the concepts and aspects identified as important in sustainability decision making and approached learning in sustainability as technicist education.

Chapter 5   Research Findings at North School

5.1 Introduction

In this chapter data are presented to describe the influences upon Wayne's local sustainability curriculum development in North School. The data, which are socioculturally and historically bound within the school setting, are presented following the cultural historical activity system theorised with respect to his school (see Figure 5.1).
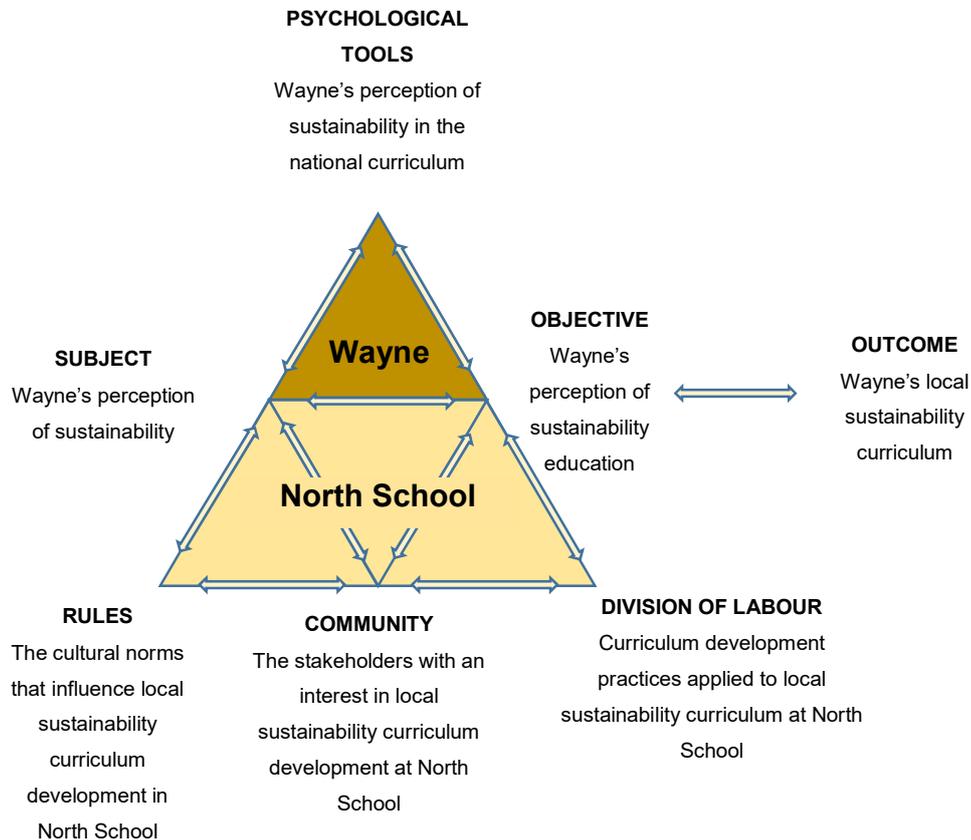
Figure 5.1: The Cultural Historical Activity System of Wayne's Local Sustainability Curriculum Development at North School.

The first four sections report upon the findings associated with the mediated action aspect of the activity system, represented in Figure 5.1 as the darker shaded upper section. Section 5.2 describes the sociocultural context for Wayne and his teaching. Section 5.3 reports upon Wayne's perceptions of sustainability as the subject of his local curriculum development, acknowledging the influences of his personal and professional background. Section 5.4 reports upon Wayne's perceptions of sustainability education, his views of its nature and its aims. Section 5.5 reports upon Wayne's view of sustainability in the national curriculum; what counts as the curriculum for him when planning sustainability education and how he used this to guide his local sustainability curriculum development.

The next three sections, 5.6, 5.7 and 5.8, report upon the influences of the sociocultural historical setting in North School, represented in the activity system shown in Figure 5.1 as the lower, lighter shaded, section; the interactions of the rules, community and division of labour surrounding local curriculum development. Section 5.6 reports upon the influences of North School's academic and wider culture on local sustainability curriculum development. Section 5.7 reports upon the way North School defined, through operation, the community of people that influenced the development of local sustainability curriculum, that is the stakeholders. Section 5.8 reports upon the way local sustainability curriculum was developed in the sociocultural historical setting of North School and how Wayne developed his local sustainability curriculum within this context.

The last section, 5.9, reports upon the outcome of the activity system, the local sustainability curriculum that Wayne developed in his school setting.

5.2 Setting

Wayne, who is in his fifties, was the head of technology (design and graphics, wood, metal and food) in a small town, decile one,[29] state co-educational secondary school catering for year 9 – 13 students. North School, where he worked, had a roll of 400, which is small by New Zealand standards. The ethnic mix of the student population was 69% Māori,[30] 27% New Zealand European and varied mix of other ethnicities. Wayne was an experienced teacher who had taught for over twenty years, mainly in South Africa, but had spent the last six years teaching in New Zealand. Wayne taught design and graphics, often to students from more than one year level in the class at the same time because of the small size of the school. According to the 2012 Education Review Office report for North School, many of the students in Wayne's classes were likely to have low levels of achievement in reading and numeracy on entry to the school.

5.3 Wayne's Perception of Sustainability (subject)

Wayne's view of sustainability had been heavily influenced by his experiences as an architecturally-trained designer, and it is in this context that he viewed sustainability as being about technological efficiency. He articulated this view when he commented: "When I think about sustainability, the first thing that comes to mind is architecture; building materials and systems" (Initial Interview). This architectural background had given him a strong belief in the power of technological developments to create more sustainable ways of living. This techno-efficiency view of sustainability was expressed through a problem-solving approach to architectural design within his teaching programmes, which included principles of sustainability and the

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[29] Low socioeconomic grouping.

[30] Māori contribute 15% of New Zealand's population (2013 Census, Statistics New Zealand) so this school has a significantly higher Māori population than the national average.

application of new technologies to creating more ecologically sustainable built environments. He commented for example: "When it comes to architecture, I just love that. I am forever thinking about, for example, how to reduce the amount of money spent on power and power bills" (Initial Interview). Wayne expressed this view through his approach to sustainability education where he had his students research sustainable materials and systems, such as solar and wind generated electricity as part of their designs.

Wayne's techno-efficiency view of sustainability was balanced by an appreciation of the environmental nature of sustainability, most often expressed when talking about his personal life. He reflected upon his appreciation of nature as a part of sustainability, as an attitudinal approach to the natural world. He commented for example: "I have an awareness wherever I go, like fishing or nature; I just have an attitude. I think I have been programmed to think that way" (Initial Interview). When prompted to clarify his meaning, he commented further: "It is just a general attitude about the depletion of resources of our planet, it's about protecting our planet" (Initial Interview). His appreciation of the natural world was expressed, not surprisingly given his design and construction focus, through the concept of resource management and conservation.

Wayne also acknowledged an appreciation of sustainability's sociocultural aspects, particularly in connection with living in his schools' community, which had many low socioeconomic indicators. In this context, he suggested that a part of sustainability was about caring for others, for example commenting that: "Sustainability is about respect for yourself and respect for the needs of others. It is about trying to persuade people to be a little bit more aware, and less selfish, so that you are taking other people into consideration" (Initial Interview).

Wayne chose to develop his understanding of sustainability at a professional level by enrolling in university papers towards a postgraduate diploma. He found this type of professional development empowering commenting:

> When I started studying last year; that really exposed me to new ideas. That is where it really all started. I knew about sustainability before that, but last year I was really prompted to start thinking, and everything changed. So I just got my students into it. (Initial Interview)

In summarising Wayne's view of sustainability, when all of Wayne's comments about sustainability were compared, they showed a perception that sustainability that is about creating more techno-efficient products.
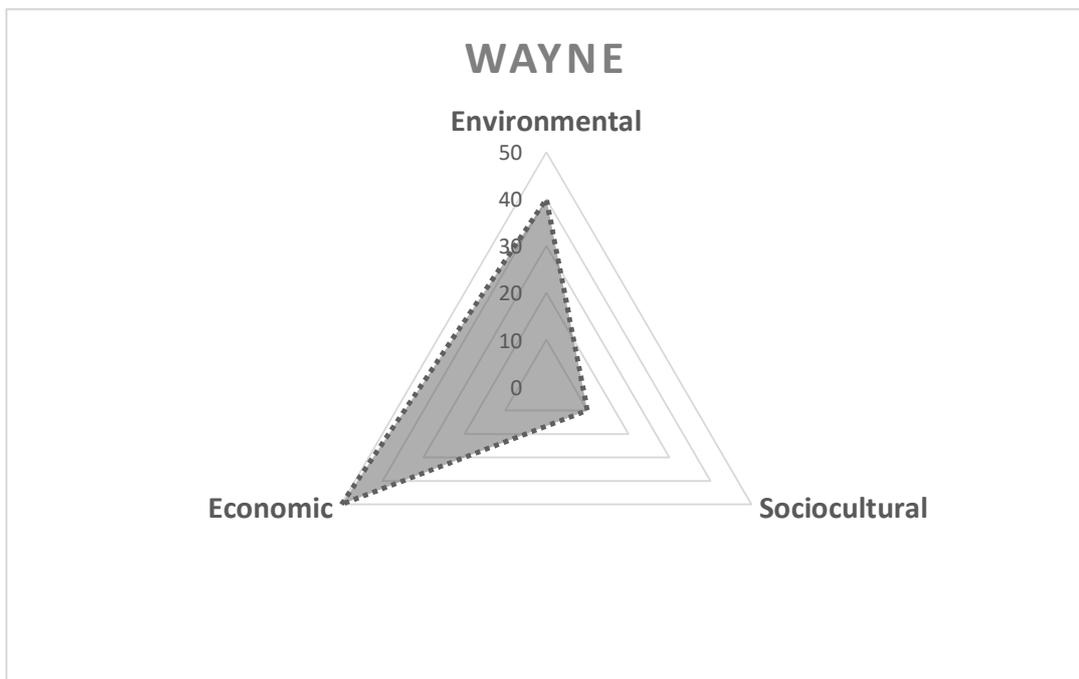
Figure 5.2: Visual Representation of Wayne's Perception of Sustainability.

Of the 16 comments he made about sustainability, seven expressed concepts associated with an environmental view, one indicated an understanding of the sociocultural nature of sustainability and eight expressed concepts associated with economic perceptions. This spread[31] of perceptions is visualized in Figure 5.2.

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[31] Expressed as the percentage of each perception represented in Wayne's comments.

5.4 Wayne's View of Sustainability Education (object)

When asked about what he thought sustainability education was, Wayne commented: "[It] is about [students understanding] the depletion of resources and about living curiously. First and foremost students need to understand that we are limited by our resources" (Initial Interview). He expanded upon this comment, saying that in his experience, in New Zealand things were normally available and people didn't experience a lack of material possessions. On the occasions when he had seen this, he observed that the normal response was for people to complain as if it was their right to have things available, an attitude he argued: "Did not work for sustainability" (Initial Interview).

When talking more about his view of sustainability education, Wayne also identified that empowering students to make informed choices, to live more sustainable lives, was a fundamental aspect. He approached this through a practical problem solving approach to his teaching. He did, however, concede that the development of this capability in students was difficult in his community of learners. He argued that in the daily lives of his students choices about living sustainably were limited by their socioeconomic situation. His view came from comparisons with students living in higher socioeconomic communities, where they had far more options to choose from in their lifestyles. He expressed this thought through commenting: "I think it would be easier to deal with education for sustainability in a decile ten[32] school, I am absolutely sure about that" (Initial Interview).

When asked about how sustainability was positioned in the curriculum, Wayne expressed some confidence talking about the place of sustainability education and how it had arrived there. He viewed sustainability education as not being constrained by any particular subject curriculum area or other structural component of the curriculum, but as being something that was

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[32] Highest socioeconomic grouping.

interdisciplinary; acting across the whole curriculum and affecting students' attitudes. He explained his understanding commenting that sustainability education was about: "Switching students on to living curiously. Being about students noting things and being aware of things" (Initial Interview). For example, he said:

> Students making connections to things, like the LED [headlights] in new Audi cars, or water use at home and harvesting water. Like a student last week that came to me wanting to do his speech in English. I gave him a camera and he took pictures of their water tanks and pumps. That tells me he is switched on (Initial Interview).

When considering how sustainability education might be incorporated into his own curriculum area of technology, Wayne expressed the view that:

> My subject runs on sustainability. It is interwoven into every [design] brief. For example, we do *Sleep-Outs*[33] in level 1. A year ago we started looking into sustainable materials and systems, and then the students had to design a sleep-out on Sketch Up[34] (Initial Interview).

When asked about classroom practices that suited sustainability, Wayne expressed the view that sustainability education should be translated into classroom practice through a mix of theory with practice, creating a practical problem solving approach to learning. He argued for example:

> So the way to address [learning in sustainability] is to be practical. That is one of the main concepts in my opinion. For example, to [have the students work out how to] use photovoltaic cells to charge cell phones. It is also about having a result form those practical things. Just theory is not good enough (Initial Interview).

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[33] Small self-contained habitable building as defined by local building planning authorities.

[34] Digital design package.

5.5 Wayne's View of Sustainability in the National Curriculum (psychological tool)

Wayne's local sustainability curriculum planning was strongly influenced by the national curriculum, but actioned through reference to the achievement objectives and the national assessment standards. Wayne had developed a deep and functional understanding of these learning and assessment objectives, and used these to structure his local curriculum, commenting: "After working with them for six years I know the units and the assessment schedules really well" (Initial Interview). In this way, Wayne had internalised the curriculum objectives and used these intuitively as cognitive tools when he planned his local curriculum.

When talking about planning local curriculum in his technology education programme, Wayne explained that it was common practice to begin the process referring to pre-prepared units of work written by industry training organisations, commenting:

> The teachers just choose the units they want from the industry training organisation material. 22 credits on average [for the year], that is the goal. The teachers just choose [the unit] and [then] choose the project to go with the unit. Like in building construction; a deck chair, or a CD rack (Focus Group Discussion Day 3).

Wayne explained the process further, recounting: "[I] look at the curriculum, but am guided largely by the pre-moderated unit from the ITO. It has already included all those objectives" (Focus Group Discussion Day 3).

This freedom to choose, what Wayne talked about as the *project,* was an important consideration in his approach to sustainability education. Wayne's local sustainability curriculum development was based upon his understanding of the nature of sustainability and the way sustainability related with design and graphics. Though achievement standards for sustainability education are present on the national assessment framework, Wayne was

unaware of their existence at the beginning of the research. In the absence of this knowledge, Wayne had structured his local sustainability curriculum around his understanding of sustainable design principles, and the way he could address these within the assessment framework for technology education.

Wayne selected and used a variety of resources in his classroom practice when teaching sustainability. He made use of digital media such as video clip animations (Focus Group Discussion Day 2, Classroom Observations) to capture his students' imagination and to expose them to new knowledge and experiences. Allied to his choice of resources was his understanding of what motivated his students to learn. He explained, what was important was fun: "It has to be fun for the students. If you don't have interesting projects then you are in deep trouble" (Initial Interview).

5.6 North School Culture (rules)

The Board of Trustees[35] at North School had articulated the vision for the school as being about nurturing, supporting, encouraging and challenging students to achieve as individuals, allowing them to look to the future with confidence. This vision was further expressed through the school's mission statement where the themes of *providing opportunities* and *building futures,* were expressed and given detail through its strategic priorities. These were to raise student achievement (with particular focus on Māori and Pacifica students), develop a safe and well organised learning environment that prepares students for the future, and building strong community relationships.

Wayne expressed his impression of the academic culture of the school, and how this related to his local sustainability curriculum development, as a classroom teacher and head of department within this setting. He explained:

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[35] Governance body comprising members of the local community. Vision and Mission Statement communicated through the schools prospectus

We are very much results driven. The principal puts the sheet on the table and looks at his graphs. He has his objectives, and the Board of Trustees has their objectives. He shows this to the parents and to the staff in the staffroom and it shows how many students have achieved level one, and compares that to the previous four years. It is very results focussed. We need to keep students in school and get them qualifications, and we compare that with the rest of New Zealand schools at our decile level (Focus Group Discussion Day 3).

Within this focus on improving student achievement, evidenced by student credentialing against national assessment standards, Wayne felt empowered to develop his own local curriculum and pedagogy in response to the perceived needs of his students. He commented:

I can do anything, as long as they get their credits. If the box is ticked, we are happy. The box is the curriculum, and of course the assessment schedule. I know the curriculum and I know the units [of work], but it is also about credits. I know I have to get credits for those students. Unfortunately it is credit driven [for] achievement and unit standards" (Initial Interview).

Wayne attributed the confidence he felt to develop his own local curriculum was linked to his deep knowledge of the curriculum and the national assessment framework. As Wayne reflected upon this confidence, he identified a tension at work between having this confidence and autonomy and having strong leadership and direction to the development process. He explained his reasoning, saying: "If we have too much democracy and teachers have too much freedom, we never see constructive things happening [such as] cross curricula approaches" (Focus Group Discussion Day 2). He argued that this was one of the reasons that curriculum and pedagogy change was slow, particularly concerning the development of sustainability education. He commented: "While we could have these lovely themes and inquiry learning happening, when teachers have the option to say

no, it will never happen. If there is too much choice people won't do it. It is an issue of leadership" (Focus Group Discussion Day 2).

Another aspect of the school culture, and the *rules* that surround local curriculum development in North School, was that teachers valued and developed quite detailed and complex understandings of their students. This understanding was structured around knowledge of students as individuals and as a part of the wider community. For example, Wayne commented: "I know about 90% of my students well, as I work with them year after year. You always get new students though, and that is a challenge. With [the new ones] I spend two or three hours extra working with them" (Focus Group Discussion Day 2).

Wayne spoke about the importance of knowing his students as individuals and the way this knowledge helped him design classroom experiences that engaged his students through their individual interests. This knowledge of students, in Wayne's view was something that most teachers in the school worked with. He explained:

> We don't have a very big roll so we know the students and we [teachers] talk. The teachers across the different technology classes; graphics, automotive, engineering, building construction, we talk with each other or email one another. You need to know the hobbies and the interests of the students. If you know that, you are in a very good position (Focus Group Discussion Day 3).

Wayne's classroom practice reflected this view that knowing his students as individuals was an important practice in his local curriculum development. His classroom environment, the choice of learning materials and the roles he adopted, allowed him to work one on one with his students. He explained:

> I have the advantage of sitting next to individual students as they are working on their computers, and asking a couple of questions. Like, explain how this photovoltaic panel gets the power to this battery? Or, explain why you have your windows oriented here on this side of the

building? I have a building mock-up in my classroom and I talk with students; we connect up all the systems and talk about them. I know exactly where students are going, what I should do, and where I should concentrate [my teaching]. So [planning] is in real time, next to the student (Focus Group Discussion Day 2).

5.7 Curriculum Stakeholders (community)

In North School, Wayne identified a number of different stakeholder groups that influenced his local sustainability curriculum development. At the school governance level Wayne identified the influence of the *Board of Trustees* as important. This group had set clear expectations of all teachers in the school to improve student achievement, as measured against national achievement standards, and Wayne was aware that his teaching effectiveness was measured against student performance with these standards.

At the middle management / department level Wayne worked with his colleagues, in the role of head of department and as the role of fellow teacher, to provide programmes of work that met the needs of his students. The normal process for negotiating local curriculum development in Wayne's department was to draw upon pre-prepared and packaged unit material supplied by various Industry Training Organisations such as the *Building and Carpentry Industry Training Organisation*. These organisations shared a stake in the development of the local curriculum as they provided material that guided and scaffolded Wayne's programme.

A third stakeholder group identified in the research was the parent / caregiver community. Wayne identified that this group had an impact on his local sustainability curriculum development through acting as a resource for his teaching programme. Wayne commented, for example: "In our community you have to identify the parents in business, and those in strategic positions which could assist in a project" (Focus Group Discussion Day 2).

The stakeholder group that Wayne talked about most often, however, was his students. Knowing his students as individuals was something that Wayne found important and powerful when making local curriculum development decisions. For example, Wayne had learned the importance of being able to capture his students' imagination and interest quickly. Knowledge of what interested his students allowed him to structure student learning in meaningful contexts, and make decisions quickly and on the spot. For example, Wayne recounted:

> You make a decision about a lesson in about 3 seconds. So you might walk up to a student and say; 'Right, we are going to make a loud speaker box', because you now that his brother has got a car and he likes sounds. Immediately you have got his attention (Focus Group Discussion Day 3).

This detailed knowledge of his students, what interested them and their motivations, worked together with his deep functional knowledge of the curriculum to allow him to create individualised local curriculum for his students. In this way, individual students were stakeholders in the development of their own individual local curriculum. As Wayne explained:

> When I do a lesson, say designing a backpack to harvest human energy. I may have about 5 different things going on in my classroom. I will have some of my Westside[36] friends starting out creating a backpack with tagging on it, starting with the artwork. … and some of the top kids will be doing the real backpack thing, magnets and copper wire and that. Then there may be another student that says they don't want to use the computer so they will use the drawing board and use pencil and paper and coloured pencils. Then you maybe have one girl that you know who is into handbags so they can design a sustainable handbag. So I have to have things prepared and

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[36] Students with affiliation to a local gang

be able to just go click and it is there for them. It works because they feel valued (Focus Group Discussion Day 2).

5.8 Local Curriculum Development Practices (division of labour)

Wayne described his approach to local curriculum development in sustainability education as: "The typical secondary scenario where teachers all create their own units of work" (Initial Interview), though he did acknowledge the influence of common starting points used by all teachers. He described the process:

> Every teacher is responsible for their own classroom curriculum. Many of them use pre-moderated units, such as the BCATS[37], Digital Technologies, and Hospitality units from the industry training organisations. The teachers just have to make a decision about the project and how he or she is going to implement it and at what point are they going to do what (Focus Group Discussion Day 3).

When pressed further, Wayne acknowledged that there was an active collegial relationship between members of his department and that they often shared ideas by visiting each other's classrooms and talked about particular learners. Wayne explained:

> We don't work together in a shared workroom. I just visit them a lot or they come to me and we talk. It makes a difference. We talk about a project, we talk about a student. We know the student in depth; the issues, their history and work out what are we going to do. If we have difficulty with a specific student we go back to their interests and talk to him, or her, in a nice way and create a project with them (Focus Group Discussion Day 3).

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[37] Building and Carpentry Industry Training Organisation.

In Wayne's opinion, one of the things that supported this informal way of working was that staffing at North School had been very stable for a number of years. As well as knowing each other well, which made communication easier, Wayne's teaching colleagues were in his view: "All very experienced and really only making small changes all the time to be more successful" (Focus Group Discussion Day 3). Moreover, Wayne argued that since the staff had been teaching the same curriculum areas for a long time they were very familiar with the material and progressions of learning expected for their students.

As the head of department of the technology learning area, Wayne also interacted more formally with the teachers in his department. Interaction at this level was linked back to the whole school focus on students achieving credentials on the national assessment framework. Wayne described these interactions in terms of:

> I look at the teacher's work and how it should build towards the graph[38] and the result. How are they going to do that? I visit them once a week and we spend time together. I comment on the projects, sometimes give them my ideas and ask questions about how and why they are doing things. I ask about student engagement. Are the students really engaged? Are they interested? It is a big thing for us. If we achieve that, everybody is happy. We are all working towards those students passing those standards and walking out with specific skills and a certificate (Focus Group Discussion Day 3).

When planning his own classroom curriculum, Wayne balanced his understanding of the curriculum and the national assessment standards with his understanding of his students and their strengths and weaknesses. This knowledge of his students was fundamental in this process and Wayne spent time thinking about his students in a number of ways.

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[38] Assessment Results.

Firstly, Wayne understood his students' needs. For example, Wayne had a realistic and practical understanding of the sorts of students he taught, including the issues that surround them being in a decile one community. He argued that many of the families of his students lived on much less than the average wage for New Zealand and many relied on social welfare benefits. He also argued that for many of his students, learning was not their immediate need, commenting: "In my experience, in a decile one school, it is about survival. Economic survival, where food comes first. Just to go through the day, to have sandwiches is important. It is about their parents and their households" (Initial Interview).

The second way that Wayne understood his students was as cohorts. This became apparent when considering the difference between teaching junior and senior students, or more globally as the difference between less advanced and more advanced students. For example, when thinking about his local sustainability education curriculum he commented:

> I find that my seniors become more interested in sustainability. I teach a unit on sustainable architecture. The juniors like to design houses and put furniture inside and that sort of thing but it is the seniors that really get into it. I think it has a lot to do with the amount of time I have spent teaching them. A different culture is created and they really think differently (Focus Group Discussion Day 2).

Wayne used this knowledge of his students as cohorts when he planned local curriculum. For example, he made allowance for students with different backgrounds and differing abilities, explaining: "I talk about the head and the tail. You have some students at the head and some in the middle and some at the tail. You can't give them the same project, so we plan to have different projects for different students" (Focus Group Discussion Day 3).

The third way that Wayne knew his students was as individuals. This was apparent when Wayne talked about his classroom approach where he worked alongside his students as opposed to spending a majority of time

teaching from the front of the room. Wayne argued that working next to his students gave him the opportunity to get to know their interests and abilities, and to structure individual local curricula to meet their needs. He described this in saying: "I think about ability and attitude. So you look at the students, and you think you know them pretty well. When you spend time with the students you get to know them really well, when you teach right there with them" (Focus Group Discussion Day 3).

