Secondary School Students'
Conceptions of Sustainability

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Abstract

Sustainability is a word that is frequently used and often without the understanding that it warrants. An understanding of sustainability is vital today as people need to adopt strategies to cope with issues caused by environmental degradation, social inequity and economic disparity. Education for sustainability has gained momentum after calls by international bodies to provide a vehicle for change to prioritise sustainability and integrate sustainable development at all levels of education. This thesis investigates what secondary school students understand about the complex concept of sustainability. It explores students' conceptions of sustainability, their views about sustainability issues and the relationship between the students' conceptions and their views about sustainability issues.

This research used a mixed method approach to collect quantitative and qualitative data from questionnaires and follow up focus group interviews. Open and closed questions were used to investigate students' conceptions of sustainability and these were compared to conceptions of sustainability that educators and scholars regard as important for citizens to hold for a sustainable future. Students' views about sustainability issues were explored using modification of semantic differentials that were directly related to principles of sustainability that had been drawn from the literature. Data gathered were analysed using a thematic approach and simple statistical tests.

Findings showed that students in this study had some understanding of sustainability. A minority of students held simple, one dimensional conceptions of sustainability but a significant number of students held conceptions that were more complex and multi-dimensional in nature. There were no students who held the expert conceptions of sustainability that scholars and educators regard as important, where environmental, economic, cultural, social and political conceptions are interrelated within an inter-generational setting. Findings also showed that students' views of sustainability issues, determined from a series of differential statements, indicated that the majority of students agreed or strongly agreed with the sustainable view for most of the environmental, economic, cultural, social, political and inter-generational sustainability issues presented to them. Comparison of these findings indicated that a student who held a more complex conception of sustainability, and was able to identify a number of conceptions of sustainability, is more likely to make a sustainable choice on an issue if given the opportunity. These findings are encouraging but, because of the importance of sustainability, they suggest a need to further develop students' understandings of this complex concept.

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Chapter 1 Introduction

1.1 Rationale

This study is concerned with New Zealand secondary students' conceptions of sustainability and what they understand about this complex concept.

I have taught in secondary schools in the North Island of New Zealand for the past ten years and have been part of a community of educators who have striven to bring sustainability learning to our students. From my own experience, and research conducted in New Zealand (Birdsall, 2010; Bolstad, 2003a; Chapman & Eames, 2007; Eames, Cowie & Bolstad, 2008; Cowie & Eames, 2004; McLean, 2003), I am aware that teachers face many barriers in this endeavour, but continue to persevere because of commitment to their students and a belief in the importance of sustainability for the future. I believe the importance of sustainability cannot be overstated and "as a concept for actions that will result in a viable future for succeeding generations, is a priority." (Littledyke, Taylor & Eames, 2009, p. xi).

As the United Nations Decade of Education for Sustainable Development ends (United Nations Educational, Scientific and Cultural Organisation (UNESCO), 2005), it was the right time to investigate what secondary students in New Zealand understand about sustainability. Today's secondary students are the decision makers of the future and can only make good decisions if they are fully informed. If students are fully informed with regards to sustainability they will have more opportunity to make good decisions for themselves and others in the future; a future that may depend on their ability to work towards the ideal of a sustainable world. Decisions made today and in the past, without much thought for a sustainable future, have led to environmental, social and economic problems, and these "problems that exist in the world today cannot be solved by the level of thinking that created them - Albert Einstein" (Parliamentary Commissioner for the Environment (PCE), 2004, p. 43).

1.2 Background

The word sustainability is increasingly being used in the media and in everyday conversation, and many different definitions exist. The popularity of this term has been traced back to the publication of *Our Common Future* in 1987 (Carew & Mitchell, 2002; Filho, 2000; Khalili, 2011; Mebratu, 1998) when concern was raised about managing the environment and maintaining development to avoid disaster in the world (World Commission on Environment & Development (WCED), 1987). Since the 1960's, many authors had been drawing attention to such issues as environmental degradation, social inequity and economic disparity around the world. At the United Nations level, the publishing of *Our Common Future* pulled together these ideas into one document and the discourse concerning sustainability (and sustainable development) gained momentum (WCED, 1987).

The 100% Pure New Zealand marketing campaign seems opposed to reality as this country has many sustainability issues it needs to address. Access to clean water is one of the most pressing issues that exists today and one that has grown increasingly significant in recent times because of intensive land use, particularly the increase in dairying in many parts of the country. Key contaminants such as nitrogen, phosphorus, faecal microbes and sediments cause degradation of both our fresh and salt water (Ministry for the Environment (MfE), 2013; NIWA, 2014; PCE, 2012). Decisions made by present and past generations of New Zealanders have caused these problems and it is only good decisions made today and in the future that can help restore water quality to its original state. Other issues such as climate change, resource management, loss of biodiversity, poverty and reliance on fossil fuels are all sustainability issues which New Zealanders face today. Education about issues like these will enable a better informed population to be able to address these problems and possibly find solutions.

Education for Sustainability (EfS) has also been gaining momentum in schools, having developed from Environmental Education (EE) during the 1970's.

Teaching and learning based on concern for the environment, and an awareness of human impact on the environment, has developed into a future focussed approach which takes into account social and economic concerns coupled with an action component. Making decisions and taking action for sustainability should be done in response to an understanding of the conception of sustainability. Having that understanding comes from the development of the accepted conception by exposure to the interrelated concepts within sustainability, e.g. environmental, social, economic, cultural, political and inter-generational. In New Zealand, the publishing of the *New Zealand Curriculum* made it plain that sustainability education should be included in teaching and learning programmes (Ministry of Education, 2007) but the document fell short of mandating this requirement. The Statement of Intent 2008-2013 (Ministry of Education, 2008) included sustainable development as one of the five themes in Government goals set for that period.

The United Nations signalled that education would be the vehicle for change and as educators we should be prioritising sustainability and integrating sustainable development at all levels (UNESCO, 2005). Comparisons between New Zealand, Australia and British Columbia have shown that sustainability education has taken similar paths. Sustainability education appeared in these countries and regions as a response to international meetings and conferences at the United Nations level. Initially, curriculum documents were prepared but teachers were given very little assistance in the delivery of this part of the curriculum as they endeavoured to translate policy into practice. The development of guidelines, programmes delivered by outside providers and assessment resources in the senior school has provided much assistance for teachers of sustainability. But is sustainability education making the difference it has been charged with? Little is known at the secondary level to reveal if educators are meeting these goals. It is from this position that my research is based.

1.3 Research question

The research question that guided this study was:

What are secondary students' conceptions of sustainability?

This question has been addressed by investigating what secondary students understand about sustainability through the use of a questionnaire, followed by focus group interviews. Data gathered were analysed using a thematic approach and simple statistical analysis.

1.4 Thesis outline

This thesis is composed of four more chapters.

Chapter 2 is the literature review. The review examines key ideas that comprise the concept of sustainability, and the development of sustainability thinking in the world outside schools and within schools. From the review, a set of 12 principles of sustainability was developed.

Chapter 3 is the methodology section. This chapter describes the methodology and the approach taken for data collection and analysis. It describes the choice of paradigm employed in this study, the research sample and instrument design. Trustworthiness of the study and ethical issues are also discussed.

Chapter 4 presents the findings of this study through identification and analysis of themes that have emerged from the data and statistical analysis of data related to the principles of sustainability that have been developed. The findings are presented in three sections: students' conceptions of sustainability, students' views about sustainability issues, and a comparison of the two.

Chapter 5 presents a discussion and summary of the study's findings that were generated in the previous chapter. The conclusions and implications drawn from the findings, and the limitations of this study are also discussed.

Chapter 2 Literature Review

2.1 Introduction

The purpose of this literature review is to bring together the development of sustainability thinking in the world outside schools and within schools to inform this investigation of secondary school students' conceptions of sustainability. The conceptions of sustainability are examined to identify the key ideas that comprise this complex notion, and the history of the development of sustainability and sustainable development are reviewed to explore some key contributors in the discourse. The terms sustainability and sustainable development are considered together to inform this research.

Current models of sustainability are also explored to add to the understanding of the concept. The development of sustainability education is reviewed and its progress within New Zealand, Australia and British Columbia is explored to highlight similarities and differences in this area. Also presented is an overview of how conceptions are formed and the theory related to this. The development of conceptions is related to the development of conceptions of sustainability in research that has been undertaken previously. Finally, a set of theoretical principles are developed to inform the construction of a survey instrument which was used to investigate secondary school students' conceptions of sustainability.

2.2 Sustainability - the conceptions

Many different definitions of sustainability have been identified from the literature (Birdsall, 2006; Carew & Mitchell, 2008; Craig, 2004) and it is evident that defining sustainability is a complex exercise. Jickling (2000) and Birdsall (2010) both stated that sustainability was interpreted by people according to their own values and the "tenor of these definitions will be clearly dictated by the stripe each adherent wears" (Jickling, 2000, p. 470).

Analysis of a word can bring to light differences in people's interpretations and this can help identify the different approaches used by groups and individuals using that word (Thompson, 2007). The Parliamentary Commissioner for the Environment (PCE) stated that it is how words are used and what they actually mean to people that is important (PCE, 2004), so identifying the origins of the key conceptions within sustainability is an important step in understanding what is meant by the term sustainability.

If the word sustainability was examined at the dictionary level it would imply that an activity could continue indefinitely and have the ability "to last" (vocabulary.com, 2013). Filho (2000) reported that traditionally sustainability was synonymous with words like long-term, sound, systematic or durable. The French translation of sustainability is durabilitè (Arnould, 2009), which appears similar to the English word durability. To some, sustainability may be interpreted as the ability to continue on in an unchanged manner or just to be in existence in the future. Aras and Crowther (2009) stated that some corporations that claim they are sustainable are using this definition and do not have any understanding of the wider implications of sustainability. Although their activity could continue indefinitely, it may occur with total disregard for dangerous environmental practices in the hope that ecosystems would, in time, adapt (Bonevac, 2010; Santillo, 2007). Statements made by the British Petroleum chairman in 2006 demonstrate this:

> This is why we care about the sustainability of our activities and why, throughout the company we work to ensure that the things we do and the way we do them are genuinely sustainable.
>
> (Aras & Crowther, 2009, p. 979).

The concept of environmental sustainability (also called ecological sustainability) emerged from the concern for the degradation of the environment because of human practices. This conception of sustainability is concerned with not only

protecting the natural environment, but also enhancing and maintaining ecological life-supporting systems (Khalili, 2011; PCE, 2004).