An implication of Wayne's approach to local curriculum development, focussing on and working with individual students, was that the planning process was ongoing and time consuming. In Wayne's view it was not something you do at the beginning of the unit and then move on. Wayne talked about his local curriculum development process using the metaphor of design. For him, local curriculum development was an iterative process, where he considered his students in an ongoing way, acknowledging and actualising their input into the planning process continually. He explained: "I think a lot about planning, even at home. I am always thinking about those students" (Initial Interview).

5.9 Wayne's Local Sustainability Curriculum in North School (outcome)

Wayne's approach to sustainability education was to create a local curriculum where sustainability was addressed as an integral part of his normal course work in his design and graphics education courses. He integrated sustainability education throughout his teaching programme at all levels and described this approach, saying:

> I incorporate sustainability in year nine and in year ten, just touching it. Year 11 and 12 it is full on. Every single thing they do has sustainable components in it. As well as the normal aspects of design, [such as] aesthetics and functional components, they have to incorporate sustainability into their building design (Initial Interview).

This approach was consistent with Wayne's view of sustainability being both ecologically and economically focused, where practical problem solving can be applied to sustainability issues to create more sustainable solutions, to benefit both the environment and human wellbeing. In this design and problem solving approach to sustainability education the choice of topic, or as is referred to in Wayne's technology education language, the project, was seen by Wayne as of only minor importance. He argued that sustainability was important in all design projects irrespective of the context. Addressing sustainability in all projects, he argued, showed students that it was an integral part of technology and design, and therefore Wayne incorporated sustainability education throughout his whole year's work.

Wayne's approach to sustainability education infused learning in sustainability into the technology learning area, alongside other planned learning outcomes. This pattern that began for students in year nine became part of their normal approach to the subject. He explained:

> In year nine and ten we talk about sustainability and include it in a subtle way, but we do incorporate that into our curriculum. I think in [design and graphics] we do the most sustainability, it is a huge chunk. It connects with design all the time. For example, in sustainable architecture you have to plan how to include that with aesthetics and function. So the student has to consider the architect, the style, the design era, the art, the colours, the shape, shadows, and then sustainability, the systems and materials in there (Initial Interview).

Wayne's approach to creating local sustainability curriculum was exemplified through his year 11 programme where he had his students design a Sleep-Out for a stakeholder. As part of their design process his students were directed to consider concepts of sustainability while researching and designing their response to the design brief.

Wayne documented his planning in sustainability education at a number of levels. Firstly, he developed an overview of the intended student learning, which he communicated to his students through an initial paper based hand out. This document showed clearly how the years intended learning addressed eight national achievement standards, comprising 22 credits, in design and graphics. This overview was then supplemented using a series of Power Point presentations that detailed the concepts and key ideas that students should consider when developing their designs. This content, as well as addressing the standard ideas of design in technology, also included a section outlining sustainability concepts that should be addressed in their design work (see Figure 5.3).

CONCEPTS AND KEYWORDS YOU HAVE TO USE IN YOUR ANNOTATIONS: Make sure you understand it and use it throughout.

Aesthetics
beauty
shape
form
style and rhythm
balance
proportion
color
contrast
complimentary
diversity
eye appeal
finish
good taste
refined
texture
touch
unity and harmony
visual appeal

Function
Construction cost
durability
efficiency
form
material choice
media - various types

mock up and model
optimization
pattern
precision
proportion
ratio
reliability
strength
shape
fitness for purpose
user friendliness
ergonomic fit
economic and social needs
restraints
safety and stability

Sustainability
Photovoltaic panel (solar-electricity)
Solar thermal panel (hot water)
small wind turbine
inverter
Led (lights)
regulator solar panel
12 volt battery (DC)
230 VOLT (standard household)
double glazed windows (argon gas)
straw bale walls
Large glass curtain
deciduous trees/shrubs

passive heating
harvesting rain water
white water
grey water
black water
green roof
bio-filter (water plants)
cooling tower
louvers
electric or hybrid car
piezo electrics
HRV (heat recovery ventilation)

***When evaluating concepts, developments and solutions consider these principles and elements and use this design language in your statements/annotations/decisions.

Figure 5.3: Example of Student Learning Guide for Wayne's Local Sustainability Curriculum

Wayne's approach to sustainability education as an infused part of design addressed the whole year's programme of work for his students. Different aspects of sustainability were focused on through a number of connected units of work, such as his Sleep-Out Unit. In this way, he argued that students would learn about, and then respond to, concepts of sustainability in the different contexts that were addressed.

In Wayne's Sleep-Out unit for example, he identified a number of sustainability concepts that he asked students to consider in their designs, including: earth building (cobb / adobe / straw bales / rammed earth); water systems including rain, grey and black water; and energy flow and conservation principles including photovoltaic panels, L.E.D. lighting, wind turbines, deciduous planting to increase sun influx in the winter, insulation including double glazing and green (vegetative) roofing, and passive heating

168

e.g. thermal mass walls. All of these sustainable architecture concepts were linked seamlessly with contemporary aesthetic design considerations such as pattern, rhythm, balance, colour and style.

Each of the sustainability concepts was then presented to students through a PowerPoint presentation with each concept introduced with information outlining the relevant aspects of the idea. An example of introducing the concept of sustainable water systems is shown in Figure 5.4.
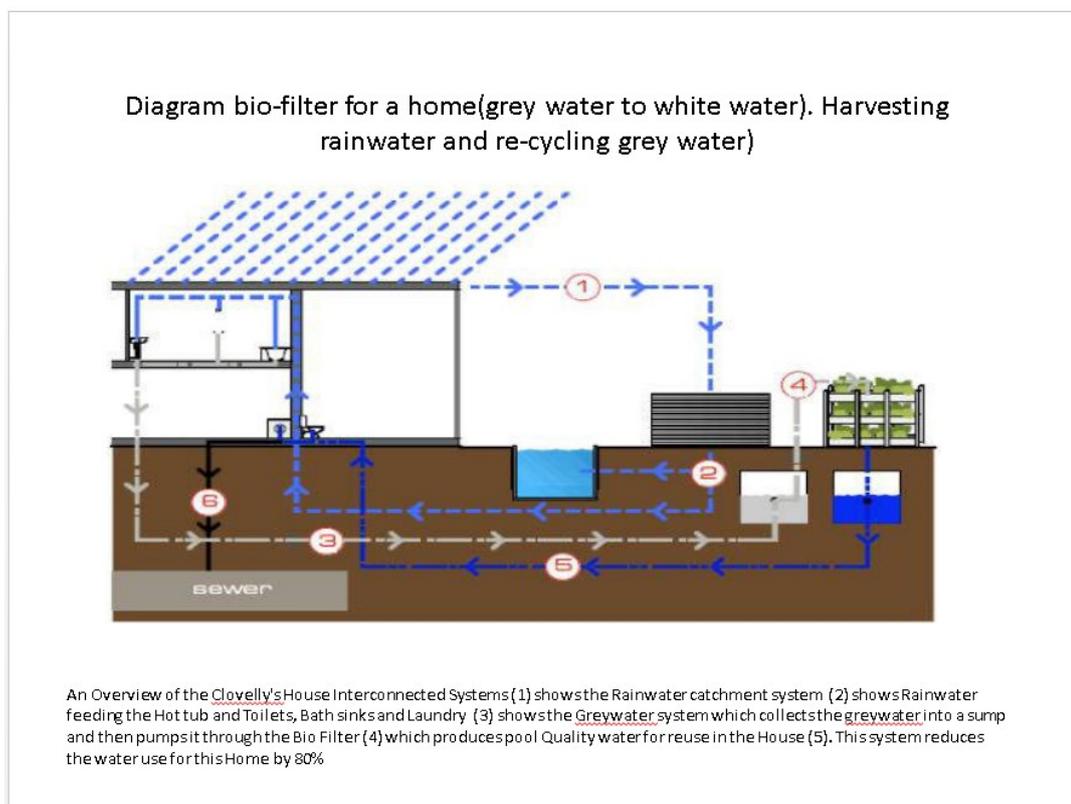
Figure 5.4: Example of Scaffolding of Student Learning in Wayne's Local Sustainability Curriculum

Wayne's sustainability education classroom practice involved students working on individual designs preparing individual portfolios of their work to explain and justify their design decisions. As well as addressing normal design criteria, they also showed how they addressed concepts of

sustainability within their designs. Wayne's pedagogy was student centred with student work individualised and varied. Wayne informed and directed students to consider specific concepts of sustainability within their work.

Though students worked on individual portfolios, Wayne also valued students being involved in collaboration and group work as well as practical work and experimentation *(*Focus Group Discussion Day 1). Wayne argued that this gave students opportunities to share ideas, justify their decisions and apply their learning in their own design work.

When Wayne was teaching his classroom was a hive of activity with students working at different stages and on different projects (Classroom Observations). The resources he made available for students were a mix of old and new. At one extreme, the students had access to high spec computers suitable for rendering digital graphics as well as searching information from the internet. At the other extreme, students had desks and drawing boards where students could use paper and pencil to communicate their design ideas. The room had an environment where individual choice was celebrated. The room also had a phone land-line, digital projector and screen as well as blackboard and whiteboard which Wayne used often in impromptu one on one teaching encounters.

When asked about how his local sustainability curriculum reflected the aspects and conceptual drivers of sustainable decision making as established in section 2.4.4, Wayne acknowledged that it focused on ecological interdependence, economic independence and economic responsibility for action. His plans for ongoing development of his local sustainability curriculum were to:

> Fill in the gaps. I will bring in more case studies. Once you bring a case study in here it touches many of the other areas. The area I am not so strong on is equity and once you are doing case studies you start thinking about it all, politics, war, debt and how to change that (Final Interview).

Wayne planned to continue with his infused approach to sustainability education and increase the coverage of sustainability decision making conceptual drivers.

When analysed with respect to the principles of sustainability education developed in section 2.5.1, Wayne's approach to sustainability education, as infused in his subject curriculum area of design and technology, was emancipatory in nature. It addressed student's knowledge of a wide range of ideas and concepts in sustainability from a techno-efficiency perspective. His local sustainability curriculum did not, however, include aspects of social criticality, though it did engage many others including; relevance, authenticity, problem and future focus, improvement orientation, sociocultural / historical positioning, systems focus, transformational and values acknowledgement.

5.10 Chapter Summary

Wayne, who taught in a small secondary school in a low socioeconomic community with a high Māori population, had a view of sustainability that was environmental and economic in nature. He saw the design and creation of more sustainable technologies as a way of being more sustainable. This view was expressed through his approach to sustainability education, where he infused sustainability education in his design and graphics teaching. In this view, students took a practical problem solving approach to designing sustainable technological products and systems. In Wayne's approach to sustainability education the topic being studied became irrelevant as he argued that sustainability, through designing for sustainability, is relevant in all situations.

Wayne viewed the aim of sustainability education as switching students on to being curious and understanding that sustainability is about living within natural limits of resources, and that resources are not limitless. He felt the aim was also to empower his students to be able to make informed design decisions in their personal lives, and understand that they can make their

lives more sustainable. In this way, Wayne saw sustainability education as being about changing his student's attitudes towards the Earth and towards themselves.

The culture within North School had a clear focus on improving student learning as evidenced by student attainment results on national assessment standards. Within this culture, Wayne felt confident to create his local sustainability curriculum and infuse it seamlessly amongst learning that was focused on codified, predetermined curriculum learning outcomes. This confidence he attributed to his deep and functional knowledge of the curriculum and the assessment standards in his curriculum area, design and technology. The second factor that he felt empowered this confidence was Wayne's deep understanding of his students, collectively and as individuals.

The local sustainability curriculum that Wayne developed was techno-efficiency focused, addressing a number of concepts in the economic and ecological aspects of sustainability, such as materials properties and efficiency. Wayne viewed learning in sustainability as empowering students to make informed sustainable decisions through designing and changing their world.

Wayne's local sustainability curriculum in North School positioned sustainability education as a theme within an existing curriculum area. When analysed with respect to the conceptual framework developed for sustainability education in section 2.4.4 and the principles of sustainability education established in section 2.5.1, Wayne's local sustainability curriculum in North School covered a number of the concepts and aspects identified as important in sustainability decision making and approached learning in sustainability somewhat as emancipatory education.

Chapter 6   Research Findings at West School

6.1 Introduction

In this chapter data are presented to describe the influences upon Greg's local sustainability curriculum development in West School. The data, which are socioculturally and historically bound within the school setting, are presented following the cultural historical activity system theorised with respect to his school (see Figure 6.1).
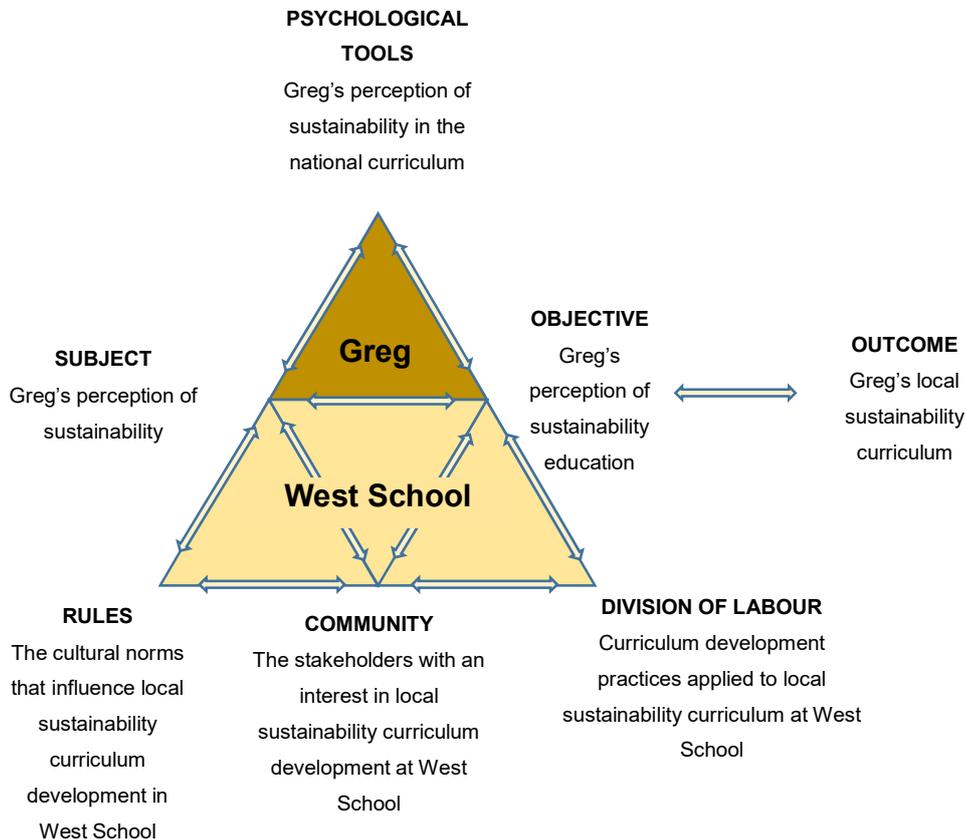
Figure 6.1: The Cultural Historical Activity System of Greg's Local Sustainability Curriculum Development at West School.

The first four sections report upon the findings associated with mediated action aspect of the activity system, represented in Figure 6.1 as the darker shaded upper section. Section 6.2 describes the sociocultural context for Greg and his teaching. Section 6.3 reports upon Greg's perceptions of sustainability as the subject of his local curriculum development, acknowledging the influences of his personal and professional background. Section 4.4 reports upon Greg's perceptions of sustainability education, his views of its nature and its aims. Section 4.5 reports upon Greg's view of sustainability in the curriculum; what counts as the curriculum for him when planning sustainability education and how he used this to guide his local sustainability curriculum development.

The next three sections, 6.6, 6.7 and 6.8, report upon the influences of the sociocultural historical setting in West School, represented in the activity system shown in Figure 6.1 as the lower, lighter shaded section; the interactions of the rules, community and division of labour surrounding local curriculum development. Section 6.6 reports upon the influences of West School's academic and wider culture on local sustainability curriculum development. Section 6.7 reports upon the way West School defined, through operation, the community of people that influenced the development of local sustainability curriculum, that is the stakeholders. Section 6.8 reports upon the way local sustainability curriculum was developed in the sociocultural historical setting of West School and how Greg developed his local sustainability curriculum within this context.

The last section, 6.9, reports upon the outcome of the activity system, the local sustainability curriculum that Greg developed in his school setting.

6.2 Setting

Greg, who identified ethnically as Māori, was in his fifties and had taught for thirteen years. He had been the head of the technology curriculum area for the last three years and specialised in hard materials-wood. He also taught

mathematics and Māori. West School, where he worked, was a small town, decile four, co-educational composite Area School (year 1 – 13) with a roll of approximately 400 students. The ethnic mix of the student population was 60% Māori,[39] 33% New Zealand European and a mix of other ethnicities. The school's stated mission was to provide a: "Quality education in a bicultural environment with a commitment to the Māori values and principles of Whakawhanaungatanga,[40] Manaakitanga,[41] Kaitiakitanga[42] and Poutama"[43] (Education Review Office, 2012). In support of this approach, the school showed a commitment to partnering with learning programmes and opportunities in the local community such as the Enviroschools[44] programme, a regional coastal restoration project, a community service programme, and a sports surfing academy (Education Review Office, 2012).

6.3 Greg's Perception of Sustainability (subject)

Greg held an environmental and relational view of sustainability, epitomised when he explained: "[Sustainability] is like my footprint in life equalising itself. Whatever I draw from the planet I actually contribute back to it" (Initial Interview). This view was expressed through many of Greg's personal lifestyle choices on a daily basis, choosing to do simple things such as minimising the waste from his household: "I recycle as much as I can; my landfill amount these days is minimal" (Initial Interview). It was also apparent in his longer term behaviours and choices, where he acknowledged living sustainably was

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[39] Māori contribute 15% of New Zealand's population (2013 Census, Statistics New Zealand) so this school has a significantly higher Māori population than the national average.

[40] Relationship, kinship, sense of family connection - a relationship through shared experiences and working together which provides people with a sense of belonging.

[41] Hospitality, kindness.

[42] Guardianship, stewardship, trusteeship.

[43] Levels of learning and intellectual achievement.

[44] Enviroschools: an action-based programme with an approach to education through which children and young people plan, design and implement sustainable projects and become catalysts for change in their families and the wider community.

something that was important to him. He talked about being on a journey towards living more sustainably; identifying things he wanted to change. He saw his personal sustainability position as a work in progress, expressing this desire and his frustrations, for example by saying:

> Living sustainably is very important to me, and it does affect what I do, but I am not living totally in a self-sustainable way as yet. I still drive a smoky old diesel. I drive to school instead of bike or walk (Initial Interview).

Greg's view of sustainability also involved taking action beyond his own personal lifestyle. He chose to participate in community action projects, acting for the good of the environment and the wider community, for example:

> Whenever I walk the beach I always take a plastic bag and put the rubbish in there, or fill my pockets up. Way back I was part of the adopt a beach [movement], and my wife and I took on about a kilometre of beach and every night we walked down with a bucket and picked up the glass and rubbish. These days you walk along there and you barely see any glass, it's nice (Initial Interview).

Greg's environmental and relational view of sustainability was also about being connected with other people, working together to build a sustainable community, where people care about each other and share ideas and values. This community connection was expressed at a number of levels. At a simple daily level it was through Greg's courtesy and care for others in the community. For example, Greg explained that when he prepared his household recycling waste: "Everything gets rinsed, [it is] thinking about the people who actually recycle our materials, to make sure that when it goes out to be recycled it is in a safe condition" (Initial Interview). At a more community level, this environmental and relational view was expressed through Greg's interest and involvement in local and regional environmental issues. He explained:

I am involved in the local Department of Conservation study. I listen to what their issues are and what the community's issues are, especially around our mountain, which has had 1080[45] drops on it. Just getting out there and seeing the changes for myself (Initial Interview).

Greg's environmental and relational view of sustainability was also expressed through his connection to the local area and the way the environment supplied resources for life. His thinking focused upon the decision-making processes that affected the long term management of the environment. Greg's identity as Māori gave him a perspective on this aspect of sustainability particularly with respect to equity and the politics of environmental management decision-making. He expressed his thinking and concerns about this in saying:

A big thing for me being Māori is to ensure that Iwi[46] are starting to get control of their resources. So to make sure that the people have the skills to manage those resources into the future. From a Māori perspective I feel sustainability [is about] Kaitiakitanga, which is caring for the environment. It is about taking, but always giving back and ensuring that the resource is maintained for future generations (Initial Interview).

The importance of the economic basis of sustainability was occasionally noted by Greg, particularly when thinking about the future employment opportunities of his students. For example, he commented: "Sustainability and sustainable practices are going to be a big issue if you are in management. I think these things are just coming to light now in business; right from office workers to factory workers" (Initial Interview).

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[45] A trade name for Sodium Fluoroacetate, a pesticide used to kill possums, an introduced Australian mammal, which are destructive to New Zealand native forest trees.

[46] Tribes.

Greg sought to further his understanding of sustainability even though no coordinated professional development opportunities existed. His approach was to become involved in the sustainability issues of his local community, where he gathered information and connection to local issues, explaining:

> I listen to the news and those sorts of things but also get involved in environmental groups. [Our town] has quite a few environmental groups. I keep up to date with what they are doing, what they are trying to do within the community to educate people and change people's perceptions and values (Initial Interview).

In summarising Greg's view of sustainability, when all of Greg's comments about sustainability are compared, they show a perception that is environmental and relational. Of the 27 comments he made about sustainability, 15 expressed concepts associated with an environmental view, six indicated an understanding of sociocultural nature of sustainability and six expressed concepts associated with economic perceptions. This spread[47] of perceptions is visualized in Figure 6.2.

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[47] Expressed as the percentage of each perception represented in Greg's comments.
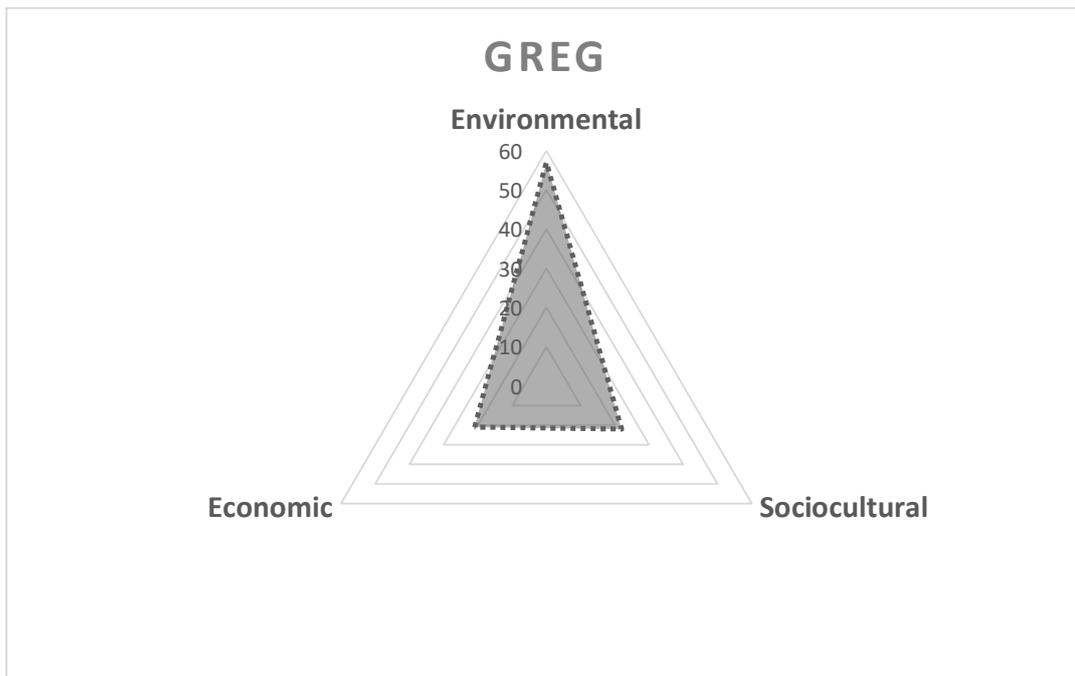
Figure 6.2: Visual Representation of Greg's Perception of Sustainability.

6.4 Greg's View of Sustainability Education (object)

In Greg's view, sustainability education is about the development of students' values, with these values firmly linked to our relationship with the Earth. This view was supported by his understanding of sustainability education within the curriculum, where he commented: "I think sustainability education comes in the values. For example, it is a value where you put your landfill; what you put in your landfill. That is a value on caring for our mother Earth" (Initial Interview).

This idea that sustainability was fundamentally about values was repeated when Greg talked about what he thought were the key concepts of sustainability education. In the context of West School's approach to sustainability education and the key organising concepts used, he explained:

> We have three values that go across the whole school; Kaitiakitanga,
> Manaakitanga and Whanaungatanga. Kaitiakitanga is guardianship,

179

the care of not just the place around you, but everything. Manaakitanga is about looking after visitors and the people around you, caring for one another. Whanaungatanga is how we relate to everything, not just people but how we relate to the trees and the birds, the fish and everything. How we all interact. Without one the other is not surviving" (Initial Interview).

Allied to this understanding of sustainability being within the key concepts of the curriculum, Greg viewed the aim of sustainability education as being about helping people understand that we live within natural limits. He commented: "I think [the aim] is to ensure we have a planet with a decent environment for future generations. Our [human] population is [increasing] and the resources are [becoming] scarce" (Initial Interview).

When questioned about what pedagogies suited sustainability education, Greg associated active, hands on teaching and learning approaches as being most appropriate. He chose pedagogies that engaged his students in practical problem solving activities associated with sustainability issues in the local environment and community. With his junior classes he explained, for example: "Last year we did a trapping project with year 7's and 8's to monitor pests around the peninsula. We designed and built traps [for rats and stoats] and trapped them to improve the environment for the native birds" (Initial Interview).

Another aspect of the pedagogy that Greg applied to his local sustainability curriculum was to connect his students with community groups outside of the school. He felt this was important, and sometimes this idea guided the choice of what project he chose for students to work on. He argued that there was value in his students becoming aware of the bigger picture of sustainability in the local area, for example commenting on the trapping project: "Doing that allowed us to introduce the kids to some of the other environmental groups working around the mountain, so having the Department of Conservation

come in, Environment Waikato, and a couple of other environmental groups" (Initial Interview).

Sustainability education for Greg was something that was bigger than just a part of his professional teaching responsibility in his school. He felt that it was a part of life in his community, and something to participate in at a community level, both as a contributor and a recipient. He explained:

> I think I have picked this up because I live in a sustainable community and have been here 28 years now. Sustainability in our community has been driven by individuals, who persuaded groups, and they have now got the council on board, influencing them, and developing community education programmes (Initial Interview).

This informal community based sustainability education was something that Greg also found himself involved in, within his own sphere of influence. Talking about his family and his neighbours, he commented:

> Another thing I do is, I have planted a vegetable garden. I also have chooks now. So I have started using the land around me to grow food but also to teach the people around me how to do this; the kids and the people I live with (Initial Interview).

6.5 Greg's View of Sustainability in the National Curriculum (psychological tool)

Greg acknowledged that the national curriculum was an important scaffold for the development of his local sustainability curriculum, but also acknowledged that he used this in concert with the national achievement framework. Greg described the synergy of the process:

> The first port of call is the curriculum, and how you then want to structure the year's programme. With the realignment of the

standards[48] we have had to gather different resources to cover material that we need for the new standards. I start with reference to the curriculum and then look at the matrix and what standards would be appropriate and then look at the content of the ones I think would be interesting for the students (Focus Group Discussion Day 3).

Greg's reference to assessment standards refers to those available in the curriculum area of technology. Unlike the other teachers in the research, Greg was aware of the assessment standards available in sustainability, but he had not considered using them as he had heard negative comments about them from one of his colleagues. He recounted:

I had some feedback from a teacher that tried to deliver some of the sustainability standards. She found them very academic, with a lot of writing and not suitable for the students she had. It meant there was too much research, too much writing, and the kids weren't interested. She sent them away for moderation and when they came back she was slammed, so she never went there again (Focus Group Discussion Day 3).

Greg's local sustainability curriculum development was scaffolded by a school wide template, used by all teachers in all curriculum areas. The template was structured around a number of school wide values; Whakawhanaungatanga, Manaakitanga, Kaitiakitanga and Poutama. Greg explained that the template prompted him to address these values: "There is a column … where we say what we are going to do, and what task is going to [achieve] it. Each one of the school values has a tohu[49] associated with it" (Focus Group Discussion Day 3).

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[48] New Zealand Qualifications Authority Assessment Standards (Unit Standards – Industry based and Achievement Standards – Ministry of Education based).

[49] Māori symbol.

6.6 West School Culture (rules)

West School expressed a set of overarching values and principles; Whakawhanaungatanga, Manaakitanga, Kaitiakitanga and Poutama, which were enacted through all curriculum areas and at all age levels of the school. Greg, who like most of the staff had taught at the school for a number of years, was aware of these and took them into consideration in his teaching programmes. He explained: "We deal with [these values] across the school in terms of portable cognition, where even the kids from the junior school can recite those values" (Focus Group Discussion Day 3). Greg explained his meaning further in talking about the special nature of the school having students from five years old on the same site as secondary school students. He explained:

> A dynamic for us is that we are an Area School. Some of the values are instilled in the kids from a young age, particularly our local kids. They come through with these values instilled in them. They know how to look after the bush, and the trees, and the flax, and know where to go and what to do; how to recycle and worm farm because their teachers are passionate about that (Focus Group Discussion Day 2).

In thinking about planning for sustainability education, Greg spoke about the importance of these values and how he used them to scaffold his local curriculum. He explained:

> Sustainability, or the environment, is pretty important to me, it just comes through anyway. I am lucky in that at school we have some values, and they are under the heading, Manaakitanga and Kaitiakitanga. Manaakitanga is looking after, not just people but, everything. Kaitiakitanga is about looking after your environment. It is about recycling. Sustainability fits right into that. Whanaungatanga is about relationships and how we are connected to everybody. So we

are asked; 'What are you doing in your planning which underpins our school values?' (Focus Group Discussion Day 3).

The fourth value, Poutama, had only recently been added to the school's values statement and Greg was working with this as a scaffold to his local curriculum planning as well. He explained the meaning it had for him:

> Poutama; you know the tukutuku[50] panels where they have the staircases. You go up to one level of learning and then sit there for a while and get it right and have a bit of an awakening. Then you come up to the next level of learning, stay there and get an awakening, and then enlighten yourself again, and then up to another level. That is what this poutama is about; an acknowledgement of academic achievement, but not just academic though, of all learning (Focus Group Discussion Day 3).

Within this values based culture of learning, West School exhibited a focus on academic success. In the junior school,[51] this academic focus was measured against the curriculum objectives, where Greg explained that he had to report to parents and caregivers upon the progress of his students against the components of each achievement strand in the curriculum (Initial Interview). In his senior programme Greg explained that academic success was measured against the national assessment framework with, for example, his year 12 students working on projects based around the achievement standards.

The reporting of student achievement and progress against curriculum objectives and assessment standards had an influence on Greg's local curriculum development. He explained that addressing the school values was the first thing he planned for, followed by addressing curriculum and assessment objectives:

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[50] Ornamental lattice-work that resembles a staircase. Displayed on internal walls of marae; meeting houses.

[51] Years 7 – 10 (age 11 – 14yrs).

The other thing I plan for is how the tasks throughout the unit align with the assessment criteria so that I have something to report on. At the moment these are negotiated school wide with the new curriculum.[52] We are trying to get some data on where they are at (Focus Group Discussion Day 3).

The final aspect of the school culture that Greg identified as being significant in affecting his local sustainability curriculum development was the concept of what was considered as normal classroom practice. For Greg in his subject curriculum area of technology, practical work, often based outside the physical classroom, was a normal part of classroom practice with the majority of Greg's teaching done in this way. Theory days were scheduled about once a week, where students worked at desks. In these theory sessions the written work by students was often structured through the use of templates or workbooks[53] giving students ideas to think about, including environmental considerations.

6.7 Curriculum Stakeholders (community)

The senior management group at West School were an important stakeholder group in local sustainability curriculum development. A number of years earlier they had made the decision to enrol the school in the Enviroschools programme. This nationally funded and coordinated programme aimed to foster a generation of people who instinctively think and act sustainably (Toimata Foundation, 2016). This decision affected the whole school and though Greg didn't have any influence over, or full cognisance of, the decision he supported it, arguing that being an Enviroschool was in keeping with the culture of community that the school served; a community that had high environmental awareness and expectations.

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[52] (Ministry of Education, 2007).

[53] For example Building and Carpentry Industry Training Organisation Unit Standard Workbooks.

The local community was also a significant stakeholder influencing local sustainability curriculum development in West School. The strong environmental ethos of the community was expressed within West School through the school wide adoption and support of a number of community based environmental programmes such as Extreme Waste[54] and Harbour Care[55]. Greg used these programmes to enhance his local sustainability curriculum. In describing his motivation for connecting his local sustainability curriculum to these programmes, Greg commented that: "Groups like these pressurise governments about pollution entering our rivers and lakes and waterways. We are lucky to have Harbour Care. They have been a big influence for the whole community and especially the school (Initial Interview).

Māori of the local tribal area[56] were also identified as being stakeholders and having influence on local sustainability curriculum development in West School. Greg recounted two situations where this influence had occurred in the development of his sustainability education programme:

> Each year we do a community project and this year the project is called Peninsula Development. The students will propagate plants that will be planted around the peninsula. The reason for this is that in consultation with local Iwi [57] we found this used to be a food gathering place. So they would like to see some fruit trees planted. Last year we worked with year 10's gathering the stories of the history of the place. We got Kaumātua[58] on site and asked them the names of the different areas and the historical significance of them (Focus Group Discussion Day 3).

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[54] A waste minimisation scheme, previously mentioned in section 7.4.

[55] Harbour Care aim to stop sediment runoff from land and improve water quality in the local harbour.

[56] Ngāti Māhanga.

[57] Tribal Grouping.

[58] Tribal Elder.

Greg also identified the influence of a number of local sustainability curriculum development stakeholders within the school structure. For example, Greg acknowledged that the principal, through his leadership and vision, had affected his local curriculum development decisions, recounting:

> The principal is trying to get all the groups with an interest in our grounds to formulate a large picture for the future, to enhance it. His idea is to plant fruit trees for the community, so many [trees] that there is enough food for everybody" (Initial Interview).

Teachers from other curriculum areas, working to this coordinated vision for the school, had influence over Greg's local sustainability curriculum development. For example, Greg talked about the "Science person who is big on horticulture, sourcing and propagating plants for planting around the village here" (Initial Interview).

Greg acknowledged that his students were also important stakeholders in local curriculum development. At the classroom level, Greg acknowledged the influence of his understanding of his students when planning for classroom practice. He described his approach as: "I look at the skills which I would like to teach the kids and look at the engagement of the kids. I try to create projects which get kids engaged" (Focus Group Discussion Day 3). He explained that he made decisions about what engaged students based on his experiences of what students had done in the past, acknowledging: "I sometimes drop a project half way through because it is just not working" (Focus Group Discussion Day 3). Greg's used a number of formal methods to gain a better understanding of his students, including: "Asking simple questions or just by watching them, or sometimes getting them to vote" (Focus Group Discussion Day 2).

Another way that students were involved as stakeholders in local curriculum development was through their own actions as an embodiment of the school community. Here students acted as leaders and visionaries within the community in two identifiable ways. Firstly, in response to students who

joined the school moving to the location from other geographical areas. Here students that had participated in the school community since entering as five year olds were seen as advocates for sustainability influencing the values and behaviours of the newcomers, creating an acceptability of sustainability education and behaviours. The second influence of students was a developmental one. Greg argued that having both the primary and secondary school systems on the same site, operating as one school, increased the acceptance of sustainability at the senior school level. He argued that the presence of the junior students positively influenced the senior students. Greg explained:

> I think the senior kids have a different attitude about the environment than the junior kids. The seniors see it as not so important, they are more focussed on socialising as they become teenagers. So getting them engaged is a bit trickier. It is the young kids with those values coming through which support the older ones into sustainable and environmentally friendly practices (Focus Group Discussion Day 2).

As well as working within the school structures to develop his local sustainability curriculum, Greg also sought support from outside of the school through local curriculum area association meetings and relationships with other local teachers in the same curriculum area, and Ministry of Education advisors. This support was apparent in his main area of technology but not in sustainability education. Greg commented that he appreciated contact with: "The local cluster of technology teachers [and the] curriculum adviser who had been a great help" (Initial Interview).

6.8 Local Curriculum Development Practices (division of labour)

The process of local curriculum development in West School occurred in the context of the explicit leadership within the school that acknowledged the culture of the community in which it sat. This leadership, evidenced by

decisions such as the school being an Enviroschool and the establishment of the whole school values system, had a significant bearing on the development of local sustainability curricula within the school setting, the scene for all of the other stakeholder interactions. In Greg's case, this leadership in support for sustainability education made the development of his own local sustainability curriculum relatively easy.

The explicit leadership decisions made at the senior, school administration level were not necessarily carried out and implemented in a way that all teachers understood, however. In Greg's view, this lack of communication and transparency was something that could be improved and if so would further support sustainability education in the school. He argued for example that:

> A lot of the decisions were worked out at management level. I am not savvy to some of the discussions, which I would like to be because I would like to communicate all of that negotiation on to the students. I want them to understand that things don't just come out because someone thought of it. They come out because there is negotiation and planning. The students [can] contribute to the process (Focus Group Discussion Day 3).

The local Māori of the area, already identified as stakeholders in local curriculum development (see Section 6.7), were also formally part of the local curriculum development processes operating in the school. The senior school management of West School sought the input of this group through a formal process of engagement, as Greg described: "The principal has had a couple of representatives in from the local Hapū,[59] Ngāti Māhanga, to give their input and progress the project to their recommendations" (Focus Group Discussion Day 3).

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[59] Sub tribal grouping.

Within the structure created by the leadership and management of the school, teachers such as Greg developed their own local curriculum. As a head of department, Greg was responsible for developing local curricula that met the school requirements and maximised student learning and achievement success. He described the situation in the following way:

> At the moment we are working on the values. We are an Area School so we have students from year zero to thirteen. So it is quite big at the moment to try and figure out what the values are for each syndicate and then make sure that we are all on the same wavelength. Years zero to six have a different concept to years seven to ten, then eleven to thirteen with NCEA[60]. For the technology curriculum area, I have just got my head around what the new curriculum means and then I'm putting it together so we can implement it. So I am leading that as the head of department. Direction for me comes from the deputy principal (Initial Interview).

The process of local curriculum development was scaffolded in West School by teachers using a common school wide planning tool with consistent language and symbolic representations of the school wide values. This common scaffolding for local curriculum developments allowed teachers across the school to communicate efficiently about their particular local curriculum developments and seek collegial approaches to student learning. Greg described how this impacted his local sustainability curriculum development commenting:

> You need to find out who else has an interest in sustainability. Then find out what programmes they deliver and find out what aspects they are covering. There is a good chance they are dealing with some of this already. You can also find out what resources and knowledge are available (Focus Group Discussion Day 2).

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[60] National Certificate of Educational Achievement, being generated from national assessment standards.

6.9 Greg's Local Sustainability Curriculum in West School (outcome)

Greg operated as the head of the technology department in West School and implemented sustainability education within his hard materials / carpentry technology programme, in concert with a whole school approach to sustainability education based on values. The projects that he chose to form the context for student learning in sustainability are ones that relate across the whole school and also link the school to the local community. He explained:

> Each year we do a community project. This year we have called the community project *Peninsula Development*.[61] We are working with the science department and building a [plant] propagation area for the school and the community. The students will propagate plants, natives and others, that will be planted around the school and the peninsula and hopefully eventually around the greater harbour. We have advice from the Harbour Care Trust and funding from Environment Waikato.[62] The reasons for this plan, [is that we found by] consulting with local Iwi,[63] this area used to be a food gathering place, so they would like to see some fruit trees planted. At the moment it is covered in gorse.[64] There is a food gathering area there at the moment [that] has a little kitchen sink, and further down there is a toilet, and a bonfire area where the junior classes camp out (Focus Group Discussion Day 3).

Greg described what he had been doing in his local sustainability curriculum with his classes:

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[61] The school is on a peninsula in a harbour.

[62] Regional Council. Local government authority.

[63] Māori Tribe.

[64] Invasive introduced weed.

Last year we worked with year ten's gathering the stories of the history of the place and we called the project *Signage*. In conjunction with the regional council,[65] a walking track has gone in around the peninsula and there was no signage. What the year ten's and I did was to research the area. We got Kaumātua[66] on site and asked them the names of the sites and the significance of them. We made signs to point out the sites and explain the names and traditions. There [used to be] a marae[67] here, and the name of that [has been lost]. [This project] thereby re-instates the history of these areas (Focus Group Discussion Day 3).

Greg believed that sustainability education is appropriate at all levels. At the senior level[68] for example, Greg explained: "This year we did a sustainability project setting up a seating area up at Extreme Waste,[69] trying to use recycled materials" (Initial Interview). Greg was just as positive about addressing sustainability education with his junior students, some of whom were intermediate-aged[70] children, explaining:

Last year we did a trapping project with year 7 and 8's.[71] It was to monitor pests around the peninsula, so [we] built traps and trapped them. We then did other things to enhance the environment for [the native] birds (Initial Interview).

In the technology area projects where Greg embedded his local sustainability curriculum, he valued the opportunity for students to connect with local community groups. These connections, he argued, gave his students the

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[65] Local government.

[66] Māori elder.

[67] Māori meeting house and associated grounds.

[68] Year 11-13 (ages 15-17years).

[69] Community based waste recycling group.

[70] 11 to 12 year olds.

[71] Intermediate School aged children, as the school is an Area School, having primary, intermediate and secondary aged students on the same site.

opportunity to be exposed to a range of views as part of their sustainability education. He explained:

> Doing [the trapping project with the juniors] allowed us to introduce the kids to some of the other environmental groups working around the mountain; so having the Department of Conservation come in, Environment Waikato, and a couple of other environmental groups (Initial Interview).

Greg's approach to sustainability education can be described as a place based and values approach that connected his students with issues identified across the whole school and the local geographical area. In this approach, he encouraged his students to seek the views of local stakeholder groups, thus linking his teaching with the rest of the school and the wider community through appreciation of a common values set shared and contested by all.

An example of Greg's local sustainability curriculum was his Peninsula Development unit. This sustainability education unit was based in the practice of technology education (intervention by design) with students involved in practical problem solving, designing and creating a solution to meet a need. In this case the identified need was a facility to propagate native and food plants for their establishment in the local area of the school. The programme identified the wants and needs of the various stakeholders interested in, and impacted by, the project and sought to meet their requirements in the design and construction of a plant propagation facility (see Figure 6.3)

Stakeholder interview.
Ms 'Sarah Smith'.   Teacher of Science and Horticulture *West School*

It has been decided to build a propagation facility on the bottom field.
Question: You will be the main teacher working this area. What facilities would you like to see?
Fence:
- Must have a high fence that cannot be climbed over.
- Security along the top.
- Gates for vehicle access and pedestrian access.

Water:
- This is important; the area will not work without plenty of water.
- A sustainable system.
- Storage tanks filled from roofs.
- Irrigation and watering system. On a timer so the place manages itself during holidays.

Propagation Shaded structure:
- Large enough to have 20 students work in it
- Outdoor classroom used in all weather
- Work benches around walls and in the centre.
- Floor concrete or pebbles with weed inhibitor
- Similar to Harbour Care shade house.

Tool store
- Lock-up
- Water proof
- Concrete floor

Storage Bins for
- Potting Mix
- Sand

Hardening off area.
- Larger than propagation area.
- Weed matt to keep weeds down
- Irrigation system

Figure 6.3: Example of Stakeholder Feedback in Greg's local Sustainability Education Curriculum

Greg formalised his local sustainability curriculum on paper identifying the major tasks to be undertaken with students and the logistical considerations needed for the successful implementation of the technology project. Greg expressed this planned curriculum to his students through a statement of intent that identified the project and the issues to be considered in their design considerations (see Figure 6.4).

Senior Workshop Technology 2011

Context – Community project: Peninsula Development

Issue – Develop a propagation area for propagating plants that will be grown around the peninsula.

Key Stages:|
    1. Brief Development: Find out what has to happen. What is needed?
Task: Write a statement describing what you intend doing on this project.
        List the requirements as specified by the stakeholders.

    2. Plans and Design: Site plan. Lay-out plan.
Task: Sketch information collected that will allow site plans to be drawn.
        Draw site plans using drawing instruments. Label drawings and parts. Include scale, dimensions, north direction and indicate boundaries.

    3. Fence designs. Fence construction details. Materials List
Task: Produce 2D and 3D sketches for 3 timber fence designs.
        Produce working drawings of the fence design that is the preferred by the stakeholders. Orthographic views and a pictorial view.

    4. Building designs. Construction details for buildings. Material List
Task: Produce 2D and 3D sketches for 3 a non consent timber building
        Produce working drawings of the building that is the preferred by the stakeholders. Orthographic views and a pictorial view.

    5. Order Materials. Cost project.
Task: From your drawings make a list of materials and determine the cost.
        Order materials for project.

    6. Construction work.
Task: Plan the construction process. Organise tools and equipment
        Keep a Record of work.

Figure 6.4: Example of Greg's Planned Local Sustainability Curriculum

Underpinning this overt planning, however, was a range of more conceptual considerations that Greg used to guide his approach to teaching and learning in sustainability education. He felt these considerations shifted his intended learning from being just technology education to also addressing sustainability education. The consideration included:

- Wanting to create an environment where students could experience social responsibility
- Developing a learning environment that was hands on and fun, based in the physical environment
- Establishing an approach that exposed, and immersed students in new ideas
- Students having the opportunity to make value judgements and determine their actions, with students having responsibility for their learning
- Using an inquiry learning approach to teaching that was flexible, acknowledging that there was not one approach or teaching style that fitted all occasions or all learners
- Adopting a cooperative learning and group work approach to classroom practice
- Accessing community resources such as Iwi, Councils, Stakeholders and Guest Speakers (Classroom Observations).

Wayne's sustainability education classroom practices were consistent with his approach to technology education, where teaching and learning were hands on and collaborative in nature. In his *Peninsula Enhancement* unit, students worked mainly outside the formal classroom with Greg's interactions being alongside his students. His students co-worked with him to achieve the outcome, with his students working very much in an apprentice model. His apprenticeship style of teaching contained both physical and cognitive dimensions where he talked and discussed with his students as they worked

physically. Wayne's pedagogy was one of working with his students as mentor and coach, guiding, encouraging, story-telling and modelling.

When asked about how his local sustainability curriculum reflected the aspects and conceptual drivers of sustainable decision-making as established in section 2.4.4, Greg acknowledged that it addressed ecological equity, sociocultural equity, ecological interdependence, sociocultural interdependence, ecological responsibility for action and sociocultural responsibility for action.

Thinking about how he might further develop his local sustainability curriculum, Greg commented:

> I will continue along the same line. As one thing finishes we will try something new. *Sustainable Technologies* looks like something I could work with next. Let's look at how we can include solar stuff and how we can include wind powered stuff. I will just continue with the same approach; identify local stakeholders and have conversations with them (Final Interview).

When analysed with respect to the principles of sustainability education developed in section 2.5.1, Greg's approach to sustainability education, as a values and place based approach that connected his students with issues identified across the whole school and the local geographical area, was emancipatory in nature. It addressed students' understanding of the interdependent nature of sustainability through sociocultural connectedness with the local environment. His local sustainability curriculum included many of the principles of sustainability education such as; social criticality, relevance, authenticity, problem and future focus, improvement orientation, sociocultural / historical boundness, systems focus, transformationalist and values acknowledgement.

6.10 Chapter Summary

Greg was an experienced hard materials technology teacher and head of department who identified ethnically as Māori. West School, where he worked, had a high proportion of Māori students. The school positioned its learning programme within a framework of four overarching values; Whanaungatanga, Manaakitanga, Kaitiakitanga, and Poutama.

Greg exhibited a strongly ecological view of sustainability linked to his understanding of Kaitiakitanga, with concepts of guardianship, caring for the environment and ensuring resources are maintained for future generations. Allied to this view he exhibited a strong sense that the decision-making processes around resource management needed to be fair and equitable with him identifying that different people have different values and priorities, an issue he advocated for from the perspective of being Māori. In Greg's view, sustainability was values soaked.

The culture of West School was based on a series of values which aligned with Greg's personal view of sustainability and supported his pedagogical approach to sustainability education, which brought students into contact with groups that saw the local area from different perspectives. Greg's approach to sustainability education, through practical problem solving in technology education, brought students into contact with the local community to design solutions for environmental and social issues.

The pedagogy that Greg applied in his local sustainability curriculum was a minds on, hands on, values soaked apprenticeship model where students acted for the improvement of the environment and the community. Student learning in Greg's local sustainability curriculum focused on students developing skills and competencies as well as a sense of place and an understanding that they lived within ecological limits. The design of practical solutions to sustainability related problems was informed by an understanding of the views, values and perspectives of others.

Greg developed his local sustainability curriculum within the structure of the national curriculum and assessment framework to which he felt accountable for student achievement. He was the only teacher in this research that was aware of the national assessment standards in sustainability education but had rejected using these to structure his local sustainability curriculum because of negative feedback about them from a colleague who had used them.

Greg's local sustainability curriculum was influenced by the local community through consultation with the school leadership and management team. Choices, such as the school being an Enviroschool, were made without his input or understanding but he chose to work with them nonetheless. Greg's local sustainability curriculum development was also influenced by the local community through having community groups such as the local Iwi and Harbour Care engage directly with his students. Other stakeholders in Greg's local sustainability curriculum development were the school Principal, through exercising their vision for the school, as well as other teachers from other curriculum areas who shared common project goals. Students also influenced Greg's local sustainability curriculum developments through his perception of their learning needs and interests.

Greg's local sustainability curriculum development was scaffolded through the use of a school wide planning template addressing the values addressed by all curriculum areas in the school. Greg also used a series of focussing questions to guide his local sustainability curriculum development.

Greg developed a local sustainability curriculum that was embedded in his materials technology programme. Within this programme students learned about the environmental as well as sociocultural historical issues associated with the local geographical area whilst engaging in practical problem solving to enhance the local environment, acting for the environment and the community. Community consultation and the understanding of different points of view were important aspects of Greg's programme. Greg's pedagogical

approach to sustainability education can be described as cognitive, practical and values apprenticeship.