Sustainability became a popular term when discussions were concerned with the management of finite resources such as food and fuel (Bellett-Travers, 2004) and led to the development of resource management as we know it today. But in reality, resource management was practised by ancient civilisations and indigenous communities who had developed an understanding of, and respect for, nature and their impact on the environment (Banon Gomis, Guillen Parra, Hoffman & McNulty, 2011; PCE, 2004) and a "good understanding of the carrying capacities of their environment" (PCE, 2004, p. 4). The carrying capacity of the ecosystem and the input and output models of consumption of resources were ideas that added to the discussion on sustainability (Schmandt, 2010) and linked the three areas of environment, society and economy.

The concept of economic sustainability can be described as the maintenance of man-made assets (Khalili, 2011) and incorporates the idea of efficient use of finite and sometimes scarce resources (Martins, 2011). Schmandt (2010) identified the management of resources as a component of economic sustainability. He considered that the protection of a resource was not the main focus of resource management, but was merely a by-product of the economic activity.

"Social sustainability addresses poverty and human development" (Khalili, 2011, p. 7) and is reliant on healthy life-supporting systems. This conception of sustainability is concerned with equity between and within generations, and between and within ethnic and social groups, based on the fair distribution of natural resources. Cultural sustainability and political sustainability have been identified as two important subsets of social sustainability (Vallance, Perkins & Dixon, 2011). Culture can be expressed in a tangible way in the form of art or buildings etc. and it can also be expressed as language, traditions and customs (Throsby, 2001). The importance of cultural sustainability lies in an ability to

balance “imposed change with continuity and development from within” (Vallance et al., 2011, p. 343), so that cultural diversity can be protected, promoted and maintained for present and future generations (Throsby, 2008).

Human rights and democracy have been suggested as the basis for political sustainability (Vallance et al., 2011). Political and civil rights have been included as one of the five freedoms by economist Amartya Sen along with economic facilities, protective security, transparency guarantees and social opportunities (Dillard, Dujon & King, 2009). These five freedoms have been identified as essential for human well-being and impact on the ability of people to influence their world. It has been reported that people should have political and civil freedom to participate in governance at all levels, so as to be able to participate in decision making and “directly contribute to the development process” (Dillard et al., 2009, p. 25).

The concept of equity has been identified as an important and overarching conception of inter-generational sustainability and, when integrated with other concepts, produced a definition of sustainable development that is widely reported by commentators in the field:

> Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.
>
> (World Commission on Environment and Development (WCED), 1987, p.8)

The WCED definition is one of the most widely quoted definitions of sustainability. It is commonly used by educators (Birdsall, 2006) and is one which has been chosen to inform this research. The broadness of the definition

has provided an appropriate framework on which to build an approach to sustainability to reflect the interrelatedness of the social, economic and environmental conceptions within sustainability in an inter-generational setting (Birdsall, 2006; Khataybeh, Subbarini & Shurman, 2010). The publishing of the WCED definition introduced the idea of sustainable development into the sustainability discussion and added to the complexity of an already complex issue. This complexity is discussed next.

2.3 Sustainability and Sustainable Development – some differences

There are many definitions of sustainability and sustainable development in use and in 1996 a British political scientist recorded three hundred definitions for the terms (Bonevac, 2010; Jickling, 2000). Sustainability and sustainable development are seen by many people as synonymous and some commentators use the terms interchangeably (Aras & Crowther, 2009; Seghezzo, 2009; Walshe, 2008). Other commentators draw distinctions between the two terms and identify sustainable development as being the pathway towards sustainability (Craig, 2004; Fien, 1997; PCE, 2004).

Much debate has been recorded about the contradictory nature of the term sustainable development, as development could be considered to be responsible for much of the environmental degradation that has occurred (Chapman & Eames, 2007; Owens, 2003). But unlike some researchers who are interested in the debate surrounding the term sustainable development (Summers, Corney & Childs, 2004), I consider the terms sustainability and sustainable development together for this review. Walshe (2008) also considered the two concepts together as she found that sustainable development could give a context in which to investigate sustainability. This same thinking has also been adopted when reviewing the history of the development of the terms in the following section.

2.4 Sustainability and Sustainable Development – the history

Several commentators credit the popularity of the terms sustainability (Carew & Mitchell, 2002; Filho, 2000; Khalili, 2011; Mebratu, 1998) and sustainable development (Fien, 1997; Kagawa, 2007; Thompson, 2007) with the publication of *Our Common Future* in 1987 which contained the WCED definition quoted above. Many events and publications can be identified as being antecedents to the publication of this "seminal document" (Bell, 2009, p. 2) and some are identified below.

The environmental movement in the 1960's was instrumental in bringing the degradation of the environment to the forefront of public attention and several authors suggest that this followed the publishing of Rachel Carson's *Silent Spring* in 1962 (Breiting & Wickenberg, 2010; Gough, 2006; Morris, 2012).

The association between the social and economic systems can be traced back to the work of early philanthropists concerned with the welfare of workers in industrial England (Bellet-Travers, 2004) and their desire to separate the economic needs of one group from the social needs of another. During this time, *An Essay on the Principle of Population* (1798) and *The Principles of Political Economy* (1848) were published to address the issues of population growth as relating to increased food production and wealth (Onuki & Mino, 2011). Commentators have drawn attention to *The Tragedy of the Commons* by Hardin (1968) as making a valuable contribution to the discussion of sustainability (Onuki & Mino, 2011; Seghezzo, 2009; Vanderheiden, 2008), where the conflicts between shared resources and individuals' self-interest were explored. Meadows, Meadows, Randers and Behrens (1972) have also been identified as producing *Limits to Growth*, another work that was a prominent forerunner in the sustainability movement (Banon Gomis et al., 2011; Dobson, 2007; Floyd & Zubevich, 2010; Morris, 2012; Owens, 2003).

In 1972, the authors of *Limits to Growth* made predictions of population growth, industrial output, pollution, food production and resource depletion based on computer modelling and these predictions forecasted environmental collapse within one hundred years. Commentators noted that there was a growing realisation in developed nations about the dangers of industrialisation, multiple social problems and growing concerns for the preservation of the environment (Craig, 2004; Parkinson & Stears, 2008).

The many warnings and predictions of environmental, social and economic disasters were antecedents to the publication of the *World Conservation Strategy* by the International Union for Conservation of Nature and Natural Resources (IUCN) in 1980. This report was considered by some to have a traditional conservation approach (Agyeman & Angus, 2003), but Tilbury (1995) disagreed and suggested that the *World Conservation Strategy* introduced the term sustainable development by drawing the link between conservation and economic growth.

Fuller (2010) considered that by 1983 a 'turning point' had been reached "signalling to the world that we could no longer afford to behave as we had been doing for the previous 200 years" (p. 7). At the United Nations level, the Brundtland Commission commenced work in 1984. The Commission sought information worldwide, received 10 000 pages of written submissions, heard hundreds of organisations' and individuals' testimony at public hearings and appointed expert advisors to assist in key areas. The publication of *Our Common Future* was the culmination of three years' work and drew together all conceptions of sustainability. All countries were cautioned that they must manage the environment and maintain development to avoid disaster because:

> economics and ecology must be completely integrated in decision making and law making processes not just to protect the environment, but also to protect and promote development.

> Economy is not just about the production of wealth, and ecology is not just about the protection of nature; they are both equally relevant for improving the lot of humankind.
>
> (WCED, 1987, p. 32)

In the search of the literature concerning the conceptions of sustainability, many models have been presented by commentators describing and explaining the concept of sustainability. Some of the more commonly used models are presented below in a bid to further understand this complex concept and provide a background for the investigation of sustainability thinking.

2.5 Models of Sustainability – models for understanding

Models have been created to demonstrate how sustainability can be understood. Two dominant models are those of weak sustainability and strong sustainability and these can be understood using the concept of capital. Ekins (2011) asserted that the concept of capital had been derived from economics thinking "whereby capital stocks (assets) provide a flow of goods and services, which contribute to human well-being" (p. 632). Manufactured, natural, human and social capital are four types of capital that have been identified in the four-capitals model of sustainable development. Sustainability has been described by Medhurst and Ekins (2006) using this type of capital modelling in which there are interrelated forms of capital that are maintained in different ways. Weak sustainability allows for some substitution of capital in order that the total amount of capital is maintained. For example, some manufactured capital could be substituted for natural capital as long as human well-being was not affected. Strong sustainability allows for no substitution of capital in order for the total capital to be maintained (Medhurst & Ekins, 2006; Seghezzo, 2009; Strongman, 2009).

The three-legged stool and three pillars under a roof of sustainability are similar graphic models used to describe sustainability (Jickling, Sauve, Briere, Niblett & Root, 2009; Pope, Annandale & Morrison-Saunders, 2004). The three legs / pillars represent the three conceptions of sustainability (economy, society and environment) and this model shows that all three conceptions of sustainability are needed to ensure that sustainability is supported and maintained. This model demonstrates that one of three conceptions of sustainability does not have more significance than another but the interrelatedness of environment, society and economy for sustainability is not demonstrated in these models.

In graphic form, weak sustainability has also been represented by three interlocking circles of economy, society and environment (Chapman & Eames, 2007; Sustainable Aotearoa New Zealand Incorporated (SANZ), 2009).

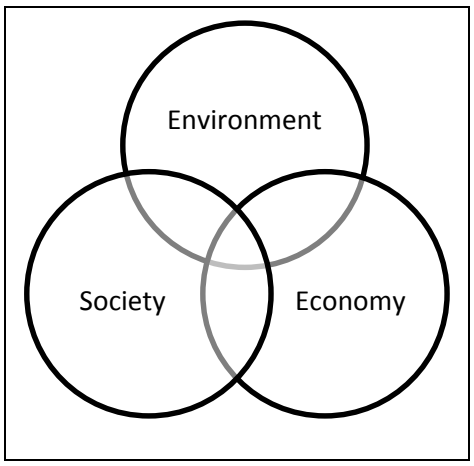


Figure 2.1. Weak sustainability

The three conceptions of sustainability are represented as distinct entities and only show a small degree of overlap or interrelatedness, whereas in reality, economy and society cannot exist outside of the environment. In this model it is presumed that sustainability can only exist at the intersection of the three conceptions. The triple bottom line model is another name for this model. People, place or planet,

and profit can be substituted for society, environment and economy respectively in this model (Craig, 2004).

The Mickey Mouse model of sustainability is another version of the triple bottom line model (SANZ, 2009). In this model, society and environment are the small ears of the much larger economic head of Mickey.

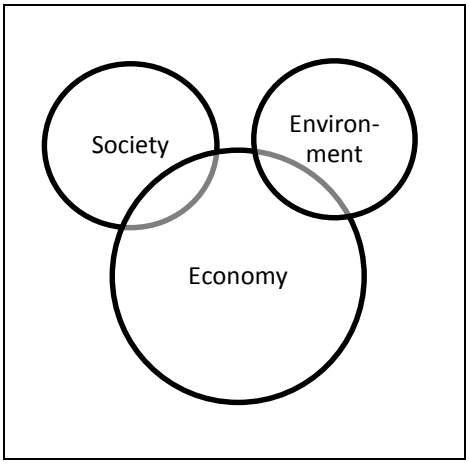


Figure 2.2. Mickey Mouse model

This model has been linked to some current global economic thinking where priority is given to the economy at the expense of social and environmental issues (SANZ, 2009). No intersection of the three conceptions is possible in this model and unsustainability is the ultimate result.

In contrast to these 'weak models', strong sustainability has been represented in graphic form by three concentric circles. Humans and all their activities are shown located within the environment and not separate from it, and the economy is located within society (Chapman & Eames, 2007; PCE, 2002; PCE, 2004; SANZ, 2009). This model shows the interrelatedness of all human activities and

demonstrates that human activity "must be constrained by the capacity of the biosphere" (SANZ, 2009, p. 10).

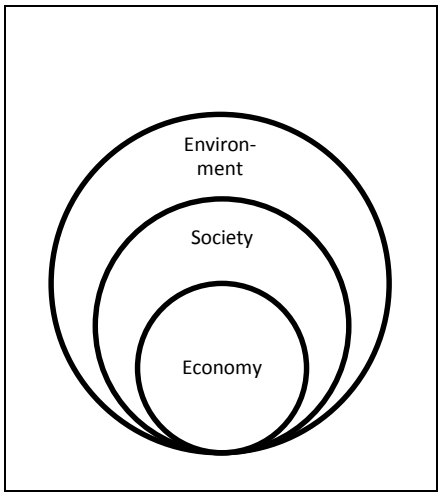


Figure 2.3. Strong sustainability

The graphic representations of different models of sustainability have been developed to aid the description and understanding of different ways of thinking in the sustainability discussion. Different groups can be identified with different models of sustainability and this may allow greater understanding of their thinking and actions, e.g. the PCE (2002) reported that the New Zealand Business Council for Sustainable Development has adopted a weak sustainability model for sustainable development.

Comparing and contrasting models can provide opportunities to find the similarities and differences in different perspectives within the debate. It is hoped that presentation of such models may help students to better express their understanding of sustainability when questioned about this complex concept. But care is needed when presenting models as they can be misinterpreted unless they are accompanied by clear and detailed descriptions about the nature of the relationships that they are representing, e.g. the strong sustainability model could be interpreted as economic decision making at the centre of the diagram being

more important than environmental considerations because of the position of environment on the periphery of the diagram (PCE, 2002).

2.6 Sustainability within Education

As this study focuses on secondary school students' understandings of sustainability, literature related to the development of sustainability within education has been reviewed. The development of sustainability education within the curriculum and within schools has revealed the progression that has taken place over the past forty years. It is important to follow this progression and be in a position to be able to relate this to secondary school students' understandings of sustainability.

Environmental Education (EE) started life as environmentalism and was developed from "grass-roots" support (Bolstad, Baker, Barker, & Keown, 2004, p. 29) during the 1970's. At this time, concern for the environment and an awareness of the impact of human activities on the environment led enthusiastic teachers to start EE in schools. Support for teachers often came from outside individuals and agencies who shared the same concerns. EE was given some structure when the *Tbilisi Declaration* provided a framework of principles and guidelines for educators in 1977. Although the word sustainability did not feature in this report, the idea of the interdependence of human behaviours and the environment was emphasised (Bolstad, 2003b). In 1991, *Caring for the Earth* was published by the United Nations (UN) to highlight sustainable lifestyles and called for "environmental education that would enable citizens to understand, appreciate and implement sustainable practices" (Tilbury, 1995, p. 198). The Earth Summit in Rio de Janeiro in 1992 saw *Agenda 21* redirect the goals of EE towards Education for Sustainable Development (ESD) and provide an umbrella for action related to ESD (Bolstad, 2003b). In 2002, Gough (2006) noted that the role of education was being used as a means to promote sustainable development at the UN World Summit on Sustainable Development meeting in Johannesburg. At this meeting, "education was recognised as critical for sustainable development

in its own right" (Littledyke et al., 2009, p. 2). The UN Decade of Education for Sustainable Development began in January 2005 with the aim of integrating sustainable development into education at all levels and promoting education as a basis for a more sustainable society (UNESCO, 2005). The UN signalled education as a vehicle for change and stated that ESD was not an option but a priority. The proclamation also stated "there was no universal model of education for sustainable development. There will be nuanced differences according to local contexts, priorities and approaches in how sustainability will be taken up" (British Columbia Ministry of Education (BC Ministry of Education), 2007, p. 7).

Sustainability education worldwide has been given direction from many international reports and meetings. It has broadened as policy turned towards issues such as poverty, economics, social development and sustainability (Bolstad et al., 2004). Comparisons between New Zealand, Australia and other countries have been drawn by Chapman (2004) to demonstrate that EE and the introduction of the concept of sustainability into schools has progressed on parallel paths from similar grass-roots beginnings.

2.6.1 Sustainability within New Zealand Education

The initial development of EE policy in many countries, including New Zealand, was influenced by *Agenda 21* (Eames & Cowie, 2004). *Learning to Care for Our Environment* was released by the Ministry for the Environment (MfE) in 1998 to clarify the development of EE. The MfE stated that "moving towards the goal of sustainability requires fundamental changes in human attitudes and behaviour. Progress in this direction is thus critically dependent on education and public awareness" (Ministry for the Environment, 1998, p. 2).

Development of EE in schools in New Zealand was given impetus when the *Guidelines for Environmental Education in New Zealand Schools* (the *Guidelines*) was released by the Ministry of Education in 1999 under pressure from supporters

of EE and the MfE (Eames et al., 2008). Chapman (2004) noted that these *Guidelines* originated from the *Tbilisi Declaration* but the five aims from the document appeared "as a neutralised form" (p. 25). The *Guidelines* indicated four key concepts within EE: interdependence, sustainability, biodiversity and action, and the interactions with Māori worldviews, but as Chapman (2011) noted, that while the concept of sustainability was evident, there was little guidance provided as to what it meant. Chapman (2011) noted that about six million dollars was allocated between 2000 and 2006 to help educators implement the *Guidelines* by providing an extensive programme of professional development and development of resources. The Secretary for Education, in 1999, was insistent that the *Guidelines* were to be used to assist teachers to identify opportunities to develop EE within the existing curriculum and not add to curriculum requirements of schools (Ministry of Education, 1999), but language later in the document promoted radical change:

> Environmental Education is a new focus for education. It is a way of helping individuals and societies to resolve fundamental issues relating to the current and future use of the world's resources. However, simply raising awareness of these issues is insufficient to bring about change. Environmental Education must strongly promote the need for personal initiatives and social participation to achieve sustainability.
>
> (Ministry of Education, 1999, p. 8)

Support for EE development in schools in New Zealand has come from many sectors and of note is the Enviroschools programme. The Enviroschools programme is run by a charitable trust that supports young people participating in sustainability programmes in partnership with government and non-government organisations (Enviroschools Foundation, 2011). In 2002, the Enviroschools programme was made available to all schools to support a whole-school approach to EE (Eames, Bolstad & Cowie, 2004).

After investigating characteristics of EE in New Zealand schools in 2002 and 2003, there was concern that there was an "apparent lack of understanding of what sustainability means, and the equally problematic notion that it means different things to different people" (Eames et al., 2008, p. 48). Developments in the past ten years have seen sustainability and the language of sustainability become more prevalent in curriculum documents and teaching programmes. Definitions of what sustainability means is a feature of some of these documents.

The PCE (2004, p. 37) stated that the "language of sustainability began to creep into the discourses of many educators in New Zealand" during the 1980's and 1990's when a greater emphasis was placed on the integration of environmental, social, cultural and economic concerns. Following this development, it was apparent that sustainability education had broadened from the earlier environmental education movement and education for sustainability (EfS) could now be considered as the contemporary extension of EE in New Zealand (Eames, Roberts, Cooper & Hipkins, 2010; PCE, 2004). It is from this position that the language of sustainability within curriculum documents is examined.

At policy level, the Statement of Intent 2008-2013 (Ministry of Education, 2008) signalled the importance of sustainable development in education by including it as one of the five themes in the Government goals but did not give a comprehensive definition of what sustainable development or sustainability is.

At curriculum level, the word sustainability is peppered through the *New Zealand Curriculum* released in 2007 and a basic idea given of what it means. The vision of young New Zealanders who are confident, connected and actively involved lifelong learners includes a view of 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" (Ministry of Education, 2007, p. 8).

The principles of the curriculum set out the foundations for curriculum decision making and inform schools how to formalise the curriculum in their planning. In the principles, attention is drawn to sustainability as an issue that students should be encouraged to explore because it is important and sustainability appears as one of the future focus themes: "sustainability – 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).

The values of the curriculum are part of the everyday curriculum of a school and should be encouraged, modelled and explored. Ecological sustainability is included in the list of values that students are encouraged to pursue. The key competencies are the capabilities that New Zealanders require "to live, learn, work, and contribute as active members of their communities" and the key competency of participating and contributing draws attention to "sustainability of social, cultural, physical and economic environments" (Ministry of Education, 2007, p. 13). In the learning areas of the curriculum, emphases on sustainability can be found in the areas of science, social science, technology and health (Eames et al., 2010; Ministry of Education, 2007).