Greg's local sustainability curriculum in West School positioned sustainability education as a values and place based focus within an existing curriculum area, linked to school wide values appreciation. When analysed with respect to the conceptual framework developed for sustainability education in section 2.4.4 and the principles of sustainability education established in section 2.5.1, Greg's local sustainability curriculum in West School covered many of the concepts and aspects identified as important in sustainability decision making and approached learning in sustainability somewhat as emancipatory education.

Chapter 7   Research Findings at East School

7.1 Introduction

In this chapter data are presented to describe the influences upon Mary, Chris and Jenny's local sustainability curriculum development in East School. The data, which are socioculturally and historically bound within the school setting, are presented following the cultural historical activity system theorised with respect to their school (see Figure 7.1).

PSYCHOLOGICAL
TOOLS
Mary, Chris and Jenny's perception of sustainability in the national curriculum

Mary
Chris
Jenny

SUBJECT
Mary, Chris and Jenny's perception of sustainability

OBJECTIVE
Mary, Chris and Jenny's perception of sustainability education

OUTCOME
Mary, Chris and Jenny's local sustainability curriculum

East School

RULES
The cultural norms that influence local sustainability curriculum development in East School

COMMUNITY
The stakeholders with an interest in local sustainability curriculum development at East School

DIVISION OF LABOUR
Curriculum development practices applied to local sustainability curriculum at East School

Figure 7.1: The Cultural Historical Activity System of Mary, Chris and Jenny's Local Sustainability Curriculum Development at East School.

The first four sections report upon the findings associated with the mediated action aspect of the activity system, represented in Figure 7.1 as the darker shaded upper section. Section 7.2 describes the sociocultural context for Mary, Chris and Jenny and their teaching.

The teachers' views of sustainability, sustainability education and sustainability in the national curriculum are then reported on sequentially. Section 7.3 reports upon Mary, 7.4 reports on Chris and 7.5 on Jenny. In each of these sections their perceptions of sustainability, as the subject of the activity complex of local sustainability curriculum development are reported on. Their views of sustainability education; its nature, aims, and what counts as the curriculum for them when planning sustainability education, and how they use this to guide their local sustainability curriculum development are reported on.

The next three sections, 7.6, 7.7 and 7.8 report upon the influences of the sociocultural historical setting in East School, represented in the activity system shown in Figure 7.1 as the lower, lighter shaded section; the interactions of the rules, community and division of labour surrounding local curriculum development. Section 7.6 reports upon the influences of East School's academic and wider culture on local sustainability curriculum development. Section 7.7 reports upon the way East School defined, through operation, the community of people that influenced the development of local sustainability curriculum, that is the stakeholders. Section 7.8 reports upon the way local sustainability curriculum was developed in the sociocultural historical setting of East School and how Mary, Chris and Jenny developed their local sustainability curriculum within this context.

The last section, 7.9, reports upon the outcome of the activity system, the local sustainability curriculum that Mary, Chris and Jenny developed in their school setting.

7.2 Setting

Mary, Chris and Jenny worked in East School and created a programme of sustainability education together. Mary, the coordinator of the programme, was a science and biology teacher in her thirties who had been teaching for eight years, the last four as assistant head of department with responsibility for the junior (year 9 and 10) science curriculum. Mary was passionate and thoughtful about student learning and was proactive in designing and trialling new curriculum approaches, one of which had been leading the development of a sustainability education unit of work at year ten, that is shared across three departments; English, science, social studies.

Chris, a social studies teacher, held the position of teacher in charge of social studies within the department of social sciences. He was in his early forties and had taught for nine years within two schools.

Jenny, the third member of the team, was the assistant head of English and had also acted temporarily as the head of department. She was in her thirties and had taught for six years in two schools.

East School, where they worked, was a mid-sized (700 student) city, decile ten, single sex girls' school catering for year 9 – 13 students. The ethnic mix of the student population was 81% New Zealand European, 7% New Zealand Māori with varied mix of other ethnic groups. East School was a faith-based, state-integrated, secondary school where families paid fees for their children to attend. The school articulated its special character through reference to commitment to strong family values, nurturing and supportive relationships, and effective restorative practices (Education Review Office, 2012).

7.3 Mary

7.3.1 Mary's Perception of Sustainability (subject)

Mary defined sustainability as being about: "Living in a way that can continue indefinitely" (Initial Interview). The meaning she held associated with this definition became apparent when she talked about how she addressed sustainability in her own life, where she focused on living more efficiently.

For Mary, sustainability was about techno-efficiency, using more advanced and efficient technologies to replace older, less efficient, ones. She argued that by choosing more efficient technologies she could minimise the resources she used as well as minimise the wastes produced from her lifestyle. Through this strategy, Mary rationalised the effect of her behaviour as a consumer on the wider ecosystem, stating for example:

> We are consumers. I like toys. But it is producing those in a way that is not producing the kinds of wastes that the Earth can't deal with. Without species becoming extinct or ecosystems being negatively affected. I have a new car so that is more energy efficient. If I have errands to run I try to do them all in one trip. That is about saving my time but it has a flow on effect of reducing my fossil fuel consumption (Initial Interview).

This techno-efficiency view of sustainability was also mirrored in Mary's comments about her home. For example, when commenting upon electricity usage she identified minimising her energy use as a sustainable action:

> We have a gas water heater that you can adjust the water temperature to suit how you are using it in the house. There is a panel in the bathroom and a panel in the kitchen. So that means you are not heating water hotter than you actually need it (Initial Interview).

Her techno-efficiency view of sustainability was grounded in an appreciation of the environmental basis of sustainability and the importance of maintaining the natural environment of the Earth, though her reasoning was so that we maintained resources for human use. She explained this saying:

> Non-sustainability is using resources and creating wastes or products that will have a negative effect on the Earth because they can't continue indefinitely. Sustainability is the opposite of that. It is about using resources that continue forever without any negative impact on the Earth (Initial Interview).

Thinking about sustainability outside of her own family life, Mary identified that living in a sustainable community was something she valued, though she felt the establishment of this ideal was yet to be realised. She felt that she was becoming more sustainable in her personal lifestyle through taking small steps and that this was the way many people experienced a shift towards sustainability, explaining:

> I think it is about being in a place with like-minded people. I guess I don't expect all the people in my community to live 100% down that extreme end of sustainability, but I would be happy [to live in a community] with people that lived around that 60% range.[72] [With people] that were happy to do those small scale things. I think the more people that try to do small things the bigger an impact it will have. That is better than a few people trying to do large things (Initial Interview).

Mary was confident in her own knowledge and understanding of sustainability where she drew upon her formal education in science. She argued that having a degree in science, and knowing how the world works, is an important aspect of understanding sustainability. She explained this view

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[72] The participants were asked to rate the importance of living in a sustainable community on a 1 – 10 Likert scale where 1 was not important and 10 was very important.

stating that: "Everything I know about ecosystems as a core biological concept, I can apply to the issues of sustainability" (Initial Interview).

She continued to add to her understanding of sustainability, albeit from a science research perspective, from a variety of informal sources, for example:

> I follow media websites quite closely, for example the TVNZ[73] news website. I like comparing TVNZ to TV3;[74] having a state media broadcaster versus a privately owned one. My husband and I have very interesting conversations about bias shown in journalism, so it is really nice to look at stories, particularly around sustainability, because it is a polarising topic, and look at [the] ways they are being reported (Initial Interview).

In summarising Mary's view of sustainability, when all of Mary's comments about sustainability were compared, they show a perception that is about techno-efficiency. Of the 31 comments she made about sustainability, 14 expressed concepts associated with an environmental view, five indicated an understanding of sociocultural nature of sustainability and 12 expressed concepts associated with economic perceptions. This spread[75] of perceptions is visualized in Figure 6.2.

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[73] TVNZ is the government owned national broadcaster in New Zealand.

[74] TV3 is a private commercial company owned by MediaWorks New Zealand, a subsidiary of the Ironbridge Capital Group of Australia.

[75] Expressed as the percentage of each perception represented in Mary's comments.
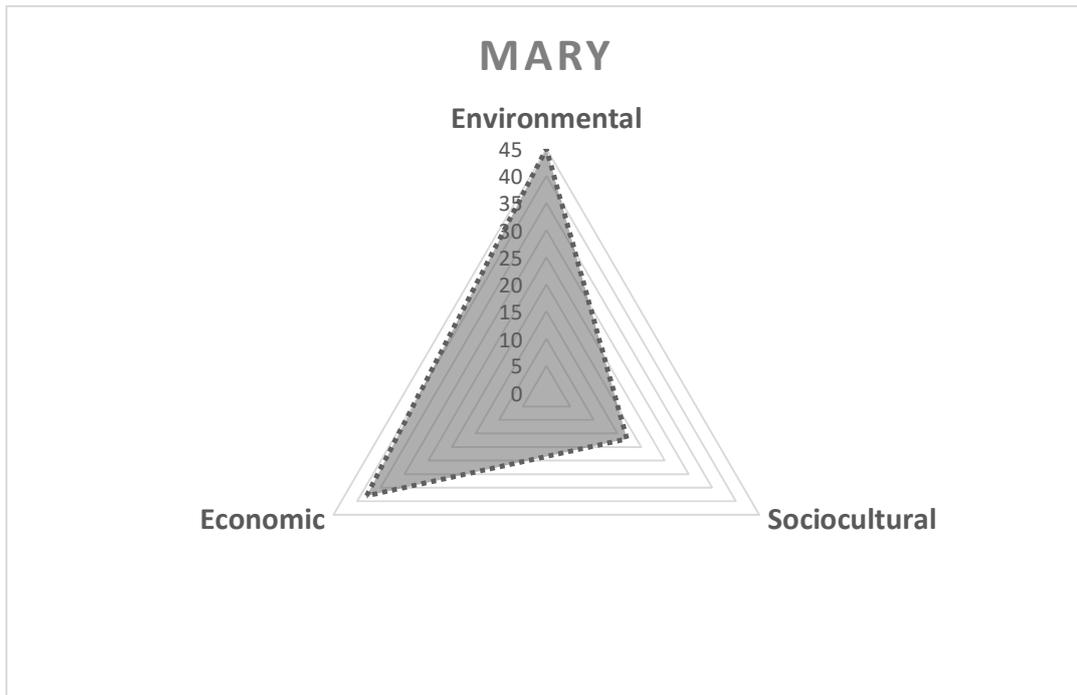
Figure 7.2: Visual Representation of Mary's Perception of Sustainability

7.3.2 **Mary's View of Sustainability Education (object)**

When asked about her perceptions of sustainability education, Mary drew upon her understanding of sustainability and expressed the view that sustainability education was about influencing the next generation to live more sustainably. For example, she expressed the desire to influence her students, the next generation of consumers, to live more sustainably arguing that: "[We can do that by] accessing those minds before they get into their own consumer patterns" (Initial Interview). She further explained her meaning in saying:

> I don't really want to change the way I live that much. I like my car, I like my phone. Even at [my age], I am set in my ways. If we can get these kids that are not set in their ways, they are still malleable, to think more carefully. It could be that they, in [say] science, think about what they are doing in chemistry and physics and biology, and in engineering, new products that can be done in a way that is more

207

sustainable. Chris [fellow teacher] has this awesome book called Cradle to Cradle.[76] It is <u>that</u> way of thinking, producing our products in a way that is sustainable (Initial Interview).

A fundamental part of helping students to live more sustainably was, in Mary's view, the development of their action competence, their ability and willingness to take critically informed action towards more sustainable conditions. She explained this viewpoint by saying: "Sustainability education is about taking action. Students need to learn that they have the power to do things, to change things; that is quite important. It is not just sitting there and thinking this issue is too big" (Initial Interview). She understood this goal of sustainability education to be a part of the curriculum where it was represented in the key competencies as well as the values statements. However, she saw this positioning as problematic. She identified that the key competencies were a generic set of skills and abilities that could be addressed through sustainability, but that addressing these competencies didn't necessarily address issues of sustainability. She expanded on her thinking by saying:

> I have done a sustainability unit and I have applied the key competencies to it. I don't think education for sustainability is <u>in</u> the key competencies. The key competencies can be applied to any area of learning, and sustainability is one of those. I think of education for sustainability more as an area of learning, not a subject. It is an area of learning that encompasses different traditional curriculum areas such as Science, Mathematics, Social Studies and English (Initial Interview).

When thinking about the position of sustainability within the national curriculum she also identified it as being part of the values structure. She had reservations about it being presented as part of the values, seeing values education as a contested area, with her interpreting values education as

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[76] (McDonough & Braungart, 2002).

being about the teaching of values. She was uneasy about the subjective nature of values, as in whose values get taught, and the power relationships of teachers being in a position of power over students. When speaking about sustainability education as part of the values section of the curriculum, Mary noted:

> It feels a bit fluffy. I don't know if I agree with values being put into the New Zealand curriculum, because I don't think we as educators should be teaching values. We may have different values to our students. We could be from different ethnic backgrounds, or socioeconomic backgrounds. As a teacher you are in a position of power in the classroom. Even if you try to run your classroom in a way where you are sort of equals with the students, not a dictator or authoritarian, you are still in the power position and you have the ability to influence the way your students think. So I think having values in the curriculum is quite a dangerous thing (Initial Interview).

In addition to seeing problems associating sustainability education with the key competencies and values, Mary also saw potential problems with leaving sustainability education as a part of the overarching component of the curriculum. In her experience of local curriculum development in secondary schools, she argued that it was likely that it would be overlooked by many teachers. She expressed her concern in explaining:

> I think things like the values are easily hop-scotched over. That is always very easy to do as a secondary school teacher. My husband is primary trained and I have seen him with a more encompassing view of the curriculum as an entire thing. In secondary, we jump straight to our subject and the achievement objectives. We often skip past the [more holistic] things at the front (Initial Interview).

When asked about what pedagogies suited sustainability education, Mary talked about students being involved in self-directed inquiry learning where they worked towards solving sustainability issues. An important part of this

learning, as indicated earlier, was the development of the students' action competence, their willingness and ability to act on their learning with respect to making situations more sustainable. As part of this pedagogical approach Mary believed it was important for her students to be connected with authentic sustainability issues from the social world outside of school. For example, when talking about one of her groups of students, she said:

> [The students] have had to access people outside the school. They have to [talk with] companies that they think are not doing a very good job. For example, these girls that approached the [city] council about recycling bins in the central business district. [They ended up] presenting a proposal to the council (Initial Interview).

An important part of what made her programme sustainability education in her view was the opportunity for her students to make contact with a wide variety of people.

7.3.3 Mary's View of Sustainability in the National Curriculum (psychological tool)

Mary viewed the national curriculum as a foundational document guiding her planning for teaching and learning. She acknowledged, however, that the way she used the national curriculum had recently changed. The introduction of the 2007 curriculum brought a fundamental change for her, where traditionally her focus was on planning for the teaching of knowledge and skills within her own learning area. She had conceptualised the curriculum as a matrix of knowledge and skills to be transferred to students at different levels, expressed through a series of achievement objectives. In thinking about the way she now viewed the curriculum, Mary expressed the change as:

> I wouldn't say the national curriculum is now more directive, but the focus of the direction has changed. You still have to show it is being met, but it has gone from a place where it was all about delivering content or skills, to being about not just what you teach but how you

teach it. That is what I mean about that whole holistic thing, bringing values in, key competencies, addressing the fact that students are different now to how they were twenty years ago. It recognises there needs to be a change from the traditional methods of teaching. From chalk and talk to holistic education (Initial Interview).

Seeing the curriculum as not just a matrix of knowledge and skills had changed Mary's view of pedagogy and challenged her thinking about what counts as codified knowledge. Her sustainability education programme, along with her other teaching programmes, contained examples of the use of contemporary and contextually relevant material to support teaching and learning. These changes, she argued, encouraged her students to work independently and autonomously, developing their critical literacy and decision-making abilities. For example, she said:

We [used to] get the *New Scientist* magazine and hang it up in the classroom and say, hey girls, take it and read an article and bring it back, and they never did. But [now] I put an article online ... and it pops up in their Facebook page. They quickly read it there. It is all just so easy for them. I make sure the articles aren't too hard and are written at an appropriate level and aren't too long (Focus Group Discussion Day 2).

This move to a more interactive digital community approach to learning was seen by Mary as effective, and well suited for learning in sustainability where she used, for example, links to topical articles in the newspaper, YouTube video clips, and links to interesting websites to augment student learning.

7.4 Chris

7.4.1 **Chris's Perception of Sustainability (subject)**

When asked about sustainability, Chris responded quickly and confidently echoing the Brundtland definition. [77] He stated: "Sustainability is meeting the needs of today without compromising the needs of tomorrow" (Initial Interview). When questioned a little more closely, Chris expanded upon his understanding, exposing some of the tensions he perceived inherent in the concept:

> It means leaving something for other people. Acting in a way that the planet can withstand. Giving them the ability to enjoy the same standard of living that we enjoy. It is all relative. I think in order to do that we are going to have to change our standard of living. That definition may need to change. I see it as quite a complex sort of area (Initial Interview).

In acknowledging the shortcomings of the Brundtland definition, Chris expressed his view of sustainability linking ecological sustainability closely with social and cultural aspects of sustainability. He suggested that: "In a broader definition of sustainability, there are some other issues we are going to have to deal with in New Zealand like rising crime rates and an increased dysfunction of society" (Initial Interview). Furthermore, he acknowledged that New Zealand society shows a number of indications that it is not currently sustainable, with social equity being a fundamental concept of sustainability, explaining:

> I think social equity is another issue we are going to be faced with. I recently read a book on equality and it surprised me to learn that within most of the indicators, New Zealand is one of the worst in the

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[77] World Commission on Environment and Development, 1987, sec. 2/1/15) "… development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

developed world. We are placed 26th out of the top 30 [wealthiest] countries on social equality [according to] the social factors they use. We have some shocking statistics; like child abuse, the number of people in our prisons, and drug use (Initial Interview).

This socioculturally focused view of sustainability, where social equity is important, sits comfortably for Chris alongside his ecological concerns, which are expressed in his personal life through a number of sustainability strategies centred on resource use and energy efficiency, for example:

I bike to school, so I try to use my vehicle as little as possible. I try to minimise my rubbish … I recycle as much as possible. Some of the purchasing decisions I make, I think about things in terms of [how much] packaging [they have] and things like that. So just little things like if I am buying something from a shop, I tell them I don't want a plastic bag with it. I reuse the plastic bags [I do get], rather than just letting them all pile up. … [Likewise] I try to minimise my energy use at home. I use energy efficient light bulbs. [if I am cold] I put on an extra jersey rather than turning on the heater. I switch off appliances as much as I can when I am not using them. So just the little things that you hope make a difference somewhere along the way (Initial Interview).

Chris's development of sustainable practices, he admits, is something he is still working on. His thinking around the issues extends beyond daily behaviours to longer term issues where his view of sustainability is again grounded in ideas of equity and fairness. For example, he recounted:

I give sustainability a lot of lip service but in some ways the more you learn about it, the more you do. For example, I watched a movie called 'The age of stupid'. It is set in the future devastated by climate change. In one particular place there is a family that sit down and work out their carbon footprint, and for the family they set a goal of one ton of carbon per year, which is low in comparison to the average

213

family. They want to go on a skiing holiday to the French Alps and they figure out that the one flight will blow their carbon budget for the whole year. I recently went on a trip to Spain and when you look at things like that, you think well, it is easy to place some importance on sustainability, but it is another thing to actually carry through with what is needed (Initial Interview).

Though Chris appreciates the value of living in a sustainable community, he views this prospect in balance with other life priorities. The development of sustainable communities in New Zealand is still a long way off in his opinion, and the development of these communities lags behind the rate of change that is happening in other parts of the world, particularly in Europe. He expressed his thoughts by explaining:

There are a lot of other things that would come before sustainability for me, more prosaic things like getting a job. At this point in time, I wouldn't make a decision about where I live based on sustainability, mainly because I see so little choice in sustainable communities. It depends on what you call a sustainable community really. I think in New Zealand, we are so little down that track that I don't think we have very much choice. From what I have seen there are more options in Europe in that direction. You hope that you can help the community to become more sustainable (Initial Interview).

Chris reported that he was also actively involved in developing his view of sustainability, focused mainly on learning new material that directly supports his teaching. His choice of professional learning, which was self-directed, was from codified sources such as textbooks. He explained his approach:

I do a lot of reading. I have been interested in sustainability, climate change, and some of those other issues, for a number of years now. When I first started looking into it, it made me realise how little I know about it. So I started looking at some select texts to read, particularly around climate change and more broadly around other issues of

sustainability. Most of my in-depth understanding derives from texts (Initial Interview).

In summarising Chris's view of sustainability, when all of Chris's comments about sustainability were compared, they show a perception that is socioculturally centred, on the concept of social equity. Of the 28 comments he made about sustainability, nine expressed concepts associated with an environmental view, 13 indicated an understanding of sociocultural nature of sustainability and six expressed concepts associated with economic perceptions. This spread[78] of perceptions is visualized in Figure 6.3.
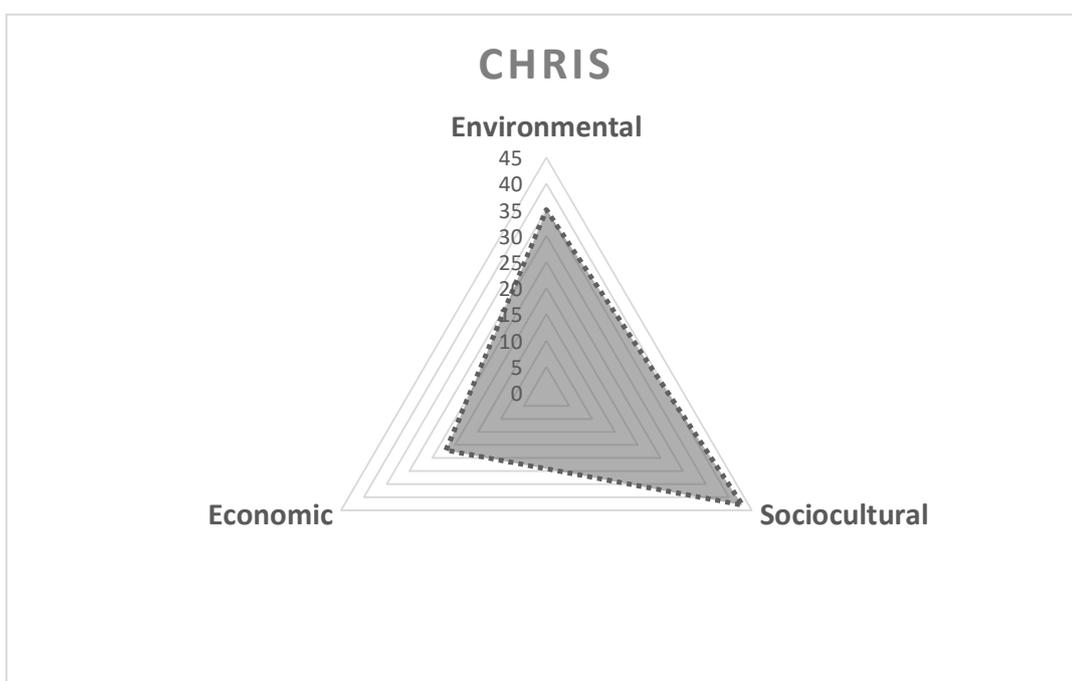
Figure 7.3: Visual Representation of Chris's Perception of Sustainability

7.4.2 **Chris's View of Sustainability Education (object)**

Chris viewed sustainability education as being about the development of students' abilities to make informed decisions. He argued that sustainability

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[78] Expressed as the percentage of each perception represented in Chris's comments.

education was fundamentally about students being able to judge the validity of the information that they were using, and about them understanding and being able to justify implications of their actions in terms of sustainability. He explained his view by saying:

> Ultimately it is about giving people the skills to think for themselves and then trying to help them see the worth in making choices that benefit everyone, and not just themselves. It is about trying to develop learners that have the thinking skills, the social dispositions, and the moral compass to make sustainable choices. To think about issues like sustainability and make ethical decisions around those kinds of things (Initial Interview).

The aim of sustainability education, according to Chris, was also about changing society. He argued that sustainability education represented a way to change people's attitudes and values, bringing about a change in the way that people viewed their relationship with the planet and with other people. Chris explained:

> I think it is the right way to go, because to me if we are ever going to achieve sustainability, then it is around changing people's mind-set. It is the way people think about things, it is the choices that people make that need to change. So if you predispose people to think ethically and give them the ability to be analytical and to look at these things, and to look at them from a viewpoint where sustainability is preferable; where it is communities that are important, [where people are] thinking from a more selfless perspective (Initial Interview).

Moreover, Chris argued that this potential to change society was a part of the nature of sustainability education, having long term and often unmeasurable in the short term, effects. Chris described this aspect of sustainability education saying: "It is [about] growing more sustainable communities, particularly around social sustainability; more functional communities where people are making better choices" (Initial Interview).

Chris recognised that sustainability education was a developing component of the school curriculum and that many secondary schools were only just beginning to address it. It was his impression that the work they were doing in his school was novel, commenting: "In terms of actual units of work, I haven't heard too much. I think we are a lot further down the track than a lot of secondary schools" (Initial Interview). As he reflected upon the situation in primary schools, an area he had some knowledge of, he felt that they were further along the development path, commenting:

> Some things I have seen happening in primary schools leads me to believe that they have some real strong focuses. [One primary school] had a lot of media coverage recently about the development of their eco-classroom where students had input into the design and building it using sustainability principles (Initial Interview).

When asked about how he saw sustainability positioned in the national curriculum, Chris acknowledged that sustainability education could be seen as part of the wider curriculum structure, identifying the key competencies as the most important connection. However, he argued strongly that sustainability was a fundamental component of social studies.

When asked about the pedagogical approaches that might be used in sustainability education, Chris acknowledged he had been influenced by professional development around the way students learn, quoting the work of Howard Gardner[79] as being influential. Chris's pedagogical approach to sustainability education was to work alongside his students. He co-learnt with them, often researching knowledge about sustainability issues that were of interest to them. He explained that, along with his students, he did: "Research on the [Internet] to find out about different sustainability issues, [taking] an interest in what different students are doing" (Initial Interview).

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[79] Gardner, Howard. (2008). 5 Minds for the Future. Boston, MA: Harvard Business School Press.

As well as his current programme in sustainability education in the junior part of the secondary school, Chris had been considering developing a senior programme. He talked about developing sustainability education at the senior level by linking social studies assessment standards with sustainability standards, commenting: "I would like to offer a senior social studies course of which sustainability could be a component" (Focus Group Discussion Day 2).

7.4.3 Chris's View of Sustainability in the National Curriculum (psychological tool)

Chris viewed the national curriculum as something distant; something that was written by experts and then delivered to teachers for them to enact. When asked about how he thought the curriculum was developed, he said:

> I am guessing that some people with expertise around education were involved. I have been to some presentations by Mark Treadwell[80] and he lead us to understand that he had some input into the new curriculum. Likewise, I know the guy in Auckland, the researcher, John Hattie.[81] I would imagine he had some input. I know one of the lecturers I worked with had a huge input into the social studies part (Initial Interview).

When thinking about how he used the national curriculum to develop his local curriculum, including his sustainability curriculum, Chris highlighted his emphasis on the learning objectives. He recounted his normal approach was to: "… start with the nine achievement objectives [for social studies]. Then I [develop] an idea of what I want to teach, or how I want to approach that particular achievement objective and how I want the programme to look" (Focus Group Discussion Day 3).

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[80] In-service Educator and national expert in digital education.

[81] Professor of Education; Auckland University, University of Melbourne.

7.5 Jenny

7.5.1 Jenny's Perception of Sustainability (subject)

Jenny, like Chris, had a view of sustainability that was grounded in the Brundtland definition (World Commission on Environment and Development, 1987), viewing the environment through the lens of sustainable resource use to enhance social and economic considerations. She described her views, saying:

> Sustainability in my mind is using things now, but also ensuring that they are there for the future as best as we can. It's easy just to go to environmental sustainability, but then you have got the economic and the social aspects of that as well (Initial Interview).

Jenny's relatively holistic sociocultural understanding of sustainability had developed over a long period of time and she was aware that the term *sustainability* had changed meaning and was connected to other concepts. For example, she recounted:

> When I was growing up, the word [commonly used] was *conservation*. Last year we had Simon Upton[82] come and talk to us, and he went through [a list of] everything that used to be about conservation … and now it is associated with sustainability (Initial Interview).

This understanding of the way language changed over time and the way meanings developed was also apparent as she argued that the changes went beyond a simple rebranding of conservation. For example, she identified fundamental differences between the contemporary use of the concepts conservation and sustainability, arguing the latter was more holistic in nature and encompassed sociocultural considerations. She argued that when

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[82] Simon Upton was the New Zealand Minster for the Environment from 1990 till 1999. At the time of writing he is the head of the Environment Division of the OECD in Paris.

comparing conservation and sustainability: "In sustainability there is a change in your ethics and the morals behind it" (Initial Interview).

Within her personal response to sustainability, Jenny identified the importance of minimising her energy usage and also minimising her use of material resources, both in terms of quantity and quality. She recounted that:

> We have solar powered heating in our home for our hot water and we have planted a vegetable garden. We have a goat and we use him to cut down all the gorse and blackberry on the section [as] we try to minimise the amount of sprays that we use (Initial Interview).

As well as identifying and acting upon these environmental aspects of sustainability, Jenny also recognised and actualised aspects of sociocultural sustainability. For example, she recounted her approach to recycling of household goods through social recycling, a behaviour that she had learnt from her parents:

> I have always recycled. It is amazing. Sometimes when you get rid of a whole lot of stuff, if you look at it, even though you have finished with it, [it is still valuable to someone]. You can take it to the Sallies[83]. So it is looking at what you term as junk and giving it that opportunity to have a second life (Initial Interview).

Jenny's personal position with regard to sustainability is one where she rates living sustainably as a high priority in her life. She expressed this position through her personal lifestyle choices, acknowledging these choices had begun to make a difference in her life. She explained:

> As sustainability has become my more mainstream way of thinking [I have begun to] do all those things; like [bundling together] all the jobs I need to do out of the house. [Also things like] looking into the fuel efficiencies of cars. For example, when we bought our last car I used

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[83] Salvation Army. A social action charity organisation.

the government website[84] to make comparisons. [Sustainability] has affected my life because when I got a kerbside recycling bin I changed the way I dealt with my [household] waste (Initial Interview).

As Jenny's awareness and operation of sustainability grew in her personal life, she felt an increasing presence of challenges and tensions in the decisions and choices that she made. She explained:

I have this moral dilemma. I can happily espouse about how important it is to live [sustainably], but then, the classic example [is] my car, a nice little happy Subaru. You are not going to take that off me. So I think it is important. But what I think, and what I do, are perhaps two different things. You know I do all those things, the veggie garden, and make sure the cleaners I use are not harmful to the environment, but really, could I do more? Yes, but I think as long as I do something it is better than nothing (Initial Interview).

Reflecting on sustainability in the wider population, Jenny valued living in a sustainable community and viewed the development of a sustainable society as a positive thing. Furthermore, she thought that the process of developing sustainable communities would be best achieved through education as opposed to legislation, a view based upon her understanding of developments in other countries. She said:

It would be nice to think everyone would put their recycling out, but on the other hand I don't ever think things should be forced on somebody. So as long as they were open and trying their best. In some European countries like Switzerland and Germany they are very good at telling people how to live. That gets quite scary (Initial Interview).

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[84] http://rightcar.govt.nz/ Provided advice on fuel efficiency for car buyers.

Jenny had been interested in sustainability for a long time and had developed her understanding through a variety of informal professional development and learning opportunities. These included:

> Good old Google. I went to the Enviroschools site[85] hoping that would help me. [I also got] a lot of information through Environment Waikato[86] which was a good one as well. [Additionally] I went to the Environment Centre[87]. The lady there, Katherine, was really helpful coming up with ideas (Initial Interview).

In summarising Jenny's view of sustainability, when all of Jenny's comments about sustainability were compared, they show a perception that is holistic, with a strong grounding in environmental sustainability but acknowledging the social and economic considerations of twenty first century life. Of the 25 comments she made about sustainability, seven expressed concepts associated with an environmental view, 13 indicated an understanding of sociocultural nature of sustainability and five expressed concepts associated with economic perceptions. This spread[88] of perceptions is visualized in Figure 6.4.

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[85] Schools Environmental Education Programme: http://www.enviroschools.org.nz/.

[86] Waikato Regional Council: http://www.waikatoregion.govt.nz/.

[87] Community Environmental Support Centre: http://www.envirocentre.org.nz/.

[88] Expressed as the percentage of each perception represented in Jenny's comments.
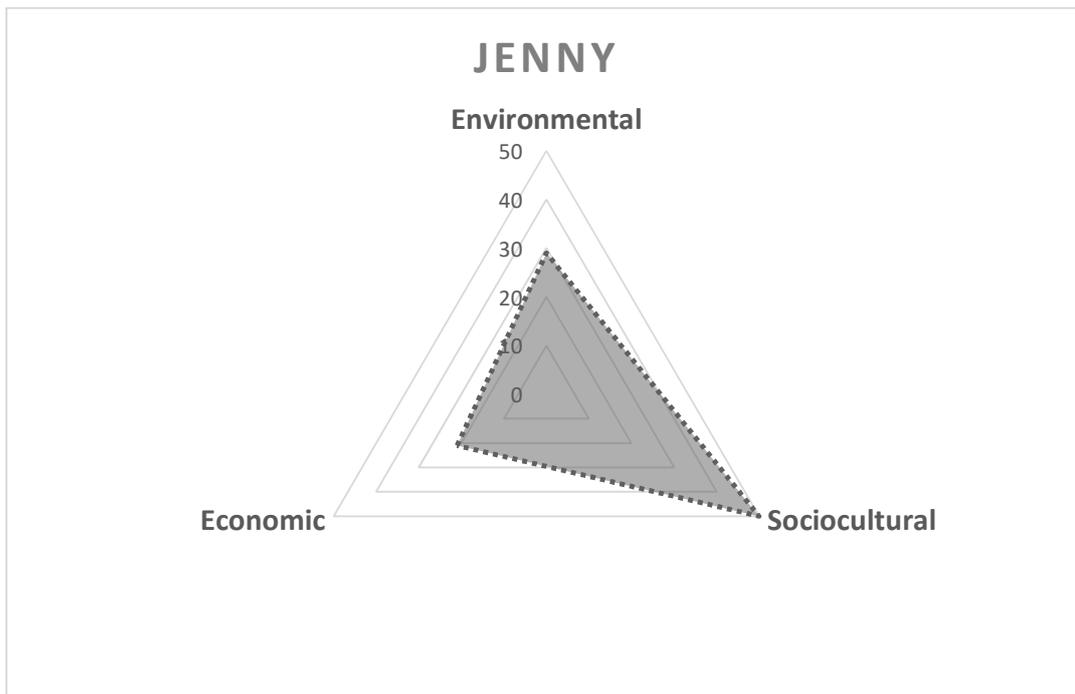
Figure 7.4: Visual Representation of Jenny's Perception of Sustainability

7.5.2 Jenny's View of Sustainability Education (object)

When asked about what sustainability education was, Jenny replied: "It is about getting people to become more aware and critical of what they do, how they fit into the world, their actions, causes and effects" (Initial Interview). She identified sustainability education as an emergent area within the curriculum, explaining that she had not seen many models of implementation from other schools and that in her experience teachers were still grappling with their understandings of sustainability. For example, she questioned: "Has it been long enough for students coming through any sort of sustainability education to become teachers? I never heard about sustainability when I was a student" (Initial Interview).

Notwithstanding this, Jenny saw sustainability education as being a part of the interdisciplinary nature of the current curriculum and commented upon her perception of the place of sustainability in the curriculum as: "I think it definitely comes through in the key competencies; particularly participating,

223

contributing, being aware of yourself in the community, possibly even managing self" (Initial Interview). She also felt that sustainability was associated with the values component of the curriculum expressed through addressing future focussed themes.

When asked about the key concepts underlying sustainability Jenny argued that there really weren't any, and that sustainability education was about developing critical thinking and decision making skills. She explained, from her English curriculum position:

> I think English is a lucky subject. Whereas science is very much knowledge based, English is skills based. So [it is about] thinking critically [being able to] take on board a whole heap of information and then also communicate your ideas well. Sustainability is a good one to generate argument and discussion (Initial Interview).

Thinking about the aims of sustainability education, Jenny again expressed the view that it was to develop students' critical thinking around sustainability. She argued: "It is about developing critical thinking including critical literacy; being aware of the bias in information and being aware of information manipulation" (Initial Interview). In this process of critical decision–making, Jenny acknowledged the role of values in making choices. She said:

> [Sustainability education] is about raising awareness. [The aim] is to have students that are aware of their choices, and [aware of] the impact and effect each choice will have. It is about getting people to be more aware and critical of what they do. How they fit into the world; we always have choices and so it is weighing those up for ourselves (Initial Interview).

When asked what pedagogies suited sustainability education Jenny talked about inquiry learning where students worked in groups and directed their own learning, with an important part of the pedagogy being action taking. When reflecting upon her local sustainability curriculum, she explained:

So looking at that issue sparked the kids off. It wasn't just a research activity, they all had to do some kind of action. So it was doing a full inquiry. Looking at an aspect of sustainability, researching it, popping out what they think is going to be the best solution or action or some kind of prevention and then critiquing that (Initial Interview).

7.5.3 Jenny's View of Sustainability in the National Curriculum (psychological tool)

Jenny's view of the national curriculum was what she described as a traditional one, held by many secondary teachers. For her the curriculum was seen as a scaffold for the intended learning for her students and in the context of her teaching in English she described her normal approach as:

> [I] identify what they need to know. I check what they need to know so that they can be successful. I look at what do I want to achieve from whatever unit of work that I want to do. This is what I want to achieve, then start looking backwards at the activities that I can do (Initial Interview).

When asked about planning her local sustainability curriculum, Jenny explained that her approach was to widen her perspective and consider addressing standards from other learning areas to better suit sustainability education. For example, Jenny suggested that one way to better focus on sustainability within an English programme was to: "Tie in legal studies and resource management standards" (Initial Interview).

7.5.4 Summary of East School Teachers

Mary, Chris and Jenny worked together in creating local sustainability curriculum in East School. They each had different perceptions of sustainability influenced by their sociocultural backgrounds (Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995). Mary's techno-efficiency view contrasted with Chris and Jenny's more sociocultural views of sustainability.

If these teachers developed local sustainability curriculum in separate schools it is likely that these perceptions of sustainability would have a major influence on their curriculum developments, as has been seen in the case of Sarah, Wayne and Greg. In Mary, Chris and Jenny's case, they worked collaboratively, sharing ideas and negotiating the meaning of sustainability and sustainability education through practices of distributed cognition (Harré & Gillett, 1994; Salomon, 1993).

Their shared understanding of sustainability and sustainability education were further negotiated in the sociocultural context of East School. Here their personal, and shared perceptions of sustainability and sustainability education were further influenced within the context of the school. These practices of situated cognition (Hennessy, 1993; Lave & Wenger, 1991; Rogoff, 1994, 1995) are now reported upon.

7.6 East School Culture (rules)

All three of the teachers interviewed in East School acknowledged the school had a strong focus on academic success as measured by student performance in national qualifications. For example, when Mary talked about teaching and learning in the school she commented: "Much of the focus on teaching is directed towards NCEA, even in the junior school. Many teachers say, students need to know this by year 11 so we can't put this other thing in" (Focus Group Discussion Day 3).

This view of student learning, as a progression leading to qualifications, had an effect on the way teachers perceived local curriculum development with the adoption of a standardised approach to local curriculum. This approach was seen as important so that student teaching could be tracked from one level to the next with the goal that student learning could be predicted and coordinated. Mary described her understanding of the reason for the procedure as:

By the end of year 10 students need to be proficient at level 5 in the curriculum. We decided on which achievement objectives are taught at which year levels and what the specific learning outcomes for those achievement objectives are. This means that when a teacher stands in front of their year 10 class at the start of the year, they know what the students have done in year nine (Initial Interview).

This standardised approach to local curriculum was further expressed through common assessments. Jenny explained that in her department: "We all work towards common assessments, and the end of year exams, and their marks schedules" (Initial Interview).

The focus and emphasis on academic achievement was accepted by the teachers as normal but not in an uncritical way. Mary, for example, reflected on the tension that she felt negotiating the goal for her teaching. This tension was expressed in terms of balancing *student learning* and *gaining grades*. She said:

On the one hand you are told to just enjoy learning for learning, but in the end there is somebody there tracking your quota. You have to do your grades analysis and explain your grades. We have to keep our NCEA grades up (Focus Group Discussion Day 1).

This tension between learning as an empowering activity and for academic credentialing was acknowledged by all three teachers as leading to some frustration. Yet it also provided a focus for the consideration of what learning success meant for their students, which the teachers considered professionally as part of their planning process. Chris, for example, exhibited this when he explained his approach to developing his local curriculum, where he identified both themes being considered:

So the question is; how are we meeting the needs of our students? To me the key thing for our kids is meeting the objectives of the curriculum. For these kids if they are thinking for themselves then we are meeting their needs. If we can create an interest around learning

227

and an enthusiasm for learning then we are meeting their needs (Initial Interview).

When asked about why they thought the school had such an emphasis on academic success, Mary, Chris and Jenny expressed the view that the emphasis came from their students' families expectations as to the outcomes of their daughter's education; expressed as education that would allow students to successfully enter a chosen career or profession. In Mary's view, these *felt expectations* were supported and codified by school leadership through the structure of subjects within the school. Mary explained this pressure and the constraining influence this exerted on her local sustainability curriculum development when she remarked:

Students come through biology because they want to go into physiotherapy, dentistry, medicine, all of those things. It would be good to have a group of kids who wanted to work within the concept of sustainability as their career. Education for sustainability is not generally seen as a career option though, is it (Focus Group Discussion Day 1).

Within this strongly academic, codified and results oriented culture the teachers exhibited considerable agency in planning and executing local curriculum. The heavy emphasis on the coverage of the achievement objectives within the learning areas of the national curriculum was taken as a starting point by the teachers, then local and personal influences were enacted. For example, Jenny explained how she approached local curriculum planning in her curriculum area of English:

The first question is, 'What are the achievement objectives I should be focussing on?' From there I look at the learning objectives and the levels, and what I need to do so that the students can hit those objectives (Focus Group Discussion Day 3).

Jenny, who was quite typical in her approach, then exercised considerable agency in deciding the content to be used in addressing the objectives of the curriculum. For Jenny, this process was quite personal. She explained:

> So that [achievement objective focus] is what happens on one side of my brain, but on the other side I have what is bugging me at the time, which directs me to the content. It is my own values that get me excited, so my own values and my own personal connection to the topic get imposed on my students (Focus Group Discussion Day 3).

As well as choosing the content, the teachers exercised considerable agency in their choice of pedagogical approaches to student learning. Mary, Chris and Jenny all exhibited a commitment to what they described as a *twenty-first century* approach to teaching and learning classroom practices. Jenny described twenty-first century teaching and learning as: "Teaching is based on student inquiry and learning is focused on addressing the key competencies" (Focus Group Discussion Day 1). Mary likewise described this approach to teaching and learning as she reflected upon their local sustainability curriculum:

> It is inquiry learning. The students are getting to a place of understanding of sustainability themselves. They feel it is more of a problem if they figure it out on their own, as opposed to us telling them that we use too many resources, or we are not living sustainably. If they get there on their own then they go wow, this is a bit of a problem (Focus Group Discussion Day 1).

Mary, Chris and Jenny showed consistency when speaking about this approach to teaching and learning, arguing that they saw benefits when compared to more didactic approaches. Chris, for example, valued the approach and argued: "It generates a hell of a lot more excitement for them because they find out, rather than us telling them." (Initial Interview). Jenny likewise valued the approach and argued that it not only helped students

learn but it raised their awareness and Mary saw advantages in getting students taking action.

7.7 Curriculum Stakeholders (community)

The senior leadership team of East School exhibited considerable influence over local curriculum development. This leadership was expressed through a curriculum committee and was guided by consistent policy, though the structure of the leadership group changed over time. Mary explained:

> There was a curriculum action group consisting of a small core of heads of department, led by one of the deputy principals, that looked at curriculum in the school and how it was being applied and how it could be improved (Initial Interview).

This leadership group acted to identify whole school curriculum development priorities with reference to national curriculum developments. These priorities were then communicated via heads of department to classroom teachers. When reflecting on her experiences of this process, Jenny explained:

> Changes either come down through the [heads of department] as departmental reflection or [from] senior management through the staff [professional development] sessions. Here we look at a new aspect [of the curriculum] and say how we could meet it. That then trickles down to the department and then goes down from there, but it has to be something that is lead from senior management (Initial Interview).

The role of the curriculum committee was to consider school wide local curriculum development and weigh proposed programme changes against the perception of school success. In this way, they were charged with having an overview of the types of curriculum developments going on around the school at any time and thereby balancing developments with stability. Mary was aware of this political system and the power it held, which influenced her actions when developing the team's local sustainability curriculum. For

example, Mary described her thinking when preparing to present their local sustainability education curriculum to the group:

> If I was to take the idea of offering a senior course in sustainability to the senior management and Board, they would ask, 'Could you justify the staffing for the small number of students?' If I couldn't they might possibly say no, we want you in front of 25 biology students as opposed to six education for sustainability students (Focus Group Discussion Day 2).

The three teachers involved in developing the sustainability education programme recognised the necessity to have senior management support and that part of this was about the timing of the initiative. Jenny expressed the view: "The school can have a lot of other developments they are focussing on at any one time; literacy, numeracy, appraisal systems etc." (Focus Group Discussion Day 2). Chris clarified this statement following up with: "We were very lucky that we got senior management support. It was a window of opportunity. If we tried to introduce education for sustainability this year we might not have been successful" (Focus Group Discussion Day 2).

The three teachers also understood the importance of keeping senior management informed about curriculum innovations with respect to intended learning. Chris explained: "We have whole school aims and there are curriculum goals that departments are expected to follow. There is an expectation that the heads of department will explain to the principal how they are meeting those goals" (Initial Interview). Mary expanded on this thought, with reference to the development of their local sustainability education curriculum:

> Senior management need to be reassured that what you are doing is in line with school goals. They need to be reassured that there is low risk in what you are doing and that the reputation of the school will not be diminished. We did a presentation to the Board to get approval

before we launched our new sustainability unit. They were excited and very supportive (Focus Group Discussion Day 2).

As well as the school leadership, colleagues working in the same curriculum area were also identified as significant stakeholders in local curriculum development. Mary, Chris and Jenny viewed their local sustainability curriculum development as a collegial endeavour, affecting the work of other teachers in their curriculum areas. They argued that changes they proposed to their junior programmes, to accommodate sustainability education, had implications on their colleagues because of the common teaching and assessment regime in the school.

Non-teaching support staff were also identified as being important stakeholders in their school. Individuals, such as the grounds staff, with particular knowledge or skills in particular context areas were seen as important. Likewise other non-teaching support staff, such as the Library staff, were identified as stakeholders.

The final group of stakeholders identified within the school was the students themselves. All three of the teachers commented on the way their understanding of their students affected the way they planned their local sustainability curriculum. For example, Chris expressed his desire to structure learning experiences that maximised his students' learning success:

I think it is an intention of the curriculum; you have to respond to the kids that are sitting in front of you. The kids here are not going to be the same as the kids sitting at [the school just up the road]. So I have a view point on what those kids need to get out of an education. That informs how we go about our teaching and learning (Initial Interview).

Mary continued developing this idea by explaining how she went about developing her understanding of her students, their interests and their preferred style of learning:

Sometimes you want to know right away how they are going. For example, I was talking about bruises and trauma to one class and

they took the discussion off into *hickies*.[89] That is where they wanted to go. The other class however were right down the straight and narrow. They just wanted to know what I was delivering (Focus Group Discussion Day 2).

Jenny also expressed this as a normal part of her approach to planning her local curriculum explaining:

I know the kids are going to be engaged with it by their response to something you bring in or say. You gauge their response. Usually I am thinking ahead and put into the conversation some stuff and ask, what do you think about this or that; sort of testing the water, looking for what they might be excited about. I don't often get it wrong (Focus Group Discussion Day 3).

Formal data gathering methods were also employed to gain a better understanding of their students to inform local curriculum development. Mary, for example, explained that it was normal practice to: "Do curriculum level diagnostic testing in the first two periods of the year using questions from the Assessment Resource Bank"[90] (Focus Group Discussion Day 3).

Mary, Chris and Jenny also considered stakeholders from outside of the school when developing their local sustainability curriculum, with the parent community being the most important group. Communication with parents and caregivers was seen as an important task so that parents knew what was going on in the school and what students were learning. Communication to parents and caregivers was usually indirect, through newsletters, most often informing them of programme details and changes. Communication in the opposite direction also occurred. The views of parents and caregivers were communicated through comments relayed back to teachers via their children, the students.

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[89] Love bite.

[90] An online assessment resource produced by the New Zealand Council for Education Research: http://arb.nzcer.org.nz/.

Despite the lack of direct contact, communication with parents and caregivers was seen as important by the teachers, meeting a number of needs. Firstly, in relation to local sustainability curriculum development it was about building relationships and: "Reassuring the parents that their students were learning and performing at their correct level" (Mary, Focus Group Discussion Day 2).

The second identified need was about increasing the parents' and caregivers' understanding of sustainability education. Part of this understanding was to assure parents and caregivers that though classroom practices in sustainability education may be different from what their children may have experienced in other subject curriculum areas, the teaching and learning going on was normal.

One of the ways this parent / caregiver communication was expressed at East School was through the work of the students being celebrated in an awards evening where parents were invited to view the work of their children. Mary explained that the evening was arranged: "To celebrate the work of the students in the sustainability unit. It is a huge reward for parents. Parents love to see the achievements of their children on display" (Focus Group Discussion Day 2).

The parent / caregiver community was also seen as an important stakeholder in sustainability education as a source of resources to inform the context and content of the local sustainability curriculum. Parents / caregivers involvement at this level, as well as supporting the sustainability curriculum that had been developed, also acted as a signal to other parents and caregivers that the classroom practices and teaching approaches were legitimate because they were supported by parents and caregivers who were influential in the community.

7.8 Local Curriculum Development Practices (division of labour)

Mary, Chris and Jenny all functioned as middle managers in East School and as such had managerial responsibility for planning local curriculum at the department level. Chris explained how he approached this departmental local curriculum development responsibility:

> I start out with a vision for the programme, so it generally starts with me. … I have an idea of what I want to teach, or how I want to approach that particular achievement objective or how I want the programme to look. From there we will have a department meeting and we will all look at ideas of how that unit can be taught. I then go away and put those ideas into a unit. I then send that out to be critiqued by the rest of the department. At any of these stages other people might contribute in terms of lessons or resources to the unit and then finalise something to teach. We then teach it and as we do we gather feedback and add things in as we go, the units are always developing (Focus Group Discussion Day 3).