Chapman and Eames (2007) stated that the *New Zealand Curriculum* gave great potential to sustainability education with the integrated nature of sustainability, and although the word sustainability appeared numerous times in the *New Zealand Curriculum*, EfS was still not mandated in the curriculum (Ministry of Education, 2007). New guidelines, aligned with the curriculum, were in the initial stages of development in 2007. They were to encompass the shift from EE to EfS and it was proposed, by the authors, that the new guidelines be given priority within education "along with numeracy and literacy in the National Educational and the Administrative Guidelines" (Chapman & Eames, 2007, p. 19). The rewriting of the guidelines did not occur but in a position paper backgrounding the new guidelines, the authors proposed a goal for sustainability

education that broadened the WCED definition to take into account all living things and not just human needs:

> To develop in individuals, groups, and society as a whole, new ways of thinking and patterns of behaviour that meets the needs of the present generation without compromising the ability of future generations of all living things to meet their needs.
>
> (Chapman & Eames, 2007, p. 13)

In recent years there has been progress in the area of assessment of EfS and the provision of resources for the study of EfS at the secondary school level. The development of National Certificate of Educational Achievement (NCEA) EfS Achievement Standards in 2008 and 2009 was seen as a major boost to delivery of EfS in secondary schools (Brignall-Theyer, Allen & Taylor, 2009). Hipkins (2007) noted that the cross-curricular EfS achievement standards were aligned with the curriculum and were an important innovation. The Level 2 and Level 3 standards provide students with a series of assessment opportunities relating to a sustainable future. In the explanatory notes, attached to the standards, information is provided to give students and educators an understanding of the New Zealand Qualifications Authority's (NZQA) view of sustainability:

> A sustainable future requires the development of ways of thinking and acting to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. Sustainability includes, but is not limited to:
>
> - maintenance of biodiversity, ecological processes and life support systems
> - an economy relative to its ecological life support system
> - a fair distribution of resources and opportunities
> - looking beyond direct consequences of activities to explore attitudes, values and moral issues that create particular views on the use of natural resources
> - personal and social responsibility
>
> (NZQA, 2008)

Te Kete Ipurangi (TKI), also known as The Online Learning Centre, is a web based initiative of the Ministry of Education which provides educational resources for teachers, school managers and the wider education community. The EfS TKI site is available to provide help for teachers to engage students in relevant sustainability learning and action by making connections between all areas of the *New Zealand Curriculum* (Ministry of Education, 2011). The central concepts of EfS identified on the TKI website include: sustainability, equity, interdependence and responsibility for action. Sustainability is defined as "individuals, groups, and society as a whole adopting ways of thinking and patterns of behaviour that will enable them to meet their needs and aspirations without compromising the ability of future generations to meet theirs" (Ministry of Education, 2011), a similar definition to that of Chapman and Eames (2007).

Supporting material available on the TKI website which contains the EfS Senior Secondary Curriculum Guide was developed in 2010 (Ministry of Education, 2011). The site states that different people have different views of sustainability and gives examples of three different perspectives: UN, Māori and business. It provides a comprehensive range of information and gives direction to other resources. This allows the reader to get a good understanding of the Ministry of Education's view of sustainability. Learning objectives are available for Levels 6, 7 and 8 of the *New Zealand Curriculum* with links to possible concept links, indicators, possible context elaborations and relevant achievement standards. There are descriptions of the four key concepts of EfS and directions that sustainability needs to be considered from four angles: environmental, social, cultural (including political) and economic, and provides definitions of each aspect of sustainability.

The WCED definition of sustainability is "the definition most commonly used by educators" (Birdsall, 2006, p. 261). Influence of this definition is quite evident in curriculum documents and supporting material made available to New Zealand teachers. In particular, it is evident that the TKI definitions of sustainability are

strongly influenced by the WCED definition. The New Zealand adaptation of the WCED definition of sustainability, in the EfS Senior Secondary Curriculum Guide, is the one that has been chosen to inform this study as it has been written for New Zealand secondary students who are the object of this study.

> Sustainability is about individuals, groups, and societies adopting ways of thinking and behaving that allow them to meet their needs and aspirations without preventing future generations from meeting theirs.
>
> (Ministry of Education, 2010, p. 6)

Sustainability within the New Zealand education sector has developed to include the integration of environmental, societal, cultural, political and economic conceptions with a future focus. It incorporates the importance of thinking and acting of individuals, groups, communities and society, with a focus on action and on the environmental conception. Sustainability is not mandated in the curriculum but it is promoted as a cross-curricular theme.

Kennelly, Taylor & Serow (2011) stated that New Zealand and Australian EfS policy statements produced by education ministries have been applauded by some commentators. Sustainability in New Zealand and Australia schools share many common features.

2.6.2 Sustainability within Australian Education

Sustainability education in Australia has developed in much the same fashion as in New Zealand. Australia, although much bigger in size and population compared to New Zealand, shares a similar heritage and similar culture. The Australian government produced national publications to inform educators about the proposed developments in sustainability education but most states were slow to implement ESD (Tilbury, 2006). With the development of a new national

curriculum, ESD has become one of the three cross-curricular priorities. Research has shown that teachers' understanding of sustainability has limited their ability to provide effective sustainability education (Littledyke et al., 2009) and provision of adequate resources has not always kept pace with the needs of teachers, although there is a movement to remedy this, as described below.

Tilbury (2004) identified a number of national developments starting in 2000 that helped inform policy and practice of ESD in Australia following international calls for action in this area. The Australian Government released *Educating for a Sustainable Future: A National Environmental Education Statement for Schools* nationally to all schools (Commonwealth of Australia, 2005). This document outlined the importance of educating for a sustainable future and provided a vision of what might be involved in the process (Littledyke et al., 2009; Tilbury, 2006). A report commissioned by the Australian Government in 2004 found that States had been slow to formalise ESD in curriculum policy and guideline documents and were slow in adopting the language of sustainability. Taylor, Nathan & Coll (2003) reported that a new curriculum introduced in 2001 by the New South Wales Government provided scope for the study of sustainability if it was implemented correctly. At that time ESD was not mandated in any state except New South Wales.

Prior to 2010 each state and territory in Australia had been responsible for their own curriculum. In 2008 after extensive consultation throughout the country, the *Melbourne Declaration* was released by the Education Ministers from all states and territories. This document was a forerunner to the development of a national curriculum. The *Melbourne Declaration* advocated education goals for young Australians and included a focus on environmental sustainability (Kennelly et al., 2011). It stated that sustainability should be integrated across the curriculum, and curriculum documents written so as to provide consistency across the country. In 2010, the Australian Curriculum, Assessment and Reporting Authority (ACARA) published the first iteration of the national curriculum. Sustainability

was listed as one of three cross-curriculum priorities (ACARA, 2010) and the description of sustainability was as follows:

- sustainability, to allow young people to develop an appreciation of the need for more sustainable patterns of living, and to build capacities for thinking, valuing and acting necessary to create a more sustainable future. (ACARA, 2010, p. 20).

The sustainability priority is future focussed and considers the interdependence of environmental, social, cultural and economic systems. Emphasis is given to informed action that will enable individuals and communities to engage with their world. A set of organising ideas reflects the essential knowledge, skills and understandings students are required to have for sustainability education in the areas of systems, worldviews and futures.

Current curriculum documents carry a system of tags to signal the cross-curriculum priority of sustainability in all learning areas. Searches of tags by Kennelly et al. (2011) found that most items tagged could be useful for the teaching of sustainability but there was "no explicit mention of sustainability" (p. 210), and information provided teachers with very little assistance on how to incorporate sustainability into their teaching programmes.

In 2003, a pilot for the establishment of the Australian Sustainable Schools Initiative (AuSSI) was started. This initiative was formed to support schools and their communities to become sustainable (Littledyke et al., 2009). AuSSI encourages participant schools to engage in a whole-school approach to make improvements on the journey towards sustainability. The AuSSI website has resources for schools and other organisations to assist them in this journey (Department of the Environment, 2011).

As evidenced in New Zealand, sustainability within the Australian education sector has developed to include the integration of environmental, societal, cultural, political and economic aspects with a future focus. The importance of thinking and acting by individuals and groups is also emphasised. Sustainability is mandated as a cross-curricular theme in the Australian curriculum.

Research in New Zealand and Australia has shown that EfS is not taught effectively, with one reason given being that the concept of sustainability was poorly understood by teachers (Littledyke et al., 2009). Chapman and Eames (2007) stated that definitions provide guidance, although definitions alone could not guarantee results. Lack of knowledge and resources were often listed amongst the barriers to EfS that teachers faced (Cowie & Eames, 2004). The publication of *Education for Sustainability in the Primary Curriculum: A guide for teachers* was an attempt to overcome barriers to EfS (Ryan, 2009; Sobel, 2010). Its aim is to apply EfS principles to the primary curriculum and overcome the problem of "poor conceptual development of environmental and sustainability issues associated with social, cultural, economic and political dimensions" (Ryan, 2009, p. 143). The teaching guidance given in the book is in line with the concepts of sustainability promoted in New Zealand and Australia education circles. It identifies, for teachers, the three pillars of sustainability; social, environmental and economic, and shows the complex interactions that exist between these. Among the many resources, the book also gives a "planning framework from questions to learning" (Littledyke et al., 2009, p. 54) expanding the coverage to include economic, political, societal, cultural and environmental perspectives of EfS to help teachers include sustainability in their teaching programmes.

As was evidenced in this section, the progress of sustainability education has followed a similar path in New Zealand and Australia. A similar situation can be seen in British Columbia, Canada. British Columbia has a similar sized population to New Zealand and has many social and cultural similarities because of ties to Britain, their indigenous peoples and recent immigration trends

(Province of British Columbia, 2013). There are comparable features of geography in both places and both peoples share aspects of an outdoor lifestyle which reflects their connection with the environment (The Canadian Encyclopedia, 2014).

2.6.3 Sustainability within British Columbia Education

The response to *Agenda 21* initiated the development of sustainability education in British Columbia with the production of publications to inform educators about the developments occurring in this field (Courtney-Hall & Lott, 1999). Resources have not always been able to meet all the demands of teachers wanting to implement sustainability education in an effective way but as in Australia and New Zealand there have been moves to remedy this (BC Ministry of Education, 2009; British Columbia Working Group (BCWG), 2009).