In Jenny's department there was a similar story about local curriculum development at the departmental level. Jenny explained that she would normally take the lead in local curriculum development and then work with her team of teachers in a formally structured way. When talking about the development of their local sustainability curriculum, she explained:

> As assistant head of department I write the scheme, and that is the only common point that we look at. For each term I plot out what the main skills or foci that we are going to have happening and I prepare a suggested timeline. I then look at the scheme again at the end of the year with the feedback from the teachers. That is when we change things based on teachers' comments and also based on

student evaluations. I then produce a fuzzy draft for the next year and everyone gets to feed into that (Focus Group Discussion Day 3).

Within this quite formal, hierarchical and accountable system of local curriculum development in East School, the teachers also talked about the growing trend in being able to develop local classroom curriculum in informal personal and collegial ways. For example, the teachers talked about sharing ideas and communicating classroom practices with others in their department. They were careful to add that in these informal interactions they were ever mindful of the need to cover common material with students at the same year level, and the need to focus on agreed national curriculum objectives. Mary explained this aspect of curriculum planning in her department:

> Even though the specific learning outcomes we teach are the same for the year level, everybody writes their own unit plans. They can cut and paste the specific learning outcomes into their unit plan because they were agreed to as a department (Initial Interview).

The development of individual learning plans by teachers was relatively new in the school. Historically, teachers in a department all taught to the same unit plan which was structured around learning objectives. The introduction of the national curriculum key competencies as an alternate way to structure learning was seen as influential on this change, allowing a more flexible and personalised approach to the development of local curriculum. Jenny explained how this change had come about in her department:

> Up until this year we have had common unit plans and common tests. All that changed this year with teachers having the freedom to do their own thing. With the key competencies in the curriculum there is no such thing as common unit plans anymore, because if you bring your key competencies into your unit plan then they are how you teach (Initial Interview).

Working within this more personal and flexible approach to local curriculum development, though bound by the hierarchical structures of the school,

Mary, Chris and Jenny had worked collegially across their three departments, to design and deliver an interdisciplinary sustainability education curriculum. Their local sustainability curriculum development took the curriculum key competencies as a shared scaffold. Collegial development of the local curriculum was coordinated using a software package called *3 Clicks*.[91] This software package allowed the teachers, coming from different curriculum areas and addressing different achievement objectives, to scaffold their curriculum planning in a common form. The software was structured with pre-set fields which prompted the teachers to respond to issues such as key competencies, learning objectives, and the resources they thought were appropriate for their intended student learning. The planning software was cloud-based and was accessed by all of the teachers involved, meaning that each teacher could see the planning decisions made by the others, and add to each other's planning ideas. Being cloud-based, the teachers could access their work at any time from any location.

The 3 Clicks platform was then used to share their local sustainability curriculum with the rest of the teachers in their departments. In this way they acted as curriculum leaders, where they developed and shared their local sustainability curriculum development initiatives with the rest of their teams of teachers from their three departments. These other teachers were then invited to participate in the interdisciplinary sustainability curriculum, teaching across curriculum learning areas within the sustainability curriculum that had been developed. Mary explained the process:

> I, as the assistant head of department, chose the specific learning objectives. I created all of the teaching resources that are electronic, for example smart board, note books, presentations, web based activities, flash files. These resources get imported into *3 Clicks*. The specific learning outcomes and achievement objectives get assigned to the resource and I assigned the key competencies and values to

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[91] http://3clicks.me/index.html.

237

each resource based on the way the resource encourages the teacher to teach it. As the unit progresses, as teachers find new resources they can add it in to the unit. They can export it and override my planning to include theirs. Then everyone downloads that resource. So it is a collaborative software tool that we share (Focus Group Discussion Day 3).

The use of the shared planning tool software was perceived by the teachers as encouraging a collegial approach to local curriculum planning. It allowed them to share ideas and work collaboratively even though they didn't actually spend time physically together. Furthermore, use of the software, with its pre-assigned questions, was perceived as having a positive influence on the quality of their local curriculum planning. Mary observed:

I don't think I used to do the key competencies and values as well as I do now. The software gets you to think about how you will deliver the teaching. That is the advantage, you think far more strongly about the key competencies and the values and how you are going to deliver your unit because you have those buttons to press. You click on your resource, and you have to click your achievement objective and have to assign the specific learning objectives to it. You then click on another button and it brings up the key competencies. It has broken these down into lists of the ways you can do it (Focus Group Discussion Day 3).

Thinking about the way they worked as a team in developing their local sustainability curriculum, Mary, Chris and Jenny argued that it was important to have one person take the lead in planning and delivering sustainability education across the different learning areas for each class. This became particularly important in their view when other teachers, who had not been formally part of the curriculum development process, were involved in teaching the curriculum that had been developed. For example, Mary pointed out that within this structure:

Each class had the three teachers associated with the unit and in most situations there was at least one of the teachers that was committed and inspired about the unit. As the students got inspired and enthused the other teachers got swept up with that and got inspired as well (Focus Group Discussion Day 2).

In considering how they, as curriculum leaders, interacted with the other teachers that became involved in the sustainability education unit, Mary, Chris and Jenny identified a number of ways that communication and negotiation of the common aspects of the local curriculum occurred. For example, Jenny, as part of the English department explained:

We share activities and resources that work, but then tailor make them to whatever we are doing at the time. It is both formal and informal, sometimes at department meetings and sometimes randomly with whoever is free at the time, or seeking out the other people teaching at the same year level (Initial Interview).

Another aspect that was found to be important when involving other teachers in the sustainability education programme was collegial support for those teachers. Informal collegial support occurred in a number of ways depending on the individual and the needs. For example, Chris acknowledged the importance of having both a departmental team to work with, as well as a particular professional *buddy* to work with. In Mary's case she identified that when she was looking for help in particular knowledge areas in sustainability, such as chemistry knowledge, she would: "Run to the chemistry teacher and ask about the cool practicals that can make this look flash" (Initial Interview).

Some school structures, both physical and behavioural, aided the communication and negotiation of local curriculum development ideas within and across departments. Shared workrooms, staff school email and shared digital storage systems were all seen as useful. Teacher's acceptance of other teachers coming into their classroom and observing specific classroom practices was also seen as highly effective. As Mary said:

> In my department we are good at wandering through each other's classrooms. We stress it quite a lot that you should be spending time in each other's classrooms in your non-contacts. It is accepted practice to wander in and just sit down for five minutes and see what is going on (Focus Group Discussion Day 3).

Informal conversations between colleagues was also seen as being an important part of local curriculum development, particularly for teachers who were not part of the original development team. These informal conversations were seen as useful in providing ongoing professional development for the other teachers who had been drawn in to teach in the sustainability education unit, for example Mary recounted:

> We end up having a lot of really quick conversations and you can get inspired by somebody else. They can say well, 'I think you should do this' and 'I would never have come up with that by myself'. There are lots of little conversations (Focus Group Discussion Day 3).

Even with a collegial approach to the development of the local sustainability education curriculum as well as with a shared unit planning facility and a range of support mechanisms, Mary, Chris and Jenny found that not all of the teachers that were invited to be part of the sustainability education unit participated fully. As Chris noted:

> It is a balancing act. We had a dozen or so teachers teaching in this education for sustainability unit that the three of us had developed. We presented them a more or less finished product that we expected them to buy into. The three of us had a really strong sense of ownership around what we had developed and the other teachers had none. There was a range of buy-ins (Focus Group Discussion Day 2).

7.9 Mary, Chris and Jenny's Local Sustainability Curriculum in East School (outcome)

Mary, Chris and Jenny worked in the same school but in different curriculum area departments. They collaborated to create an eight week module of sustainability education that operated across the three departments at the same time for year nine (13 / 14 year old) students. Mary described the local sustainability curriculum they developed, saying:

> [We] have constructed an interdisciplinary inquiry unit that involves the science, social studies and English departments, where our year nine students work on an inquiry unit within the context of sustainability for the entire period of time. It is a team teaching approach (Initial Interview).

The local sustainability curriculum involved all of the year nine teachers, not just the teachers reported in this research, across the three departments in the school as well as the resource people that are accessed by the students, such as the library staff and other specialists.

The local sustainability curriculum that they created was an open-ended, inquiry-based unit that was structured around students working in small groups addressing a sustainability issue of their choice. In Chris's words: "We have [developed] a specific unit that we call sustainability, which we subtitle, 'What can you do'?" (Initial Interview). This pedagogical approach to student learning based on student inquiry was consistent with the school's culture of encouraging what they called 21st century learning based on student inquiry. Jenny described the pedagogical approach of the unit saying:

> [The students] look at an issue [that] sparks [them] off. [We] really push that they all must do some action of some kind. It isn't meant to be just a research activity, it is really about getting the students to engage, so doing a full inquiry. [They] look at an aspect, research it, popping out what they think is going to be the best solution or action

or some sort of prevention and then even critiquing that (Initial Interview).

Their sustainability education programme was set in the junior secondary school and as such did not have direct links to the national qualifications assessment standards. The programme addressed the Key Competencies of the New Zealand curriculum, specifically; Thinking, Using Language, Symbols and Text, Managing Self, Relating to Others and Participating and Contributing. This scaffolding of student learning was seen to be important as the students moved from class to class and learning area teacher to learning area teacher as they continued their inquiry in the same groups to explore the different perspectives on the issue.

The aim of the project was for students to research their chosen sustainability issue to such an extent that they could then raise the awareness of this issue amongst others, and also problem solve or offer solutions to the issue by taking action. This aim was communicated to students through an initial unit handout, which explained the aim as well as an overview of what sustainability was about (see Figure 7.5).

Outcome
The students will undertake a course of action or produce a body of work that shows their journey of learning and raises awareness amongst others on their sustainability topic. They will use an assessment rubric to self-assess their progress and reflect on their experiences.

Sustainability
For the purposes of this study, sustainability is defined as:

Meeting the needs of today without compromising the needs of tomorrow

Environmental
Protecting and enhancing our natural ecosystems and biodiversity

Social
Maintaining and improving the health and well-being of people in a community

Economic
Achieving sustainable economic growth and job creation without compromising social and environmental factors

Figure 7.5: Initial Handout explaining the Aim of Mary, Chris and Jenny's Sustainability Curriculum to students

To facilitate planning for student learning in their local sustainability curriculum, which involved multiple people from three departments, Mary, Chris and Jenny used a digital planning tool called *3 clicks*. This cloud based software package created a collaborative database and stored information about; Learning Outcomes, Learning Areas, Levels, Strands, Achievement Objectives, Key Competencies and Values to be addressed in their teaching. All of this information was available for all of the teachers involved in the unit, around 12 people and was accessible from any computer (see Figure 7.6).

Final Student Instructions.doc						
Describe the meanings of ecology, habitat, environment, species, population, community, and ecosystem. // Interpret a food web. // List the environmental factors which affect ...anisms // Identifies other sources to gather ...rmation with supervision // Asks appropriate questions // Finds a range of relevant sources which cover the research topic // Present what they did and what they found out in ways and forms appropriate to their peer group // integrates sources of information and prior knowledge confidently to make sense of increasingly varied and complex texts // selects and uses appropriate processing and comprehension strategies with increasing understanding and confidence // thinks critically about texts with increasing understanding and confidence // thinks critically about texts with increasing understanding and confidence // monitors, self-evaluates, describes progress, and articulates learning with confidence // understands the importance of taking action to raise awareness of important issues	English	Level 4	Speaking, writing, and presenting	Select, develop, and communicate ideas on a range of topics. [Ideas]	Adapt to different roles -- (AR)	Community -- ()
					Set achievable goals -- (SG)	Belonging -- ()
				Integrate sources of information, processes, and strategies confidently to identify, form, and express ideas. [Processes and strategies]	Accept challenges and take informed risks -- (AC)	Civic-mindedness -- ()
					Demonstrate resilience and perseverance -- (RP)	Connectedness -- ()
			Listening, reading, and viewing	Show an increasing understanding of ideas within, across, and beyond texts. [Ideas]	Manage time effectively -- (MT)	Participation -- ()
					Critically reflect -- (CR)	Negotiation -- ()
	Science	Level 4	Nature of science	Use their growing science knowledge when considering issues of concern to them. [Participating and contributing]	Seek assistance and guidance -- (SA)	Unity -- ()
				Explore various aspects of an issue and make decisions about possible actions. [Participating and contributing]	Locate resources -- (LR)	Citizenship -- ()
					Participate actively in a collaborative team or community -- (CT)	Respect for others and their views -- ()
	Social Studies	Level 4	Social Studies	Understand how exploration and innovation create opportunities and challenges for people, places, and environments. [Social Studies]	Empower and enable others in a team -- (EE)	Environment -- ()
				Understand that events have causes and effects. [Social Studies]	Show awareness of the needs of others -- (AN)	Harmony with nature -- ()
				Understand how producers and consumers exercise their rights and meet their responsibilities. [Social Studies]	Contribute own ideas to discussions -- (CD)	Conservation -- ()
				Understand how people participate individually and collectively in response to community	Actively listen -- (AL)	Guardianship -- ()

Figure 7.6: Example of the Collaborative Planning Format used by Teachers in East School

The pedagogy that was used in the local sustainability curriculum was student-centred and teacher-directed, with students working autonomously in small groups to investigate their chosen sustainability issue. Student learning was scaffolded clearly with a 4-page handout that guided their practice, modelling inquiry learning. The guidance material included templates for gathering and valuing information as well as information about the assessment structures their work would be judged against.

The pedagogical approach in the unit gave students freedom to choose where they worked. Sometimes they worked in their normal classrooms and at other times they chose to work in other specialist areas of the school, such as the library. Students, in their groups, negotiated with their teachers where they needed to be to achieve the goals they had set. For example, in the classroom observation of Mary's class, groups of students moved off to work in a computer room to research information about their chosen issue. In another classroom session, the whole class was present in the library, working with book resources that had been provided in advance by the library staff who had been briefed by the teachers as to what the students would need to have access to.

Teacher-student interactions within the unit that were observed by the researcher when making classroom observations indicated that the role of the teacher was one of facilitator of learning as opposed to deliverer of content. For example, in Mary's class she worked with groups of students in informal ways, with students approaching and engaging her as they felt the need. Groups of students took turns approaching her and asking questions about information they were finding. Mary used these opportunities to look at what students were writing and to critique their arguments, prompting them to think deeper, for example suggesting that one group draft an email to the local council asking: "We know we send our plastics to China for recycling, but what happens to them there?" (Classroom Observation) or in another case asking: "So how does having the correct air pressure in your tyres reduce CO_2 emissions?" (Classroom Observation).

In Mary's classroom practice her students were not always physically present with her in the classroom as they had negotiated to use other resources around the school in class time. In response to this, Mary had developed a range of ways to keep informed about her students' progress. Students were encouraged to email her with updates and in one case she was heard to say to a student: "Would you send me a link to your blog so I can keep an eye on what you are doing" (Classroom Observation).

245

Each group of students involved in the sustainability curriculum worked on a sustainability issue that they had personally identified. Examples of these issues included; bees, recycling, vehicle emissions, and water pollution. They drew on the professional strengths of their teachers in the different curriculum areas involved in the unit, English, science and social studies to inform their research. The students directed their own learning. This responsibility was taken seriously by most students, exemplified by one group who arranged to visit a nature reserve and completed the school's Education Outside the Classroom documentation themselves. They arranged a day out of school and conscripted a parent to transport them. Likewise, another group arranged to borrow digital recording equipment from the science department following the normal booking procedures that staff normally follow.

One of the planned outcomes of the sustainability education unit was that students would take some action regarding their chosen issue with the meaning of 'action' being scaffolded within the guidance material (see Figure 7.7).
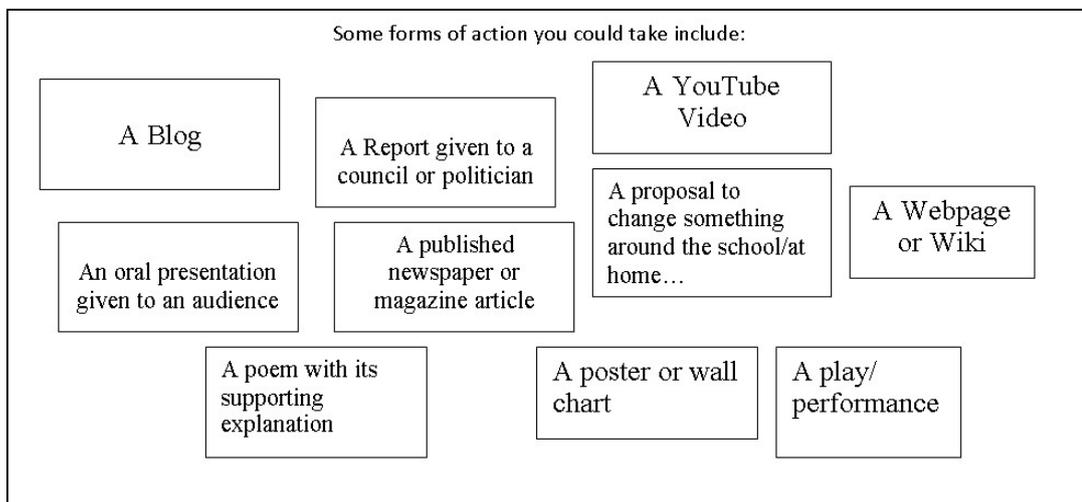

Figure 7.7: Suggested Sustainability Actions

When asked about how their local sustainability curriculum reflected the aspects and conceptual drivers of sustainable decision-making as established

246

in section 2.4.4, Mary, Chris and Jenny acknowledged that it addressed sociocultural equity, economic equity, ecological interdependence, sociocultural interdependence, ecological responsibility for action, sociocultural responsibility for action, and economic responsibility for action.

When asked about their plans for ongoing development of their local sustainability curriculum, Chris expressed the feeling of the team when he talked about continuing with small adjustments, but on the whole they were happy that the curriculum they had developed achieved sustainability education the way they had wanted to. The biggest concern was the energy required to continue with the development. Chris reflected: "At this stage a lot of that comes down to me and if I have the energy and the motivation to do it" (Final Interview).

When analysed with respect to the principles of sustainability education developed in section 2.5.1, Mary, Chris and Jenny's approach to sustainability education, as interdisciplinary, open-ended, student inquiry was somewhat emancipatory in nature. It addressed a wide range of aspects and conceptual drivers in sustainability decision-making.

The local sustainability curriculum they developed collegially gave the opportunity for students to experience a wide range of principles of sustainability education including; social criticality, relevance, authenticity, problem and future focus, improvement orientation, sociocultural / historical boundness, systems focus, transformationalist or values acknowledgement.

7.10 Chapter Summary

East School had three teachers who worked together to create a local sustainability education curriculum for year nine students. The first of these, Mary, was a science teacher who displayed a techno-centric view of sustainability. She viewed technology as an important aspect of sustainability as new technologies, informed by science and technology, use less

resources and create less waste. Allied with this view was a strong affiliation with the economic aspect of sustainability represented in the economic development of these new technologies. This techno-centric view of sustainability carried over to her view of sustainability education, where she viewed the aim as empowering young people to make changes through the application of scientific knowledge and to make decisions about better uses of goods and materials.

Mary viewed sustainability education as being a part of the national curriculum, sited in the focus on values and key competencies where critical thinking, decision making and taking action are important. She expressed this view of curriculum using the term *21st century learning*. For Mary, sustainability education was embedded in authentic practice, engaging students in the world beyond school with links to the local community. Her students engaged in sustainability education through connecting with local, contemporary and meaningful sustainability issues. Her chosen sustainability education pedagogies embraced the use of digital media as a way to engage students in issues and decision-making.

Chris, the second teacher at East School involved in the development of the local sustainability curriculum, was a social studies teacher who viewed sustainability as being about meeting the needs of the present without compromising the needs of tomorrow. His view of sustainability was firmly grounded in a sociocultural view, where issues of community structure and social equity were paramount, but balanced with an understanding of the environmental basis of sustainability. For Chris, sustainability education fitted logically as a part of social studies, where he felt he had licence to address issues of sustainability within the normal framework of his curriculum area.

For Chris, the aim of sustainability education was to develop students' thinking, skills, and social dispositions to create within them a moral compass by which they could make sustainable choices. He believed this was achieved by helping students to be able to judge the validity of the information

they used and to help them understand the implications of their actions. Chris viewed sustainability education as having long term effects which were not easily measured in the short term cycle of secondary teaching and assessment. Chris' preferred pedagogical approach in sustainability education was to position himself as a co-learner alongside his students.

Jenny, the third teacher at East School involved in the development of the local sustainability curriculum, was an English teacher. She displayed a balanced and holistic view of sustainability with a high appreciation of its sociocultural nature. Moreover, she was mindful of the way language surrounding sustainability had changed over time. She expressed sustainability in her personal lifestyle through minimising energy and material resource use, as well as being mindful of the quality of the resources she used. She saw a strong connection between acting sustainably and positions of morality and ethics.

For Jenny, sustainability was a part of the national curriculum, addressing learning within future focused themes. The aim of sustainability education she argued, was about developing students' critical thinking around sustainability, acknowledging the role of values in making choices and decision-making. She argued that this could be achieved through making students aware of causes and effects in sustainability issues as well as recognising the bias in language.

East School exhibited a strong academically focussed culture where success was represented and measured through credentialing of student achievement against national assessment standards, with students' parents / guardians expectations being the perceived source of this pressure. Within this culture, teachers generally had a strong commitment to covering the content knowledge perceived to be important in curriculum areas for students to gain academic success. This academic focus was supported and codified through the departmental use of common unit planning formats and assessments.

The local sustainability curriculum developed at East School in some ways contested this notion of academic success. The teachers interviewed in the research expressed a tension between seeing student's education as being just about academic success through credentialing and notions of education as more holistic in nature. The sustainability education programme that was developed addressed this tension through constructing education in terms of what was referred to as 21st century learning, where curriculum was seen not only as the sum of knowledge and skills for students to learn but an encompassing statement of intent, inclusive of learning approaches and pedagogy.

The dominant stakeholder in local curriculum development in East School was the senior leadership team, represented by the deputy principal and heads of departments who report to the Board of Trustees. Normal operations were that local curriculum development initiatives flowed in a top down manner from this group to departments for implementation by classroom teachers. Where local curriculum development initiatives occurred at a departmental level, endorsement and support of the innovation was required from this group as well as the necessity of ongoing monitoring of the initiative in terms of meeting the schools stated goals.

Other stakeholder groups included: Teaching colleagues; non-teaching resource staff of the school, for example the librarians and other staff with specialist background skills and knowledge; students; and the parent / caregiver community. Students were seen as a major factor in the teachers' local curriculum planning decisions.

Local curriculum development processes occurring at the department level were enhanced by collegial interactions. The development of consistent understandings between all the teachers involved, within and across departments, was enhanced by collegial interactions as well as the use of a shared planning format. At one level these interactions were informal and personal with teachers engaged in personal professional development

through observing colleagues classroom practices, conversing about strengths and weaknesses, and seeking information from each other. These informal interactions occurred most often within a teaching department. At another level local curriculum development was enhanced through the use of a shared, cloud based, digital planning template that allowed consistent communication of curriculum planning decisions across the three departments involved in the sustainability education curriculum. This feature enhanced communication across the siloed structure of the secondary school and developed a more democratic and inclusive style of planning, where the planning moves of all of the teachers involved were available for all to see. Within this structure the need for overall leadership was, however, still acknowledged.

The local sustainability curriculum that was developed in East School was based at year nine and drew together 12 teachers across three departments, science, social studies and English with one teacher from each department taking the lead; Mary, Chris and Jenny respectively. The local sustainability education curriculum was an open ended, student inquiry based interdisciplinary unit of work, where students investigated a topical sustainability issue with the thought of 'What can you do?' This unit was connected strongly within the national curriculum through the key competencies and values, and less strongly through some connections to learning areas and subject based learning outcomes. The pedagogical approaches used in East School to address learning in sustainability were student-centred and teacher-directed, where students worked with a high degree of autonomy. To facilitate this approach learning intentions were carefully and clearly scaffolded by the teachers and articulated in writing, including expectations of practical actions addressing their sustainability issue.

Mary, Chris and Jenny's local sustainability curriculum in East School positioned sustainability education as an interdisciplinary student inquiry coordinating across a number of existing curriculum areas. When analysed

with respect to the conceptual framework developed for sustainability education in section 2.4.4 and the principles of sustainability education established in 2.5.1 Mary, Chris and Jenny's local sustainability curriculum in East School covered a wide range of the concepts and aspects identified as important in sustainability decision making and approached learning in sustainability somewhat as emancipatory education.

Chapter 8   Discussion and Conclusions

8.1 Introduction

Sociocultural learning theory, and in particular notions of mediated action (Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995), situated cognition (Bell & Gilbert, 1996; Driver et al., 1994; Hennessy, 1993; Lave & Wenger, 1991; Rogoff, 1994, 1995), and distributed cognition (Augoustinos & Walker, 1995; Resnick, 1991; Salomon, 1993; Salomon & Perkins, 1998), have been used in this research to theorise (explain) teachers' development of local curriculum in sustainability education. Furthermore, Cultural-Historical Activity Theory (Dakers, 2011; Engeström, 1999; Hsu, van Eijck, & Roth, 2010; Roth, 2004) was used as a tool to investigate the sociocultural meaning making of the teachers involved as they created local sustainability curricula in their schools.