A national action plan for environmental education was developed in Canada for all provinces and territories in response to *Agenda 21* (Courtenay-Hall & Lott, 1999). In 1995, the British Columbia Ministry of Education produced an unsuccessful guidebook for teachers called *Environmental Concepts in the Classroom* to promote and facilitate EE in schools. This document was produced in response to the federal Ministry of the Environment's series of meetings at local, provincial and national levels (Bell, 2009). Stevenson (2007) noted that the language in the book was a problem for teachers because of the complexity of the concepts involved. Courtenay-Hall and Lott (1999) agreed that the document produced was of little use to teachers wanting guidance to integrate EE into their curriculum. The concept of sustainability in this document was "seen to explore the relationships between social, economic and environmental factors for the well-being of the human species" (BC Ministry of Education, 2007).

Environmental Learning and Experience: An interdisciplinary guide for teachers was published in 2007 to build on the earlier BC Ministry of Education document

from 1995 and provided educators with a number of alternatives in which to develop environmentally focused lessons (BC Ministry of Education, 2007). The underlying values of ESD were seen to include the following:

- respect for the dignity and human rights of all people throughout the world and a commitment to social and economic justice for all;
- respect for the human rights of future generations and a commitment to inter-generational responsibility
- respect and care for the greater community of life and all its diversity, which involves protection and restoration of the Earth's ecosystems; and
- respect for cultural diversity and a commitment to build a culture of tolerance, non-violence and peace, both locally and globally.

(BC Ministry of Education, 2007, p. 7)

A national non-profit organisation called Learning for a Sustainable Future (LSF) was founded in 1991 to facilitate ESD (LSF, 2014). The purpose of LSF was to advance sustainability policy within education and outside the education sector by supporting educators and community organisations throughout Canada (Bell, 2009). The LSF website has resources for teachers and students to aid them in their study of sustainability. Links to research are available, as is information from the sustainability curriculum review initiative. In 2005, the Canadian Sustainability Curriculum Review Initiative commenced to review policy, produce resources and carry out research into developments. The Ministry of Education developed a Sustainability Education Framework in 2008 that encouraged environmentally sustainable practices at schools and learning opportunities for students to do this.

Provinces set up working groups, often in collaboration with other partners, to facilitate ESD programmes and initiatives. The British Columbia Working Group

(BCWG) has been set up in partnership with the BC Ministry of Education and British Columbia Hydro to develop guidebooks for teachers to assist them to integrate environmental concepts into their classrooms. *Why Sustainability Education?* (2007) and *How Sustainability Education?* (2009) have been produced by BCWG to promote and support education initiatives in this area (BCWG, 2009). The concept of sustainability has been defined by the BCWG as "the reconciliation of social justice, ecological integrity and the well-being of all living systems on the planet" (BCWG, 2009, p. 7). As a goal, sustainability is a means to create an ecologically and socially just world without compromising future generations. One of the ten principles of sustainability explores the language of sustainability:

> The language of sustainability education must be simple and transferable. The term 'sustainability' is difficult to define and has been mobilized for many, often conflicting, purposes. While we confine refining our understanding, educators need to ensure the core values of right livelihood, ecological integrity and social justice are embodied in the language of sustainability.
>
> (BCWG, 2007, p. 6)

Green Schools is a whole-school initiative that has been established in British Columbia to provide schools with support to enhance environmental sustainability. Programmes have been set up to support teachers and students, develop school communities and enhance school infrastructure and transportation systems (BC Ministry of Education, 2011). While the BC Ministry of Education recognises that sustainability concepts and learning outcomes may be found in curriculum documents, only *Sustainable Resources 11 and 12* have sustainability as a major organiser. Following the units of work there are definitions for sustainability and sustainable development given in this document:

> Sustainability – Sustainability is based on the efficient and environmentally responsible use of natural, human, and economic

> resources, the creation of efficient infrastructures, and the enhancement of quality of life.
>
> Sustainable Development – Development that meets the needs of the present without compromising the ability of future generations to meet their needs.
>
> (BC Ministry of Education, 2010, p. 12)

Sustainability within the British Columbia education sector has developed to include the integration of environmental, societal, cultural, political and economic aspects with a future focus, as in New Zealand and Australia. All countries surveyed put extra emphasis on the environmental aspect of sustainability. The focus on action seen in New Zealand and Australia is not found in the curriculum documents of British Columbia. In Australia and New Zealand emphasis is placed on individuals and groups, but this is not evident in statements from British Columbia, although it is implied. Sustainability is mandated in Australian education but is only encouraged in New Zealand and British Columbia, although its importance is evident.

As seen in New Zealand and Australia, the influence of the WCED definition is evident in curriculum documents of British Columbia, and in supporting material made available to teachers. But without sufficient support it is not possible for teachers to translate these complex ideas to their students and carry out effective sustainability education.

2.7 From Policy to Practice

Policies internationally and specifically within New Zealand, Australia and British Columbia education have been shaped by the response to international meetings and conferences at the United Nations level and in particular in response to

Agenda 21. Curriculum documents prepared by ministries have indicated to educators the importance of sustainability. In all three places guidelines have been produced to assist teachers in their teaching.

Eames et al., (2008) stated that both guidance and support are necessary for schools to provide successful sustainability programmes. Teachers must be able to translate complex ideas about sustainability and present these in a context, and then transform them into practice. To do this, most teachers require assistance and Stevenson (2007) believed that those that needed help had been let down by policy makers and curriculum writers who have been more concerned with developments at curriculum level and not at the level of practice. An example of this occurred in Canada where the first set of guidelines written in 1995 were not well received by teachers because of the complexity of the language used (Courtney & Lott, 1999) but it took twelve years to produce another version (BC Ministry of Education, 2007).

If teachers lack knowledge of issues then they are restricted in their practice and they are uncertain how their teaching might contribute to the issue. Guidelines are necessary to provide direction and resources are needed so that teachers are able to engage students in in-depth inquiries and provide them with meaningful challenges (Stevenson, 2007). *Guidelines* were available in New Zealand in 1999, but in 2004 it was reported only half of respondents in a survey were familiar with them (Cowie & Eames, 2004). Moves to update the *Guidelines* were underway in 2007 (Chapman & Eames, 2007) but despite strong support for this to occur the *Guidelines* have yet to be updated (Eames & Barker, 2011). Birdsall (2010) reported that in Australia 42.3% of primary teacher respondents to a survey rated their knowledge of environmental education theories and pedagogy as low or very low and most were not familiar with relevant guidelines.

Teachers do have concerns about their knowledge and skills (Cowie & Eames, 2004) and this lack of knowledge affects their capacity to develop the knowledge and skills of their students. Researchers have reported that "teacher knowledge of the concepts underpinning teaching for sustainability is not well developed" (Kennelly, Taylor & Jenkins, 2008, p. 62) and teachers' understanding of sustainability affects what and how they teach in their classrooms (Walshe, 2008).

The understanding of sustainability developed by students at school is of great importance and "could be crucial in determining their life-long understanding of the concept" (Walshe, 2008, p. 539). Researchers in the field suggest that targeting students' conceptions would enable programmes to be developed that would help students broaden their understanding and would have implications for how teachers approach teaching the concept of sustainability (Loughland, Reid & Petocz, 2002; Rickinson, 2001; Walker & Loughland, 2003).

2.8 The Importance of Education for Sustainability

The Ministry of Education has indicated that sustainability is an important part of education in New Zealand by its presence in the *New Zealand Curriculum*. Sustainability is a theme that runs through the *New Zealand Curriculum* (Ministry of Education, 2007) and appears in the vision, principles, values and in several learning areas in the document.

Although not mandated in the curriculum, the importance of sustainability has been included in the Ministry of Education's Statement of Intent 2008 – 2013 (Ministry of Education, 2008). This statement sets out key elements of how the ministry will facilitate government goals and priorities for education in that five year period. Excerpts from this document demonstrate a commitment to sustainability education:

> Sustainable Development – developing long-term sustainable strategies for our economy, society, environment, culture and way of life.
>
> Education helps New Zealanders to develop the skills and knowledge to balance the pressures of social and economic progress on the environment and natural resources.
>
> New Zealand's future is dependent on long-term sustainable strategies for our economy, society, environment, culture and way of life.
>
> (Ministry of Education, 2008)

Three government departments, the Ministry for the Environment, Ministry of Education and Ministry for Local Government, have all signalled the importance of sustainability and the role of education by being "proactive in this area" (Law, 2004, p. 92). Regional and district councils have also been proactive in their commitment to sustainability education, e.g. support of the Enviroschools programme, provision of resources, employment of environmental education officers, co-ordination and promotion of activities (Auckland Council, 2013; Northland Regional Council, 2013).

Education for sustainability has been promoted at the international level. In the foreword of *Our Common Future,* the Chairman reiterated the importance of sustainability and how it relates to youth and their education. She was of the opinion that a shift towards sustainability was the only way to ensure an acceptable life for future generations, and education was seen as the means to enable this to occur.

> But first and foremost our message is directed towards people, whose well-being is the ultimate goal of all environment and development policies. In particular, the Commission is addressing the young. The world's teachers will have a crucial role to play in bringing this report to them. If we do not succeed in putting our message of urgency through to today's parents and decision makers, we risk undermining our children's

> fundamental right to a healthy, life-enhancing environment. Unless we are able to translate our words into a language that can reach the minds and hearts of people young and old, we shall not be able to undertake the extensive social changes needed to correct the course of development.
>
> (WCED, 1987, p. ix)

We are nearing the end of the United Nations' Decade of Education for Sustainable Development (2005 – 2014) where the integration of sustainability education was called for at all levels to provide a basis for a more sustainable society (United Nations Educational, Scientific and Cultural Organisation, 2005). The effort that has been put into the promotion of sustainability education at the international, national and local levels signifies the importance of the concept and why it appears in our curriculum. As noted earlier, evidence has suggested that teachers have poor conceptions of sustainability. What then of the conceptions that their students hold? Little is known of this in New Zealand, so research into secondary school students' conceptions of sustainability is important to discover if their understandings are in line with what is currently promoted nationally and internationally.

To broaden students' understanding of sustainability, it has been suggested that teachers include developing their students' conceptions of what sustainability is. The next section of this review investigates what is currently known about students' conceptions of sustainability.