According to Bell: "The main goal of a sociocultural view of learning, thinking and the mind is to create an account of human mental processes that recognises the essential relationships between mental processes and their social, cultural and institutional settings" (Bell, 2005, p. 49). Accordingly, sociocultural theory was adopted as a research lens for this research because of its ability to interpret and describe the meaning that the teachers had for the significant concepts of the research, and the way these meanings are negotiated in the school setting. It was also chosen for its ability to expose the way the teachers used these concepts to create their local sustainability curriculum.

In the context of local curriculum development in secondary schools, the activity complex of local curriculum development was defined as occurring in two interrelated parts. The first part focuses on the teacher and the meaning they have constructed for sustainability, acknowledging their sociocultural history. This meaning interacts with the meaning they construct for sustainability in the national curriculum and together interact influencing their

253

perception of effective sustainability education. In Cultural Historical Activity Theory these interactions are represented by an activity system comprising the subject (teacher), psychological tool (curriculum) and objective (sustainability education).

A second layer of the activity in Cultural Historical Activity Theory focusses on the sociocultural interactions occurring in the community of practice of the subject. In this research, this community of practice is theorised as being the school community of the teacher. Here the interactions influencing teachers' meaning-making are theorised to be the cultural norms of the school that govern what is appropriate in local curriculum (rules), the views of local curriculum stakeholders (community), and the local curriculum development practices of the school (division of labour) influenced by school leadership and management.

This thesis argues that local sustainability curriculum development is a practice of contextual sociocultural meaning-making. Meaning-making around sustainability, sustainability education and learning in sustainability is influenced by their personal sociocultural background and further influenced by the sociocultural context of their school. Teachers make sense of sustainability within a community of educational practice where the meaning of sustainability is contested, socially-constructed and within limits context-dependent.

The teachers in this research worked within the secondary school context to create local curricula in sustainability education. Curriculum area community of practice norms were found to be most influential with three of the four schools creating local curriculum in sustainability within the curriculum area of the teachers involved. Three different local curriculum initiatives were created that addressed sustainability education within the existing curriculum specialisation, referred to in this research as; learning area topic, learning area infusion, and place based values exploration. One of the expressions of local curriculum addressed sustainability from a perspective outside of the

normal learning area silos operating in secondary school and is referred to in this research as issues-based interdisciplinary inquiry.

This chapter firstly discusses the three research questions in a sequential manner. It then presents a number of conclusions drawn from the research, noting the limitations inherent in the research approach. Finally a number of implications are drawn from the research for sustainability education curriculum development in New Zealand.

8.2 Research Question 1: How do secondary teachers make sense of sustainability?

The teachers in this research expressed a range of perceptions of the concept of sustainability that reflected influences from their sociocultural backgrounds. The presence of these personally constructed meanings for sustainability can be understood in the context of the sociocultural historical influences on each teacher with them making personal meaning from their experiences through mediated action (Vygotsky, 1978; Wertsch, 1991; Wertsch et al., 1995).

The presence of a range of perceptions of sustainability within the group of teachers is not surprising, as the concept is not represented in society as a clear and consistent concept. It has been shown to be values-soaked with its meaning socially-negotiated (Fairclough, 2013) and expressed in a variety of ways dependent on the values of communities of practice (Marien, 1996).

The concept of sustainability that a teacher constructs is important as research has shown that a teacher's knowledge, skills, attitudes, and dispositions have implications on their teaching, student learning (Timperley et al., 2007), and influence their local curriculum development practices (Bell, 2005).

All of the teachers in this research expressed in some manner an understanding of sustainability that reflected its contemporary meaning,

concerning the effects of human development on the Earth's environment (Dresner, 2008). Moreover, all the teachers identified care for the environment as an important perspective, a finding which is in congruence with the literature (Birdsall, 2014; Kilinc & Aydin, 2013; Spiropoulou, Antonakakai, Kontaxaki, & Bouras, 2007; Summers, 2013; Summers & Childs, 2007; Summers et al., 2005). The teachers in the research also expressed a range of other perspectives including; techno-efficiency, economic development and sociocultural equity.

The influence of sociocultural history on perceptions of sustainability was exemplified in the research. For example, Greg who identified culturally as Māori expressed perceptions of sustainability that reflected his cultural identity through values such as kaitiakitanga (guardianship), manaakitanga (care for others) and whanaungatanga (relating to the world). These values were integral in the way he spoke about sustainability and underpinned his sustainability actions.

Jenny also exemplified this socially and historically mediated influence on perceptions of sustainability when she spoke about her childhood experiences with recycling unwanted goods through a social service agency so that the goods would be re-homed. These experiences informed her perspective on sustainability, influencing her to develop her social wellbeing-focused perception.

Sarah also exhibited the influence of sociocultural historical mediation on her perception of sustainability. Sarah's perception of sustainability as environmental care paralleled her passion for the natural world. This passion was expressed in her personal life, including her family setting with her husband's interests and professional career choice as an employee of the Department of Conservation.

The other teachers in the research did not present such clear examples of the connections between sociocultural historical experiences on their perspectives of sustainability. Though strong data did not appear in the

research to support this connection for the other teachers, it may be assumed that similar influential sociocultural historical experiences may exist.

The sociocultural influences on teacher's conceptions of sustainability were sometimes shown to create dissonance or tension in the way the teachers spoke about sustainability in their lives. Mary's conversations exposed this situation clearly. At times she spoke strongly about sustainability from her science and technology educational background and then at other times, when working with her colleagues, clearly accepted and worked with alternate meanings of sustainability that were more aligned with social equity. This difference in the way she interacted with the concept of sustainability exposed a tension in her enacted meaning of sustainability. This tension around meaning, and the social mediation of meaning through collaborative community practice exemplified the process of the social construction of meaning underlying this research (Wertsch et al., 1995; Bell & Gilbert, 1996a; Lave & Wenger, 1991; Rogoff, 1994, 1995; Augoustinos & Walker, 1995; Resnick, 1991; Salomon & Perkins, 1998).

For sustainability education to be effective a broad and multi-perspectival knowledge is seen as being essential for teachers (Kysilka, 1998). In secondary schools where curriculum silos exist, it may be that the development of this broad and deep subject knowledge needs to be addressed through specific in service professional learning opportunities. The learning of broad and multi-perspectival knowledge is seen as being essential to understand the interconnectedness of the content in sustainability (Birdsall, 2015; Dyment et al., 2015; Summers et al., 2005). For this to happen the professional learning may be best in mixed subject specialist groups and needs to develop the aspects of sustainability least understood by the teacher.

The teachers in this research were all learning area specialists who had gained tertiary qualifications in their curriculum area of teaching, followed by a teacher education qualification. Their initial formal professional learning, for

example a tertiary degree, separate from teacher education, occurred prior to entering the teaching profession and laid the foundation of their professional knowledge base for teaching in their curriculum area. This formal education appeared to correlate with concepts of sustainability within the secondary teachers in the research. The science and technology teachers expressed mainly techno-efficiency perspectives of sustainability and the English and social studies teachers expressed mainly socioculturally-based perspectives.

Sustainability education is a relatively new phenomenon in the New Zealand curriculum and none of the teachers in the research had studied it in their pre-service tertiary qualifications or as part of their teacher education. Moreover, teachers in New Zealand have not had the opportunity to participate in government-supported nationally or regionally coordinated professional learning since 2009, and few recent professional learning opportunities have been offered in sustainability or sustainability education.

In the absence of any official coordinated professional learning opportunities that address these requirements, all of the teachers in this research reported the need to be actively engaged in their own professional learning to support their local sustainability curriculum development. The teachers met this need through a range of self-selected and self-directed personal learning opportunities.

The personal selection and management of professional learning however had the effect of reinforcing the partial, and often environmentally grounded, view of sustainability held by the teachers. This finding is significant in the context of previous research that indicates for professional learning in sustainability education to be effective it should be designed to help teachers see the holistic nature of sustainability, and develop ways to work in a multi-curricula manner (Birdsall, 2015; Dyment et al., 2015; M. Summers et al., 2005).

The self-selection of professional learning by the teachers had the effect of conserving their perspectival concept of sustainability rather than developing

them to be more holistic. For example teachers who perceived sustainability as being mainly about care for the environment chose professional learning opportunities that addressed further and deeper learning about the environment. Likewise, teachers who perceived sustainability as sociocultural phenomenon chose professional learning opportunities that furthered their understanding of this aspect.

For future in-service professional learning for teachers to be effective a number of factors would need to be addressed (Timperley et al., 2007). In sustainability education engaging teachers in problematic discourse around the nature of sustainability that helps them recognise and actualise their understanding of their knowledge gaps seems fundamental. Furthermore professional learning opportunities that provide opportunities for teachers to socially negotiate and build on their previously mediated understandings of sustainability would seem to be important.

All of the teachers acknowledged sustainability as a holistic concept encompasses care for the environment, social wellbeing and economic development when asked about the nature of sustainability. They also affirmed an understanding of its holistic nature when referring to the way sustainability was positioned in the curriculum within the Principles, Vision, Key Competencies and Values (Ministry of Education, 2007). Addressing this holistic nature of sustainability has however been shown to be difficult in secondary schools (Eames et al., 2008), where teachers normally operate in departments arranged around curriculum area specialisation. This siloed and specialised nature of curriculum and its local development, within curriculum areas, contrasts the holistic nature of sustainability, which recognises and values the interplay of knowledge and competence from a variety of sources. Teachers working in curriculum silos are unlikely to have their, likely partial, perspectives of sustainability challenged or enhanced.

8.3 Research Question 2: How do secondary teachers make sense of sustainability education?

The processes that inform teachers' decision making about their teaching have been theorised by a number of authors and shown to be influenced by a number of sociocultural factors including teachers' perceptions of intended student learning (Taba, 1962; Tyler, 1949). Sustainability education, being a relatively new curriculum area, takes many forms and is presented in the literature under a number of different names and labels (Fien, 2000; Sauvē, 1996) and is far from codified. Much of the diversity in the way sustainability education is expressed and interpreted by teachers can be attributed to tensions within the concept itself. These tensions include the boundaries, and relationships, between sustainability and environmental education, and the extent to which the aim of sustainability education is directed towards direct behavioural change, as in <u>for</u> sustainability.

The relationship between environmental education and sustainability education was contested in this research. In Sarah's case her local sustainability curriculum took the form of environmental education with the emphasis being about the natural environment and developing student's appreciation of its unique nature. Her approach to student learning included classical environmental education pedagogy, providing opportunities for students to experience the natural environment. Though effective as environmental education, her approach as a topic within her science programme excluded many of the principles of sustainability education such as social criticality. Furthermore when interpreted through the lens of sustainable decision making her local sustainability curriculum ignored the aspects of social wellbeing and economic development.

Other local sustainability curriculum examples in the research also included aspects of environmental education in their approaches, but balanced these with other aspects of sustainability. The pedagogy for Greg's local curriculum, for example, was based around projects that occurred mainly outside the

classroom with students working in the local school environment, both built and natural. In this case, the environmental focus of the local curriculum was about improving the built environment. This environmental focus was however augmented with a focus on the sociocultural / historical issues of the school site. In Greg's local curriculum these sociocultural issues blended with his environmental focus.

The local sustainability curriculum co-developed by Mary, Chris and Jenny was the least connected to environmental education. In their case, students self-identified the issues to be investigated in terms of sustainability, many of which had no direct environmental connection. Issues of social equity, justice or efficient and non-toxic product development were just as likely to be addressed as issues of environmental care. This example of local sustainability curricula was the most reflective of the holistic nature of sustainability. Furthermore, this local sustainability curriculum was the most emancipatory in approach to student learning. Students identified sustainability issues in a range of fields and developed responses to improve these situations drawing on a wide range of aspects and concepts within sustainability to inform their decision making processes.

The differences in the local curricula developed in the research schools reflected differing perceptions of the aim of sustainability education. The aim of sustainability education is an important construct for teachers as it influences curriculum development decisions and teaching approaches. All of the teachers in the research supported the notion that the goal of sustainability education was to bring about a change in society towards living in a more sustainable way (Kopnina, 2012), however, they expressed alternate ways of perceiving the aim of sustainability education. These included developing students' sustainability literacy and sustainability criticality.

These differing perceptions of the aim of sustainability education ranged in intent from emancipatory through technicist. Where the aim was about

developing sustainability literacy the intent was technicist in nature, developing knowledge about known sustainability issues such as endangered species. Where the intent was about developing student criticality, and students had agency in developing the local curriculum, the education was emancipatory in effect.

Another issue that arose in the research was that of assessment in sustainability education. This became apparent when the teachers discussed immediacy versus longevity of what counted as learning in sustainability. This dipole created a source of tension for the teachers. For example, the aim of Sarah's local sustainability curriculum was for students to learn knowledge about sustainability, which could be credentialed immediately against national assessment standards. This immediate aim was juxtaposed with her hope that this knowledge would affect her student's sustainability thinking and behaviours in the future, affecting their lives and sustainability decision-making in ways that were future focused, unpredictable and beyond the limits of the assessment descriptors within the national standards. This tension was also identifiable in the way the other teachers talked about the way they perceived the aim of sustainability education.

The immediacy of assessment and credentialing as practiced in the secondary school system, with assessment and credentialing measured against national standards, influenced how the teachers perceived educational success, and therefore influenced notions of how learning in sustainability might be measured and reported. When focussing on the measuring and reporting of student learning teachers perceived the goal of sustainability education as being the successful collection of credits on the national assessment framework. Sarah, Wayne and Greg were clearly influenced by this view of the aim of education.

All of the teachers in this research sought opportunities for credentialing student learning in sustainability through assessment standards associated with their own subject area, such as science, technology or social studies.

The use of these standards allowed sustainability education to be addressed in part but lacked the coordination required to address sustainability in a more holistic way, therefore developing students' sustainability literacy.

None of the teachers chose to offer students the opportunity to credential their learning in sustainability through the assessment standards specifically designed for sustainability education (education for sustainability) in which the holistic nature of sustainability is more likely to be apparent and therefore understood by students. Though all of the teachers were early adopters, and enthusiastic sustainability educators, many were unaware of the existence of the sustainability achievement standards. Where the standards were known, negative comments about their use by colleagues who had used them had dissuaded them from attempting to use them. Colleagues had reported their use as complicated and difficult to use to assure student success.

A longer-term view of what the aim of learning in sustainability was about was also expressed and teachers expressed other types of indicators of student learning success. These included students being more interested in sustainability issues, identifying links between sustainability principles learnt in class and their own lives, and applying sustainability learning in personal problem solving. These indicators align with expressions of emancipatory education (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013).

Moving beyond seeing the aim of sustainability education in terms of changes for individuals, the teachers also identified sustainability education as a means for democratic social transformation. This was seen as being about growing more sustainable and functional communities, where people make better choices (Gough, 2013; Huckle, 2014). In this view developing student's criticality when dealing with sustainability issues was seen as more important than developing any body of knowledge, or set of skills in sustainability education (Jickling, 1992; Jickling & Wals, 2008; Scott, 2002; Wals, 2010; Wals & Dillon, 2013).

A theme within the emancipatory approach to sustainability education was the development of students' critical agency or action competence (Jensen & Schnack, 2006). The teachers saw this aim as being about giving students the skills to think for themselves, and then trying to help them see the value in making choices that benefit everyone and not just themselves (Gough, 1999). Part of developing student agency was seen to be about being positive and enthusiastic for the future, identifying the urgency of what is going on and the part young people had to play. This critical agency / action competence was not only seen as individual action but also included learning how to work cooperatively to achieve sustainability goals.

8.4 Research Question 3: What influences secondary teacher thinking when creating local sustainability curricula in secondary schools?

This research positions local curriculum development in sustainability education as a sociocultural meaning-making practice (Lave & Wenger, 1991; Salomon & Perkins, 1998; Wenger, 1998). Teachers' local curriculum development practices were investigated using Cultural Historical Activity Theory (Engeström, 1999) as a sociocultural research tool.

As the teachers in the research developed their local sustainability curricula in their school settings, their personal constructs of what constitutes effective sustainability education were also influenced by social interactions occurring within the community of school cultural practice (Salomon & Perkins, 1998) and the influence of the specific sociocultural and historical setting provided by the school in which the practice took place (Lave & Wenger, 1991).

The social interactions that occurred in local sustainability curriculum development within the community of practice of the school are theorised in this research to be described through considering the influence of the cultural norms of the school, that govern what is appropriate in local sustainability

curricula, the influences of local curriculum stakeholders, and the influence of local curriculum development practices that occur in the school.

The Influence of School Cultural Norms

The sociocultural norms and the context of the school are recognised as having an influence on local curriculum development (McGee, 2008; Nicholls & Nicholls, 1972). Teachers work with their own socioculturally-agreed and accepted knowledge of what constitutes the curriculum in action within their learning area, and this view extends to what constitutes appropriate and effective pedagogy (Bell, 2010; Bell & Gilbert, 1996). Within this sociocultural construct of what curriculum and pedagogy looks like, teachers co-labour to create meaningful local curriculum through processes of situated and distributed cognition (Lave & Wenger, 1991; Salomon & Perkins, 1998) as members of school departments. In the processes of negotiating meaning, ideas and practices from other curriculum learning areas may be outside the pedagogical norms experienced by the teacher and therefore be rejected as effective (Bell & Gilbert, 1996).

The sociocultural setting of the school influences local curriculum development as teachers consider issues of meaning within the context (McGee, 2008; Nicholls & Nicholls, 1972). The influence of this school setting is often approached through an analysis of the situation in which the learning is to take place, including recognising the influences of the learning environment, the students, the teachers, and the school (McGee, 2008). These considerations determine the learning and teaching activities that students will encounter, and the evaluation of teaching and learning to be carried out. In this research the school-wide view of what counts as educational success for students, and notions of what constituted acceptable pedagogy influenced local sustainability curriculum development.

Educational Success

The teacher's local sustainability curricula developments were influenced by school-wide views of what counted as educational success. In Sarah's case in South School, for example, students gaining credits on the national assessment framework was the accepted measure of student learning success. North School also exhibited a cultural view of student learning success as indicated by the achievement of credits on the national assessment framework. In Wayne's case at North School, this cultural position also affected notions of teacher effectiveness where course pass rates were published for all staff and parents / caregivers to see.

Both of these teachers accepted these cultural expressions of learning success in an unproblematic way and structured their local sustainability curricula to reflect this position. In both schools this view of learning success was articulated and monitored by school leadership and management.

This view of educational success as credentialing was present in all of the schools in the research, though was variable between cases. In West School, educational success was also defined more holistically and allied to the overarching values that the school had adopted. This created a second level of success indicators which teachers planned for and monitored alongside national assessment standard success rates.

East School also exhibited a strong focus on academic success as measured by student performance in national qualifications. This culture influenced the design of local curriculum across the school causing a standardised approach to both curriculum and assessment.

In contrast to this standardised approach to student learning, the teachers at East School in the research also expressed a consistent and strong professional voice that advocated for learning to be acknowledged in more holistic terms. The teachers co-constructed their meanings of learning success in sustainability education and acknowledged other evidence of student learning such as engagement, problem solving, initiative and ability,

and willingness and ability to communicate their sustainability ideas. These alternate indicators of learning in sustainability resonated with Wayne's view as well where he sought alternate indicators to augment the school's value of national assessment standard measures.

Pedagogical expectations

All of the teachers in the research participated in curriculum departments which operated within perceptions of normal pedagogical limits (Bell, 2005). The development of curriculum in sustainability challenged, in some ways, these notions. For example in East Schools local sustainability curriculum students worked in groups which moved from one learning area class to the next continuing to work on their sustainability project. Classroom pedagogy was negotiated by the teachers and the students with students co-directing what pedagogy was appropriate given the tasks they were performing at the time. In this way, group reading and discussion, normal pedagogy for say a social science class, was transported into the classrooms of science teachers. The conceptual boundaries of what counts as acceptable pedagogy in sustainability education was a matter of social construction by the teachers in the research.

Secondary teachers participate in a number of curriculum communities of practice which influence notions of normal practice. The first of these is the curriculum department with a set of learning area-oriented cultural norms (Bell, 2005). The second curriculum community of practice is the secondary school environment, which can be contrasted with the environment of a primary school which is more holistic in nature (Cowie & Eames, 2004). Cultural norms operating at the whole school level in secondary education include learning being apportioned into time bound blocks, often called periods, which operate across all curriculum areas.

An example of pedagogical norms is seen in Sarah's approach at South School to negotiating meaning for pedagogy in sustainability education within her science programme. She drew upon her understanding of the pedagogies

of environmental education as in, about and for, the environment to inform her pedagogical approach. In her local sustainability curriculum students participated in individual, teacher-scaffolded, research using computer based information and participated in education outside the classroom experiences in the natural environment. These pedagogies were used in teaching other aspects of the science curriculum.

In a further example student led inquiry formed the basis of sustainability pedagogy in North and East Schools where teachers positioned themselves as cognitive learning guides working alongside students. In both of these schools students had access to a wide range of resources and exercised considerable choice in their learning. In both of these cases it could be argued that multiple sustainability curricula were operating in the classroom at the same time. Learning was tailored to individual needs as well as the needs of groups of like students within the class.

The Influence of Curriculum Development Stakeholders

The research identified a number of curriculum development stakeholders who influenced local sustainability curricula development. The construction of the teachers' meaning and implementation of sustainability education was influenced by the presence of these stakeholders in the teacher's community of practice. These stakeholders included students, parents / caregivers, local sustainability practitioners and professional curriculum developers.

Students

Local curriculum development is affected by teachers' perceptions of their students' learning needs. That is their understanding of the way their students learn, and what interests them, influences the way they structure intended student learning. These understandings, including content, context, pedagogy, and assessment, direct their decisions within a broad framework (Bishop & Berryman, 2006; McGee, 2008).

In all of the schools in this research students were identified as the most significant stakeholder group in local sustainability curriculum development. Teachers interacted with their students through a range of discursive practices to better understand their learning needs and perceptions of sustainability thereby creating local negotiated meaning around sustainability (Bell & Gilbert, 1996; Driver et al., 1994; Hennessy, 1993; Lave & Wenger, 1991; Rogoff, 1994, 1995).

Student influence was perceived in two ways; firstly as individuals, and then as cohorts of like students. Students as individuals influenced local sustainability curriculum development as teachers made allowances for students with differential learning needs, abilities and interests. This knowledge of students as individuals was seen as critical in some cases allowing the teachers to tailor successful learning experiences for students. Teachers were willing to invest time in getting to know their students as individuals, increasing students' feelings of being valued.

The second way that students influenced local sustainability curriculum development was as cohorts of learners. As well as understandings associated with learners at different levels within the curriculum, students were understood as cohorts in the local community. Here understandings of the issues that students faced living in the local community of the school became important influences on local curriculum development. Relevancy, authenticity and sociocultural and historical connectedness have shown to be important principles of sustainability education (Barnes, 2013; Horvath et al., 2013; Medrick, 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978).

Parents / caregivers

Outside of the school the parent/caregiver community was identified as being influential in local sustainability curriculum development decisions. This influence was supportive of curriculum innovation in some cases, such as in North School where parents were found to support curriculum developments. This support was given through practical support of the teaching programme.

In other cases such as East School, the most noticeable influence was conservative in nature, expressed as concern by parents / caregivers where the local curriculum and classroom practices were seen as going beyond the socially-accepted boundaries of normality. Where local sustainability curricula were seen to be too radical, this influence limited curriculum innovation through pressure from parents / caregivers to deliver accepted, normal, classroom practice.

Local Sustainability Practitioners

Influential curriculum development stakeholders were not limited to groups within and connected to the school community. In a number of cases local sustainability practitioners were found to influence the expression of local sustainability curriculum development. These groups included local iwi, government environment agencies, environmental educators, and community groups.

Professional Curriculum Developers

The influence of professionally developed curriculum by agencies outside of the school was identified as a stakeholder in local sustainability curriculum development. Teachers in the research showed how these pre-prepared local curricula could be used to scaffold the development of their own contextualised local curricula. A tension was identified that these pre-prepared curricula did not take into account the sociocultural situation of the school. Their focus was on predetermined learning which did not address the principles of sustainability education such as being problematic, transformational or acknowledging of local values. This reflects the findings of other research (Barnes, 2013; Horvath et al., 2013; Medrick, 2013; Ritchie, 2013; Tilbury, 1995; UNESCO, 1978).

The Influence of School Curriculum Development Practices

Effective local curriculum development has been shown to be an iterative process, where teachers constantly review decisions to continuously improve the learning outcomes for students (Cornbleth, 1990). Local curriculum development is seen as an ongoing activity that involves continual interactions between teachers and their students as they respond to the contextual influences that affect them and their learning. When local curriculum decision making processes are restricted to something that occurs as a precursor to curriculum delivery, for example at the beginning of the year, or the beginning of a teaching cycle, and not revisited during the teaching, curriculum development can be viewed as somewhat static and technocratic, limiting its effectiveness for student learning (McGee, 2008). This research identified a number of informal and formal teacher practices that influence local sustainability curriculum development.

Informal practices

Local curriculum development was enhanced by teachers having the opportunity to discuss their practices with other teachers. This discursive practice, though time consuming, was found to be important by the teachers in the research. Teaching as inquiry, the process of continually acknowledging and actualising student input into the planning of local curriculum, is advocated in the national curriculum (Ministry of Education, 2007).