2.9 Student conceptions of sustainability

2.9.1 What are conceptions?

Much research has been conducted into investigating what it means to understand ideas or concepts. "A concept can be expressed as a single word, such as democracy" (Ministry of Education, 2009, p. 5) or as a phrase. Concepts may be abstract or concrete in their nature. An abstract concept would be representing

something that is intangible and a concrete concept would be representing something that is tangible. For example, abstract concepts such as freedom and equality would be associated with the concrete concepts of rules and laws to describe democracy. Tynjala (1999) and Carey (2000) suggest that conceptions are complex mental structures that explain the understanding of an idea or ideas and "are much more important than just knowing facts" (Milligan and Wood, 2010, p. 488). Conceptions can be described as the generalisations that are developed about the nature of a concept and are sometimes referred to as "big ideas" (Ministry of Education, 2009, p. 6). Milne, Kirch, Basu, Leou and Fraser-Abder (2008) describe one view of conceptions as "internally-held learned cultural representations of reality" (p. 421). It has been suggested that a conception is controlled by the person holding the conception and it may or may not be easy to change. Milne et al. (2008) suggest that this is a widely held view of how students form conceptions.

A range of conceptions, also called conceptual understandings, can be associated with one idea (Duit, 1993; Larsson & Hallden, 2009; Ministry of Education, 2009). Conceptions described as content, initial, naïve or primitive conceptions refer to understandings that are quite simple in nature, e.g. the Earth is "a flat rectangle or a flat disk" (Larsson & Hallden, 2009, p. 6). More complex conceptions have been described as inclusive, developed or expert conceptions, e.g. the Earth is "a cosmic body up in space without human beings" (Larsson & Hallden, 2009, p. 20). So, a simple conception could be described as having one dimension, whereas a more complex conception has many dimensions.

Students sometimes construct conceptions that do not conform to the accepted view. Carey (2000) suggests that these alternative conceptions (originally referred to as misconceptions) are inevitable because not all students have access to the same experiences and not all students will use the same experiences to develop similar conceptions (Meadows, 1993; Siegler & Alibali, 2005). Originally these alternative conceptions, usually found before formal instruction has commenced, were considered wrong or false. An alternative view considered

these conceptions to be valuable conceptions which needed to be changed, not necessarily erased and replaced, before students were able to understand the accepted conception (Duit, 1993). Lane (2008) draws the important distinction between alternative conceptions which arise from prior learning and everyday experiences, and conceptions based on inadequate or incorrect background knowledge. This distinction is important to educators who wish to change conceptions through instruction.

2.9.2 Changing Conceptions

Larsson and Hallden (2009) have described several models of conceptual change. The linear model of conceptual change occurs when one conception is replaced with another. But results from their research showed that students developed their understanding by restructuring their knowledge and not replacing one conception with another. So to develop new conceptions, students needed to build connections with other ideas or conceptions that they already held (Linnenbrink-Garcia, Pugh, Koskey & Stewart, 2012; Ministry of Education, 2009; Reinfried, Aeschbacher & Rottermann, 2012).

Linnenbrink-Garcia et al. (2012) undertook research to investigate how motivation, in the form of self-efficacy and individual interest, impacted on conceptual change. Prior to their study, research suggested that students with high self-efficacy would change conceptions because they were confident in their own abilities and persisted at tasks longer in the face of challenges. But, some students were resistant to changing their prior conceptions because of a high self-belief in their own understandings (Linnebrink-Garcia et al., 2012). A positive link between individual interest and conceptual change was found to exist in most students involved in studies of college and adolescent students. But, a small number showed no conceptual change which led researchers to believe that individual interest may be necessary for change but interest alone is not sufficient. To be able to facilitate student conceptual change, it is necessary to investigate how conceptions are formed.

2.9.3 How are conceptions formed?

People understand in different ways, and there are several theories to explain how this occurs. Meadows (1993) stated that Piagetian theory suggests individuals are always trying to make sense of the world around them and they construct understanding through experiences. New knowledge is attached to pre-existing structures of knowledge and understanding occurs in distinct stages of development (Meadows, 1993). Two Piagetian processes have been described and signalled as important in this development process: assimilation and accommodation. Assimilation occurs when people transform new information to fit their existing ways of thinking. This occurs when the new information is similar to what is already known and they can "add it to their schema" (Ministry of Education, 2009, p. 8). Accommodation occurs when people adapt their thinking to make sense of new information. This occurs when new ideas are different to what is already known and they alter their schema. Figure 2.4 shows the interaction of assimilation and accommodation. This interplay of these two processes occurs when individuals are constructing understandings (Duit & Treagust, 2003; Meadows, 1993; Ministry of Education, 2009; Siegler & Alibali, 2005; Tynjala, 1999) and "every new experience has the potential to help learners develop new knowledge that they can use to make sense of the world" (Ministry of Education, 2009, p. 8).

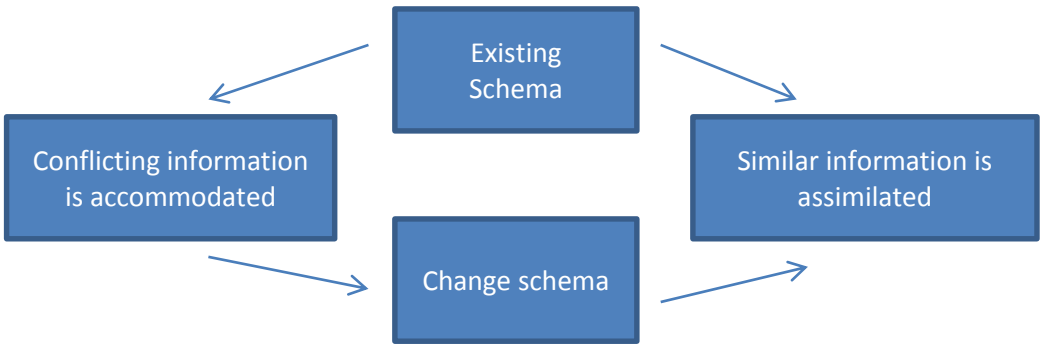


Figure 2.4. Changing schema by accommodation and assimilation

Prototype learning theory states that people identify a typical example of a concept as a prototype, by identifying characteristics and features of the concept (Ministry of Education, 2009). Any new information received related to the

concept is compared to the prototype and classified as an example or non-example of the concept. Prototypes become more complex as the learner is exposed to more and more new information.

A social learning environment has been claimed to be important because learning occurs through social interaction, a view ascribed to Vygotsky (Duit & Treagust, 2003; Novak, 2002; Reiss & Tunnicliffe, 1999). Therefore, understandings are created through the interactions and dialogue with others. This differs from Piaget's approach to understanding, which emphasised the individual's role more. Vygotsky's view was that construction of knowledge takes place in a zone of proximal development (Vygotsky, 1978), see Figure 2.5. This zone covers a developmental range which denotes the difference between a student's actual developmental level, and the level of the student's potential which can be attained with some assistance. Novak (2002) has suggested that effective group learning may occur because students have zones of proximal development that are similar.

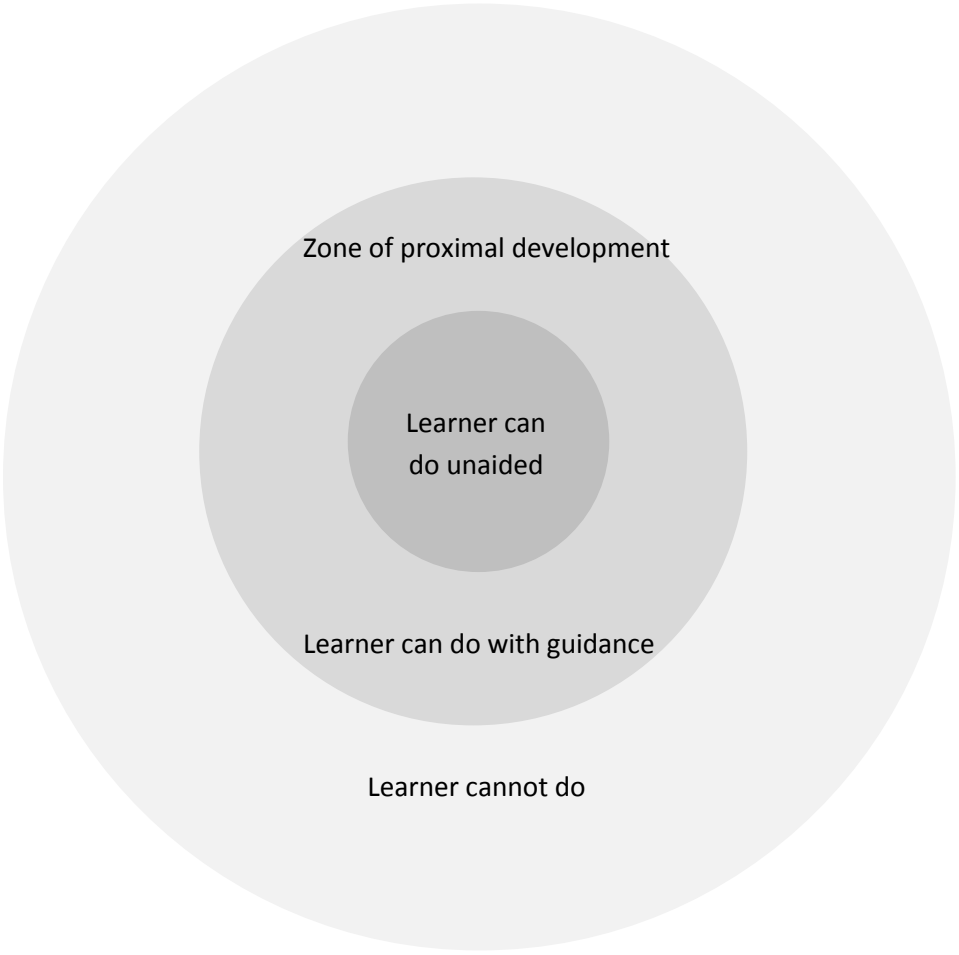


Figure 2.5. Construction of knowledge zones

The constructivist learning theory was developed by merging several approaches. This theory places emphasis on students' experiences and social connections when knowledge is constructed (Duit, 1993; Duit & Treagust, 2003; Gilbert & Watts, 1983; Larsson & Hallden, 2009). An underlying principle of the theory is that concepts are grouped together in levels of understanding and the more that is known about a subject, the more comprehensive the conception is (Buntting, 2006). By starting with what students know and using this information to provide the learner with opportunities to build on this knowledge, the teacher can help the student construct accepted conceptions. "Research in New Zealand by Nuthall and Alton-Lee (1993) suggests that students need to be exposed to a new concept on three to five occasions over no more than two days to develop strong understandings about the concept" (Ministry of Education, 2009, p. 9).

Accepted conceptions of sustainability have been identified in the literature, and for New Zealand secondary schools accepted conceptions of sustainability have been drawn from this literature and guidelines provided to teachers by the Ministry of Education. These are discussed below.

2.9.4 Key Concepts of Sustainability in Education

The Ministry of Education (2010) states that "key concepts are the ideas and understandings that we hope will remain with our students long after they have left school" (p. 7). The key concepts of sustainability have been identified from the literature and by the United Nations in *Our Common Future*. They are referred to within the four aspects of sustainability in the EfS Senior Secondary Curriculum Guide that support teaching Achievement Standards and signalled by the Ministry of Education as the concepts that secondary school students should be exposed to.

1. "Environmental sustainability is about maintaining the integrity of life support systems. This aspect incorporates the important notions of biodiversity

and ecosystem services. Environmental sustainability is fundamental to a sustainable future." (Ministry of Education, 2010, p. 8).

Environmental sustainability is central to a sustainable future because it involves caring for all forms of life and protecting their habitats so that all ecosystems will be able to exist together into the future. The maintenance of ecosystems, and all the features needed for them to function, is necessary for the continued existence of all the different forms of life.

2. "Social sustainability is 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 a fair distribution of natural resources." (Ministry of Education, 2010, p. 8).

Social sustainability is concerned with considering all people equal whether they are of different ages, from different cultures or from different social groups. Therefore, all people should have the same rights to be able to live and grow in a caring community within a healthy environment.

3. "Cultural sustainability refers to the nourishment and sharing of attitudes and values that represent ways of viewing the world. Cultural sustainability is inclusive of political sustainability, which is about all citizens having the opportunity to express their views freely and participate in decision making." (Ministry of Education, 2010, p. 8).

Cultural sustainability encompasses valuing all ways of living. Therefore, all groups should show respect for cultures that are different from their own, and have the opportunity to share their values and participate in decision making about their own environment. Although Māori culture is not specifically stated in this section it is implicit that the Māori worldview would be central in teaching and learning programmes in New Zealand.

4. "Economic sustainability means 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."

(Ministry of Education, 2010, p. 8).

Economic sustainability is defined in terms of resource management. Resources should be used responsibly in the present so that there are still resources for use in the future.

The strong sustainability model of concentric circles, presented after the four aspects of sustainability, shows that all other aspects of sustainability are occurring within the environment (Ministry of Education, 2010). This model highlights the importance of the environment and the importance of the interdependence that exists between all aspects of sustainability. A four capital model is also presented as an aid to understanding the concept of sustainability. It is stated that natural, human, social and built (manufactured and financial) capital need to be maintained for societies to function (Ministry of Education, 2010).

2.9.5 Students' conceptions of sustainability

Studies carried out investigating students' conceptions of sustainability have revealed that the complex nature of sustainability is reflected in a range of students' understandings of the concept. Research has demonstrated that this range of conceptions can be found in students of all ages and experience.

Post-graduate student teachers' conceptions of sustainable development were analysed by Summers et al. (2004) and seven strands identified. These seven strands were: purpose, nature, human focus, timescale, geographical scale, controversy and aesthetics. The seven strands were further divided into categories for analysis, e.g. the nature of sustainable development was divided into three categories: environmental, social and economic. In total, 21 sub-

categories were identified and used to code elements in the responses. Students of science and geography majors were compared and responses demonstrated that most students did not possess complex developed conceptions of sustainable development.

Table 2.1

Individual responses mentioning environmental, social and economic categories

Number of inter-related categories of sustainability	Category of sustainability mentioned	Frequency of mentions of category of sustainability by geography students	Frequency of mentions of category of sustainability by geography students	Total frequency of mentions of category of sustainability by students
1	Environmental	4	9	13
1	Economic	0	0	0
1	Social	0	1	1
2	Environmental Economic	1	15	16
2	Environmental Social	0	2	2
2	Social Economic	2	2	4
3	Environmental Economic Social	11	11	22

(Adapted from Summers et al., 2004, p. 174)

Research into conceptions of sustainability among undergraduate university students, beginning a technology and enterprise education course, found they possessed seven alternative concepts of sustainability (Brady, 2006). The seven categories were: durability (usually economics), maintaining something (often not specified), management of resources, impact of human behaviour, effective use of resources, living in a balanced way, and effect on the environment. Responses were analysed to determine the object of sustainability that students were identifying. The environment, economic factors, and social or cultural issues were identified in this analysis. Most students identified one object of

sustainability, usually the environment (70%), 40% of students identified economy as significant, and 20% identified social or cultural issues as important (Brady, 2006). A small minority of students (10%) included all three objects of sustainability in their responses and demonstrated a well-developed understanding of sustainability and "a sophisticated balancing of the need for social, economic and environmental sustainability" (Brady, 2006, p. 182).

Birdsall (2006) identified two concepts within the complex definition of sustainability from *Our Common Future* when conducting her investigation into assessing students' conceptual understanding of sustainability before and after an environmental education programme. The environmental conception of sustainability and the inter-generational aspect were chosen by Birdsall due to the age of students involved (11 and 12 years). She developed a tool to analyse student responses which had four categories of understanding: no idea, environmental, future/choices and complex ideas. A sustainability analysis tool developed by Birdsall (2006) was used to analyse students' understandings.

Table 2.2

Birdsall's sustainability tool

Idea	Student response
No Idea	Response has no relation to sustainability or caring for the environment
Environmental Ideas	Response contains ideas about caring for the environment
Future/Choice Ideas	Response includes idea of past decisions affecting future or idea of not limiting choices for future generations
Complex Ideas	Response includes idea of present decisions affecting future generations plus an environmental example

(Adapted from Birdsall, 2006, p. 26)

From this analysis tool Birdsall (2010) compiled three categories of student understanding: unrelated ideas, simple understandings and complex understandings. Most students identified only one of the two ideas or concepts of sustainability. These responses were related to either the environmental or the social ideas conception and Birdsall (2010) categorised these responses as being simple understandings of sustainability. Only a minority of students were able to integrate two concepts and their responses were placed in the category of complex understandings (Birdsall, 2010).

Walshe (2007) identified seven key strands when examining Year 8 students' conceptions of sustainability. These seven strands had previously been identified by Summers et al. (2004) and were divided into subcategories by Walshe (2007) following analysis of the students' concept diagrams.

Nature	-	environmental, social, economic
Purpose	-	preservation, balance, conservation, improvement, s self-sufficiency
Human focus	-	human population
Geographical scale	-	geographical scale
Timescale	-	future, seasonality
Controversy	-	conflicting ideas
Aesthetics	-	aesthetics

The nature of sustainability was the most common concept to be identified by the students, with the environmental nature of sustainability the most commonly mentioned subcategory (Walshe, 2007). The majority of the Year 8 students possessed conceptions of sustainability related to the nature of sustainability, e.g. environmental, social or economic. Analysis showed that many students lacked

understanding of the interrelatedness of these three concepts needed to develop the more complex conceptions, although these three ideas were often linked with the purpose of and timescale of sustainability. Walshe (2007) has suggested a model to illustrate the understanding of sustainability of her students.

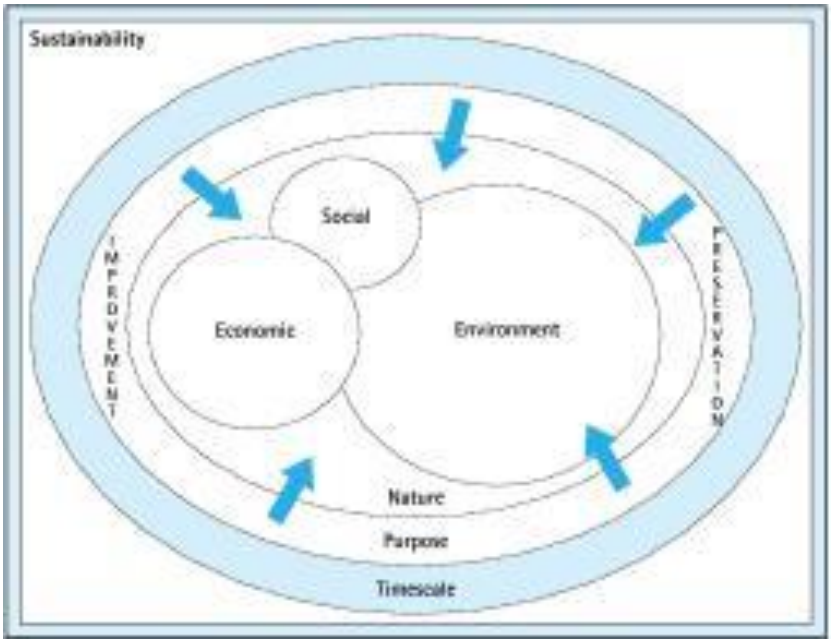


Figure 2.6. Walshe's students' understanding of sustainability. From Year 8 student's conceptions of sustainability. Retrieved from http://www.geography.org.uk/journals/journals.asp?journalid=3 Copyright 2007 by N. Walshe. Reprinted with permission.

From recent research that has been reviewed, it is apparent that if students possess a conception of sustainability it is likely to be only a simple, one dimensional conception of sustainability. These conceptions are either one of the key conceptions of sustainability or are related to a key conception. A minority of students possess complex conceptions of sustainability. These more complex conceptions are formed from the interrelationship of key conceptions of sustainability or parts thereof. When all the key conceptions are brought together, a complex multi-dimensional conception of sustainability is developed and this is the conception that is currently being promoted internationally, nationally and locally.

2.10 Theoretical Framework

In this study, I have been informed by constructivist ways of learning, as developed by scholars such as Piaget (Meadows, 1993). He suggested that the learner is an active participant in the construction of knowledge and this occurs through the interplay of new experiences with prior knowledge. Social constructivists, such as Vygotsky, place emphasis on the social setting of learning and suggest that the construction of knowledge occurs with others (Duit & Treagust, 2003; Novak, 2002; Reiss & Tunnicliffe, 1999).

A set of theoretical principles have been drawn from the literature to inform the construction of survey instruments in the development of this research.

1. Sustainability comprises environmental, economic, cultural, social, political and inter-generational conceptions, and these are interdependent.

2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.

3. Environmental sustainability is underpinned by interdependence, biodiversity and the maintenance of ecological life-supporting systems.