Informal collaborative social meaning-making practices (Lave & Wenger, 1991; Salomon & Perkins, 1998) that supported local sustainability curriculum development included teachers visiting each other's classrooms and talking about particular learners. In East and North School the teachers reported a culture of classroom visitation where colleagues were encouraged to observe classroom practice, student learning and engage in professional discussion around the effectiveness of student learning. In other situations these

collegial discussions occurred out of the classroom in break times, as well as facilitated through digital means such as email and shared planning software. In some cases school architecture aided this practice with teachers sharing a common workroom space. The negotiation of meaning around learning in sustainability was aided by these opportunities.

Where little or no opportunity existed for collegial discussion and socially-negotiated meaning-making to occur, the development of effective local sustainability curriculum was more difficult. In South School, for example, these informal practices were minimal leaving Sarah to develop her local sustainability curriculum very much as a lone developer. Sarah had very few opportunities to negotiate meaning around sustainability, sustainability education, learning in sustainability or educational success, all important and socially negotiated concepts in local sustainability curriculum development.

Formal practices

Formal curriculum development practices were also reported in the research as having an effect on local sustainability curriculum development. The role and position of school leadership and management was found to be influential. For example in East School, where school leadership in the form of Principal and Board of Trustees were supportive of local sustainability curriculum development. The teachers created an interdisciplinary approach to sustainability education that effectively addressed the principles of sustainability education, covering a wide range of the aspects and conceptual drivers of sustainability decision-making. Where this leadership and management support was less obvious, or not apparent to the teacher such as at South School, curriculum innovation occurred to a lesser degree.

8.5 Conclusions

The following conclusions can be drawn from this study:

The development of effective local sustainability curriculum in secondary schools requires social negotiation of meaning around sustainability and sustainability education. Sustainability as a concept does not have a clear and robust meaning in society. Likewise, the teachers in this research held partial understandings of sustainability which showed connection to their sociocultural backgrounds and professional learning opportunities. Care for the environment was a common partial understanding of sustainability expressed, as were others such as techno-efficiency.

Professional learning opportunities were valued by all of the teachers in the research to further develop their understanding of sustainability. Deeper and wider understandings of sustainability are important for sustainability education to be effective. In the absence of coordinated national provision of professional learning, by government or other agency, the teachers were self-directed in their professional learning choices. The effect was to reinforce rather than expand their partial perspectives. Teachers' professional learning in sustainability has the potential to widen their perception of the nature of sustainability and sustainability education. To be effective, however, it requires coordination and focus intentionally to address the holistic nature of sustainability, widening teachers' perceptions of sustainability. If uncoordinated, it may lead to entrenching existing partial understandings.

Sustainability education is most effectively positioned as emancipatory addressing principles such as: social criticality, relevance, authenticity, problem and future focus, improvement orientation, sociocultural / historical boundness, systems focus, transformationalist or values acknowledgement. Addressing these principles in sustainability education has been shown to be problematic in secondary schools because of the siloed nature of curriculum delivery. Where teachers in this research perceived sustainability education as something that could be addressed within their curriculum silo, without

reference to other curriculum areas, the local curriculum that was developed was techno-centric in nature with student learning focusing on knowledge and skill development associated with immediately measurable sustainable actions. Where sustainability was perceived as an overarching concept, with intrinsic links to learning in other curriculum areas, the local sustainability curriculum that was developed was more likely to be emancipatory in nature, addressing student learning that lead to the development of critical decision-making and action skills for students to apply in known and unknown future situations. Addressing these principles in sustainability education can be problematic in secondary schools because of the siloed nature of curriculum. The development of effective local sustainability curriculum in secondary schools requires social negotiation of meaning around sustainability and sustainability education.

The aim of sustainability education is problematic for secondary teachers. They work in a culture where student learning, and teacher effectiveness, is measured through students gaining credit on a national qualifications framework. The assessment standards that make up this framework are often techno-centric and assessed as achieved at some level or not. This atomisation of assessment is at odds with the holistic nature of sustainability. A conflict exists between assessment of learning in sustainability through atomistic, techno-centric immediate credentialing through recognition on the national assessment framework, and learning in sustainability that is emancipatory, future focused and transferable, leading to critical agency and action competence.

Local sustainability curriculum development was significantly influenced by two aspects of school culture in this research, what counted as educational success and what counted as acceptable classroom practices. The concept of educational success was socially negotiated within each school. Credentialing of student achievement as measured by national assessment standards was one indicator. The teachers also identified alternate indicators of educational success that they valued such as students being more

interested in sustainability issues, identifying links between sustainability principles learnt in class and their own lives and applying sustainability learning in personal problem solving.

The meaning of acceptable classroom practice in sustainability education was under social negotiation by the teachers in the research. Cultural pedagogical norms of individual schools and curriculum areas influenced local sustainability education curriculum development by the teachers. The teachers drew from the cultural practices of their own learning areas, environmental education, and innovated with new classroom practices they associated with twenty-first century learning approaches.

The local sustainability curriculum development practices of the teachers in this research were influenced by other stakeholders. The most influential group were students. The sociocultural power position held by students differed between schools in the research, but where they had a voice, the teachers perceived their educational needs and affordances and used this knowledge to direct local curriculum development. Where students were understood as individuals, as opposed to cohorts, local curricula were iterative in nature taking account of student needs on an ongoing basis.

External stakeholders influenced the local sustainability education curriculum development of the teachers in the research. Parents / caregivers who held expectations of what the aim of education was about, and expectations of school performance exerted a conservative influence on curriculum innovation. Local sustainability practitioners also influenced the teachers' local curriculum developments through clarification of the local sociocultural context in which sustainability was seen. External stakeholders such as local iwi, environmental managers provided students with access to authentic practice in their sustainability education.

School wide curriculum development practices influence local sustainability education curriculum development. In the schools in the research where local sustainability curriculum development was understood and supported by

school leadership, the teachers innovated. Where this support was less obvious the teachers developed local curriculum that was more conservative, working from within existing curriculum areas.

8.6 Limitations

This research was exploratory and interpretive in nature. It investigated the practices of a small number of research participants, 6 practising teachers, looking deeply into the way they think and act when planning local curriculum in sustainability education. The research participants were chosen because of their perceived early adoption of sustainability education and the perception amongst their peers and researchers that they were successful in developing local curriculum in this area. There is no assumption therefore in the research that these teachers represent in any way average teachers or that the results can be ascribed to teachers in general in any statistical sense. The types of thinking and practices identified in the research, however, can be interpreted as being a part of the act of local curriculum development by teachers.

Another limitation of the research stems from the choice of activity theory to frame data collection within the field of sociocultural practice. This sociocultural framework offers a way to integrate the sociocultural theories underlying the research but has been critiqued as favouring a narrow and economic view of human development (Stetsenko, 2008; Stetsenko & Arievitch, 2010). Further work in this field may therefore benefit from alternate research frameworks to guide data generation.

8.7 Implications

This thesis ends with some implications and recommendations based on its findings.

8.7.1 **Implications for National Curriculum Developers**

The introduction of sustainability as a learning focus in the national curriculum is a political act and as such embodies the notion of power relations within society. The addition of sustainability is an example where curriculum is positioned to act in a societally transformative manner. Sustainability education is currently positioned as emancipatory education within the curriculum which by nature seeks to challenge the status quo of the development paradigm of the 20th century. In this positioning sustainability education aims to develop learners' skills, abilities and affordances to make decisions which lead to acting in more sustainable ways. The inclusion of sustainability in the national curriculum challenges the notion of curriculum acting as a conservative influence, supporting the current social and cultural systems of society. Because of this transformative nature within curriculum, the effort required for successful implementation should not be underestimated.

The meaning of the term sustainability has changed and continues to change in society. Sustainability's inclusion in the New Zealand curriculum is not unproblematic and its meaning should not be assumed. The teachers in this research, though intrinsically interested in sustainability, and early adopters of sustainability education, displayed a range of perspectives of sustainability with no one teacher having well developed, holistic views of the concept. It would seem that at this stage of curriculum development in New Zealand it cannot be assumed that teachers will hold consistent and similar meanings for the term sustainability.

At the national level, this study highlights the need for debate around the further development of meaning around sustainability and sustainability in the national curriculum. At present sustainability is positioned as an overarching theme with a future focus and support material positions sustainability education as education **for** sustainability. This positioning draws on the strong position of environmental education but may hinder the development

of aspects of sustainability education that move it beyond environmental education such as its socially critical, and sociocultural and historical nature. This research has approached sustainability education in a neutral form, without reference for a need for action and presents an argument for sustainability education being positioned as sustainability education, focused on empowering sustainable decision making.

This research also adds detail to our understanding of how the siloed nature of curriculum delivery in secondary schools restricts local curriculum development efforts, limiting implementation to within these existing silos. If no further development is done on defining sustainability education in the curriculum the likelihood of this is that locally developed curricula in sustainability in secondary schools will be technicist in nature, developing student's knowledge about sustainability, and skills to address current and known sustainability problems only. It will not address the future focused and emancipatory goals of the nature of sustainability as indicated in the curriculum. Teacher professional learning is required.

As sustainability education is a relatively new phenomenon, without established pathways for teacher education, it is unlikely secondary teachers will have a formal academic background in sustainability. If sustainability education is to be pursued as a component of the national curriculum teacher professional learning opportunities are necessary. Pre-service teacher education in sustainability and sustainability education are long term solutions however the immediate need is for teacher in-service education to help teachers develop deep and wide understandings of sustainability.

A coordinated approach is recommended for this teacher professional learning. This research indicates that when teachers are left to self-select their professional learning opportunities they are conservative and further develop their existing perceptions of sustainability. This does not develop wider, more holistic understandings which are required for emancipatory sustainability education. For secondary education a nationally coordinated

and led professional learning programme bringing teachers from different learning areas together, with teachers from other schools and school levels with opportunities to negotiate meaning around sustainability and sustainability education may be effective. Communities of learners may be an appropriate grouping structure for this initiative.

8.7.2 Implications for Regional Curriculum Developers

The design of professional learning, particularly for secondary teachers, should allow opportunities for teachers to develop their understanding of sustainability through dialogue with teachers from different learning areas, and potentially from other schooling levels. This dialogue and collaborative action allows teachers to negotiate meaning around sustainability and sustainability education thereby widening their perspectives on sustainability. Opportunities to develop knowledge and meaning around sustainability with teachers from other learning areas also offers opportunity for teachers to identify potential links across curriculum silos and develop understandings of pedagogy appropriate for learning in sustainability. If sustainability education in secondary schools is to be emancipatory and future focused it will need these links to be established and opportunities to work across curriculum silos with students identified. This research in no way determines how these links may be formed but does indicate that they are important and possible, with two examples being shown, place based values exploration and interdisciplinary inquiry.

The implementation of nationally coordinated regionally sited professional learning opportunities, which draw teachers together from a range of local schools, would seem an appropriate structure to facilitate in-service professional learning in sustainability and sustainability education. This local grouping would allow contextually relevant, as well as global, meaning to be negotiated around the concept of sustainability. Teachers would have the opportunity to negotiate meaning through processes of mediated action as well as situated and distributed cognition. This local grouping would also

allow the identification and assessment of the potential influence of local stakeholders in sustainability education and engage these in local curriculum development where appropriate.

8.7.3 Implications for School-based Curriculum Developers

School leadership and management have a strong influence over local curriculum development. Where teachers in this research felt understood and supported by school leadership and management their local curriculum development was innovative and addressed issues of effective sustainability education. Specific professional learning may be required for school leaders and managers to understand the transformative and political nature of sustainability education in the curriculum. This may be needed so that they better understand the political nature of sustainability and sustainability education and better support local curriculum development.

At the secondary school level, local sustainability curriculum development has been shown to be enhanced when teachers work collaboratively, preferably with colleagues from different curriculum subject areas. Working collaboratively with teachers who hold differing perspectives on sustainability allows situated and distributed cognition to occur. This enhances the development of a holistic view of sustainability and acknowledges the differing perspectives held by other colleagues. In this research a number of ways were identified by the teachers involved that allowed them to collaboratively negotiate meaning around sustainability, sustainability education and learning in sustainability. These included: the presence of a culture of collegial classroom visitation; time to visit each other's classrooms; shared workroom space where teachers could talk and share ideas informally; and collaborative planning tools such as cloud based digital software. All of these ways of communicating and developing new and contextual knowledge around sustainability and sustainability education in the school setting supported successful local curriculum development.

Classroom teachers developing local curriculum in sustainability education should be aware of the potential influences of a range of curriculum development stakeholders. These include students, parents, caregivers, industry training organisations and sustainability professionals. These potential stakeholder groups can empower or constrain local curriculum development. Teachers should prioritise students as their most important stakeholder in curriculum development and identify and use formal and informal ways of understanding their perspectives of sustainability. This influence should be seen iteratively, informing local curriculum on an ongoing manner.

8.7.5 Implications for Further Research

Student learning in sustainability was not addressed in this research, nor is it described or defined in the national curriculum. What is meant by learning in sustainability, how students learn sustainability and the corollary to this, how we acknowledge learning in sustainability through assessment, are conceptual areas that are currently under theorised and under researched. This is an area that should become the focus of classroom based sociocultural research in the New Zealand context to inform the way sustainability is presented in the national curriculum.

Furthermore, the teachers in this research found the idea of the aim of sustainability education problematic in the secondary school system. The tension they expressed between their understandings of educational purposes being deep learning that was empowering, conflicted with the need to balance secondary school demands for credentialing. This conflict around the nature of evidence of student learning and how this evidence is acknowledged is another area that requires research to support successful curriculum implementation of sustainability education. An international research agenda would be most informative in this area drawing on and adding to theorising in the field.

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Appendices

Appendix A   Interview Schedules

Initial Interview Questions

<u>Demographics</u>

1. What is the main department that you teach in?

2. Do you teach / have you taught in any other departments?

3. How many years have you been teaching in New Zealand secondary schools?

4. Have you taught in any other schools? Where?

5. What is your position in the department?

6. How long have you been in that position?

7. Which age bracket do you currently fit into: <u>20-30</u>, <u>31–40</u>, <u>41-50</u>, <u>51-60</u>, <u>60+</u>

<u>Sustainability</u>

8. What does the word sustainability mean to you?

9. What do you understand as the issues of Sustainability in New Zealand?

10. What information sources do you draw on to help you understand sustainability?

11. In your personal life (not when you are being a teacher at school) are there any things you do that you feel make your lifestyle more sustainable?

12. On a scale of 1 to 10 how important is it to you to live sustainably? Has this affected your life in any ways?

13. On a scale of 1 – 10 how important is it to you to live in a sustainable community where others live sustainably?

<u>Sustainability Education</u>

14. Thinking of the New Zealand Curriculum (2007) as a whole, how do you see Education for Sustainability being presented?

15. What are your views and feelings on the way Education for Sustainability is presented within the curriculum? How should it be presented in your view?

16. What about your particular subject area within the curriculum, how do you see Education for Sustainability fitting with that?

17. Thinking about Education for Sustainability in the Curriculum, how do you think it arrived at its current position?

18. Thinking about teaching and learning in Education for Sustainability, what have you been personally involved in?

19. What Education for Sustainability have you heard or seen others do?

20. In your view what is the main aim of Education for Sustainability?

21. What do you understand as the key concepts to focus on in teaching and learning in Education for Sustainability?

22. What are your views on assessing Education for Sustainability?

23. What assessment opportunities do you know of that might be used to show achievement in Education for Sustainability?

Curriculum Development

24. Thinking about curriculum as what teachers and students do in the school, what is the process of curriculum development and implementation at the whole school level within your school? Can you give examples?

25. Thinking about planning for teaching and learning at the classroom level. How do you normally go about that process? What do you think about and what do you actually do?

26. What materials do you draw on to help you plan for teaching and learning and how do you use them?

27. What interactions do you <u>seek</u> with others when you plan for teaching and learning? Who do you interact with?

28. When it comes to having people share the work of planning for teaching and learning, who are you supported by and how does this happen?

29. What are the "rules of the game" as it were? Are you allowed to do what you want or are there things you are not allowed to do? What guides you to get it right?

30. How do you feel about the process of local curriculum development in your school?

31. On a scale of 1–5 how much influence do you feel you have on curriculum development within your **normal subject area**; in <u>your department</u>?   (why?) <u>School</u>?   (why?) <u>Nationally</u>? (Why?)

32. On a scale of 1-5 how much influence do you feel you have on curriculum development in **Education for Sustainability** in; <u>your department</u>?   (why?) <u>School</u>? (why?) <u>Nationally</u>? (Why?)

33. When you have completed the task of planning for teaching and learning, what do you have to show for your efforts? Typically what does this look like and what do you do with it?

Final Interview Questions

1. Tell me about what you are planning for next year.

2. How have the experiences of this year affected what you are planning to do?

3. Reflecting upon our understanding of the nature of sustainability (as shown in the diagram) how did this year's work address these characteristics of sustainability?

4. Reflecting on your understanding of the nature of sustainability (as shown in the diagram) how will what you are planning for next year address these characteristics of sustainability?

5. With respect to the whole school structure, not just your own classroom, how might this be achieved?

6. How did you find the process of the research?

7. Is there anything else you want to talk about?

Diagram Referred to in Final Interview

Sustainability			
Concepts / Attributes	Equity	Interdependence	Responsibility for action
Environmental Care	Respect for others Respect for all life	Biodiversity Ecosystem Function / services – (energy flow / materials cycling)	Action orientation towards the environment
Social Wellbeing	Social Justice Intergenerational Equity	Informed decision making processes (politics) Family - Whanau / Hapu / Iwi Community Democracy Cultural Diversity	Citizenship – (active and informed) Guardianship / Kaitiakitanga
Economic Development	Resources – Finite / Renewable	Local Goods and Services Trade Fair Trade Globalisation	Consumerism – (sustainable use of resources) Green Enterprise / Entrepreneurship (technology towards a sustainable future)

Appendix B   Participant Selection and Ethics

Participant Information Letter

[Date]

Dear [teacher's name]

I am writing to invite you to participate in a research study as part of my PhD. The research involves investigating *"Curriculum and pedagogy development in Education for Sustainability for New Zealand Schools"*. The research involves teachers talking about what they understand about sustainability and education for sustainability and the thinking involved when planning for and reflecting on classroom practice. The findings of the research will inform the design of professional development in education for sustainability. The school Principal has granted me permission to conduct the research in the school and I would like to involve you.

The research is based in Waikato secondary schools and will be carried out by myself under the supervision of Dr Chris Eames (Director, Centre for Science and Technology Education Research) and Associate Professor Beverly Bell (Director, Post Graduate Studies, School of Education). The research will involve you participating in 2 interviews, one initial and one final, of up to an hour duration. The research will also involve your participation in 4, whole day (9am – 3pm) focus group discussion days at the School of Education. On these occasions your discussion will be audio taped and these tapes will be transcribed into written form and your comments used as data for the research. All transcripts will be presented to you for checking and verification before being used as research data. As part of the data collection I may also want to look at your teaching documents, such as curriculum planning and teaching plans. With your permission I may copy certain parts of these documents to enable analysis at a later date. There is no intention in the research to interview or look at student work. All effort will be made in the research to keep your participation confidential and to ensure you and your schools anonymity. Any research data collected from you will be kept confidential to me and the research supervisors.

Data collected from you may be used in writing reports, publications or in presentations. Your name and the name of your school will not be used in any

publications or presentations so your work and ideas will remain anonymous. The information that is gathered in the research will be stored securely. You can decline to be involved in the research and can withdraw from involvement in the research at any time. This will mean that no further information will be gathered from you. Research data that has already been verified by you will be maintained in the research.

As a part of the research design you will participate in 4 days of professional development supported with professional readings and relevant teaching resources as well as the opportunity to work with a small group of like-minded teachers. These workshops will be followed up with school visits where I am available to act as curriculum advisor. My research role on these visits is confined to observations and field notes.

Your consent to be involved in this research would be appreciated. If you need any more details about the project please feel free to contact me, email – johnl@waikato.ac.nz.

In the event of any issues arising in the research also contact me. If I cannot clarify the issue please contact the research supervisor, Dr Chris Eames at the Centre for Science and Technology Education Research (email: c.eames@waikato.ac.nz tel: 07-838-4357).

If you consent to being involved, please sign the attached consent form and return to me.

Sincerely,

John Lockley
Department of Mathematics, Science and Technology Education
School of Education
University of Waikato
Private Bag 3105
Hamilton (3216)

Participant Consent Form

I have read the attached letter of information.

I understand that:

1. My participation in the project is voluntary.

2. I have the right to withdraw from the research at any time.

3. Data may be collected from me via transcribed interview and discussion comments, as well as copies of teaching planning where permission is given. This data will be kept confidential and securely stored.

4. Data obtained from me during the research project may be used in the writing of reports or published papers and making presentations about the project. This data will be reported without use of my name o the name of the school.

5. I acknowledge my commitment to undertaking 2 research interviews, each of no more than an hour's duration.

6. I acknowledge my commitment to attend 4 days of focus group discussions.

I can direct questions to the researcher, John Lockley at johnl@waikatoac.nz tel: 07-838-4500 ext 7785. For unresolved issues I may contact the research supervisor, Dr Chris Eames at c.eames@waikato.ac.nz tel 07-838-4357.

I consent to be involved in the project under the conditions set out above.

Name:_____

Signed:_____

Date:_____

Please return to:

John Lockley
Department of Mathematics, Science and Technology Education
School of Education
University of Waikato
Private Bag 3105
Hamilton (3216)

School Participation Letter

[Date]

Dear [Principal's name]

I am writing to ask your permission to formally include your school in a research study. The research is for my PhD and involves investigating *"Curriculum and pedagogy development in Education for Sustainability for New Zealand Schools"*. Education for sustainability is a growing issue in the national curriculum. The research involves teachers talking about what they understand about sustainability and education for sustainability and the thinking involved when planning for and reflecting on classroom practice. The findings of the research will inform the design of professional development in education for sustainability.

The research is based in Waikato secondary schools and will be carried out by myself under the supervision of Dr Chris Eames (Director, Centre for Science and Technology Education Research) and Associate Professor Beverly Bell (Director, Post Graduate Studies, School of Education). The research will involve a teacher from your school participating in 2 interviews, one initial and one final, of up to an hour duration. The research will also involve this teacher participating in 4, focus group discussion days (9am – 3pm) at the School of Education. The research project will pay teacher release for these days at $250 per day. The teacher will be involved in discussions supported by academic readings and relevant teaching resources in education for sustainability and their discussions will be audio taped to gather research data. The data will be transcribed into written form and presented to the teacher for checking and verification before being used as research data. Additionally I will visit the teacher at your school following the workshop. The research part of the school visit will be to make observational field notes and where the teacher agrees, if relevant to the research, collect copies of teacher curriculum and classroom planning. There is no intention in the research to interview or look at student work. The teacher involved will be free to decline to be involved and to withdraw from involvement at any time.

Should you give permission for me to collect data in your school I will seek informed consent from the teacher involved prior to commencing the research project and data collection. Any data collected from them will be kept confidential to me and the

research supervisors, Dr Chris Eames (Director, Centre from Science and Technology Education Research) and Associate Professor Beverly Bell (Director, Post Graduate Studies, School of Education).

All effort will be made in the research to keep your schools, and the teacher's participation confidential and to ensure you and your schools anonymity. Data collected from your school may be used in writing reports, publications or in presentations. Your name, the teacher's name and the name of your school will not be used in any publications or presentations.

You can withdraw your school from involvement in the research at any time. This will mean that no further information will be gathered from the school for the project. Research data that has already been verified by the teachers up to that point will be maintained in the research.

I would appreciate your permission for your school to be involved with this research project. If you need any more information about the project please contact me, John Lockley, email – johnl@waikato.ac.nz or tel 07-838-4500 ext 7785.

In the event of any issues arising in the research again please contact me. If I cannot clarify the issue please contact the research supervisor, Dr Chris Eames at the Centre for Science and Technology Education Research (email: c.eames@waikato.ac.nz tel: 07-838-4357).

If you give consent for the school to be involved, please sign the attached consent form and return to me.

Sincerely,

John Lockley
Department of Mathematics, Science and Technology Education
School of Education
University of Waikato
Private Bag 3105
Hamilton (3216)

Research Consent Form - Principal

I have read the attached letter of information.

I understand that:

1. My school's participation in the project is voluntary.

2. I have the right to withdraw my school from the research at any time.

3. Ethical approval will be gained from the staff member/s involved before collecting any data from them for this research.

4. Data may be collected from my school in the ways specified I the accompanying letter. This data will be kept confidential and securely stored.

5. Data obtained during the research project will be used in the writing of reports or published papers and making presentations. This data will be reported without use of my name, the names of my staff, my students or the name of the school.

6. I acknowledge my teacher/s involved in the research will commit them to 4 days of focus group discussions and the research project will fund their teacher release at $250 per day.

7. I acknowledge the researcher will visit the teacher/s at school once every term in 2009 to observe classroom practice and make observational research notes.

8. I can direct questions to the researcher, John Lockley at johnl@waikatoac.nz tel: 07-838-4500 ext 7785.

For unresolved issues I may contact the research supervisor, Dr Chris Eames at c.eames@waikato.ac.nz tel 07-838-4357.

I give consent for my school to be involved in the project under the conditions set out above.

Name:_____

Signed:_____

Date:_____

Please return to:

John Lockley, Department of Mathematics, Science and Technology Education

School of Education, University of Waikato

Private Bag 3105, Hamilton (3216)