4. Social sustainability is underpinned by equity and social justice.

5. Political sustainability is underpinned by democracy.

6. Cultural sustainability is underpinned by the protection of cultural diversity.

7. Economic sustainability is underpinned by management of finite resources.

8. Inter-generational sustainability is underpinned by a vision for future generations.

9. Constructivism acknowledges the importance of prior learning.

10. Social constructivism acknowledges the importance of social learning.

11. Knowledge is necessary for informed decision making.

12. Knowledge and values are identified as necessary for taking action.

These 12 principles were used in studying secondary school students to investigate their conceptions of sustainability.

2.11 Summary

Sustainability is a complex term that comprises many different conceptions: environmental, economic, cultural, social, political and inter-generational. The emphasis that is placed on the different conceptions of sustainability by different individuals and groups goes some way to explaining the many different interpretations of the word that exist. The history of the development of the term and the emergence of its popularity can be linked to the degradation of the natural world and predictions of environmental, social and economic disasters. Many authors and organisations have been involved in the evolution of the term and much discussion has occurred over many years about the term.

The most widely reported definition, the WCED definition, comes from The Brundtland Commission which sought to provide a broad approach to sustainability. This definition is the one that has been most commonly used by educators. The WCED is also the one that has been used to inform curriculum and supporting documents in New Zealand, Australia and British Columbia schools. The New Zealand adaptation of the WCED definition of sustainability has been chosen to inform this study as it has been written for New Zealand students, who are the subject of this study.

Promotion of sustainability education at international, national and local level signifies the importance attached to sustainability. It is evident that the complex idea of sustainability, although encouraged in New Zealand and British Columbia

schools and mandated in Australia schools, is not able to be fully embraced in some schools because of the lack of teacher understanding of the concept. There appears to be insufficient support for teachers to enable them to translate the complex ideas about sustainability to their students. The suggestion has been made that targeting students' conceptions of sustainability will broaden their understanding of the concept.

The work of Piaget and Vygotsky and constructivist learning theory has been drawn upon to understand the development of conceptions. Conceptions have been described as being simple and having one dimension, or described as complex and having several dimensions. Development of complex conceptions is dependent on exposure to complex knowledge. The concept of sustainability is complex in nature and students' understandings of this concept can range from a simple, one dimensional conception to the more complex with several dimensions. A complex multi-dimensional conception of sustainability would prepare students most appropriately for their future. If teachers are aware of their students' conceptions of sustainability, then it may be possible for them to provide assistance to move students' understandings towards the concept of sustainability that will benefit their future.

The next chapter details how a study of secondary students' conceptions of sustainability was conducted.

Chapter 3 Methodology

3.1 Introduction

In Chapter 3, the methodology used for this research project, and the approach taken for data collection and data analysis is described. It describes the choice of paradigm employed, the research sample and design. A mixed method approach was used to collect qualitative and quantitative data to investigate the following question:

- What are secondary school students' conceptions of sustainability?

Data were gathered from secondary school students in the North Island of New Zealand using a questionnaire and follow up focus group interviews. The data were then analysed using a thematic approach and simple statistical methods.

3.2 Research Methodology

A research methodology describes the methods used to gather and interpret data. Ontological and epistemological considerations affect the methodology, as the beliefs of a researcher affect how the research is carried out and how the data are analysed. A paradigm is a particular view of the world which links theory and research style (Mutch, 2005) and each paradigm has consistent views about ontology (the way of looking at the world) and epistemology (the way in which knowledge can be verified). Many paradigms have been developed in the area of educational research. Three of these include: positivism, interpretivism and critical theory (Mutch, 2005; Morrison, 2012) and I considered each of these for this research.

3.2.1 Positivism

The positivist approach can be viewed as an investigative, scientific approach to social science. Morrison (2012) described positivism as an approach "where it is accepted that facts can be collected about the world" (p. 16). The positivist paradigm is usually concerned with quantitative research and in this approach the

emphasis is "on objectivity, measurability, predictability, controllability, patterning, the construction of laws and rules of behaviour" (Cohen, Manion & Morrison, 2007, p. 26). Positivists are believed to hold the following assumptions:

- Determinism – events have causes
- Empiricism – knowledge is derived from experience
- Parsimony - phenomena should be explained simply
- Generality – observations can have a general application

(Morrison, 2012)

Several characteristics of positivism appear problematic in this research when the approach is considered. Positivists are concerned with observed phenomena and the understanding of the phenomena. If positivists believe that knowledge is derived from experience, then people's feelings cannot be considered as relevant unless they are observable and measurable (Morrison, 2012). Scott and Morrison (2005) stated that positivists "argue that abstract concepts have no meaning unless they can be derived from experience" and "knowledge of the world can be obtained free from any types of values" (p. 174).

If positivists do not take into account people's interpretations of situations or sometimes presume to know these interpretations, then it is possible to misconstrue what a subject might be doing in a certain situation and misinterpret why they might be doing it (Cohen et al., 2007). Because this research is concerned with people, and not inanimate objects, it is necessary to take into account human behaviour and interactions derived from the person's "intention, individualism and freedom" (Cohen et al., 2007, p. 18). This would be important in this study of students' conceptions.

3.2.2 Interpretivism

Interpretivism, like positivism, is concerned with the understanding of human behaviour, but through a different, subjective lens. Neuman (1994, as cited in

Mutch, 2005) stated that the interpretivist approach was "the systematic analysis of socially meaningful action through direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds" (p. 64). Unlike the positivist approach, the interpretivist approach is concerned with people's interpretations of their world in order to understand their behaviours (Cohen et al., 2007). Researchers are concerned with exploring the meanings of phenomena from the participants' perspective. They are part of the research topics they investigate and not separate from them (Morrison, 2012). An interpretive approach possesses the following assumption and features:

- People act intentionally
- People actively construct their world
- Situations are constantly changing
- Individuals and events are unique
- No intervention or manipulation of the social world
- Fidelity to the phenomena studied
- People interpret events and act on interpretations
- People construct multiple interpretations of events
- Reality is complex
- "Thick" descriptions are needed for complex situations
- Situations are examined from the participant's perspective

(Cohen et al., 2007)

The interpretive paradigm is concerned with the individual and the data collected will include the "meanings and purposes of those people who are their source" (Cohen et al., 2007, p. 22). One criticism of the interpretive approach is that individual participants could become influenced by researchers and situations they are placed in and data collected could be biased. It would be important to take steps in this approach to reduce this possibility.

Mutch (2005) contended that typical methodological approaches in the interpretivist paradigm are ethnographies (study of people and their activities in a natural setting) and case studies. She also drew a link between the interpretivist paradigm and constructivism within education. Mutch (2005) stated that teachers often use constructivist principles for learning activities where "knowledge and truth are created not discovered" and "meaning is socially …… situated" (p. 61) and if the researcher has an interest in the reality of their participants' lives then this fits within an interpretivist paradigm. In this research study, I am interested in what secondary school students understand about sustainability and if it is part of their reality.

3.2.3 Critical Theory

Critical theory contains many features of the interpretive paradigm, as it is concerned with the social reality of research participants. However, it goes much further and seeks to change this reality, for the better, through intervention. Neuman (1994, as cited in Mutch 2005) stated that a critical approach was "a critical process of inquiry that goes beyond surface illusions to uncover the real structure of the material world in order to help people change conditions and build a better world for themselves" (p. 64). This paradigm seeks to put knowledge into action and involves both the participant and the researcher in this process. Scott and Morrison (2005) contended that researchers are unable to maintain a distance when collecting and analysing data, and their values and political aspirations are "implicated in their work as researchers" (p. 48). This could lead to two problems within a critical approach. If driven politically, the researcher needs to justify their research. The researcher could also justify an over-estimation or under-estimation of bias in the study when collecting or citing evidence.

Mutch (2005) contended that typical methodological approaches in critical theory can be borrowed from other approaches. Action research or a survey with a distinctive end purpose would be compatible with critical theory.

3.2.4 The Research Paradigm for this Study

This study is located closest to the interpretivist paradigm because it is concerned with people's interpretations of their world, as secondary students' conceptions of sustainability are investigated. The study is based on the view that people actively construct their world and they construct multiple interpretations of their world (Cohen et al., 2007). The individuals in the study are unique, as are the events and situations that individuals encounter, as they construct these meanings. The researcher is concerned with exploring the constructed meanings from the participant's perspective (Morrison, 2012) in order to investigate what students understand by the term sustainability.

As the positivist paradigm relies on applying a scientific investigative approach with an objective focus, it was considered not suitable for this study. Equally, a more critical approach seeking to elicit change in the participants' reality was thought inappropriate for this study at this time. Types of research data gathered in interpretive studies are discussed in the next section.

3.3 Types of Research Data

The two types of research data gathered in interpretive studies are quantitative and qualitative data and these are discussed in the next sections.

3.3.1 Quantitative Data

Collection of quantitative research data is underpinned by a set of assumptions that seek to apply a scientific model of research to investigations in the educational world (Scott & Morrison, 2005). The focus is on finding patterns, regularities, causes and effects.

Quantitative researchers are concerned with collecting facts and studying the relationship between sets of facts (Bell, 2005). Techniques are used that can produce "quantified and, if possible, generalizable conclusions" (p. 7). This type

of research is useful to identify causal relationships, and for large samples, but quantitative research also has its limitations. For example, it is difficult to investigate detailed information about participants' lives, particularly their beliefs and perspectives (Hibberts & Johnson, 2012).

Data gathering instruments in quantitative research may consist of pre-set questions and responses as researchers seek to explain causes of an occurrence through objective measurement (Cohen et al., 2007). While not looking to describe a causal relationship, it is possible to provide numerical data to show simple prevalence of perspectives and this can allow for generalisations to be offered if they are evident (Hibberts & Johnson, 2012).

3.3.2 Qualitative Data

Collection of qualitative research data involves research approaches that are underpinned by a set of assumptions about how the social world operates. Foundations of qualitative research come from the idea that the human world is distinct from the natural world and needs to be treated as such by employing "distinctive (often interpretative) methods" (Scott & Morrison, 2005, p. 182).

Qualitative researchers are concerned with understanding "individuals' perceptions of the world. They seek insights rather than statistical perceptions of the world" (Bell, 2005, p. 7). A qualitative research approach looks deeply at a small number of participants and analyses their thoughts, feelings and stories. Typically, this may be done by researchers asking a few broad open-ended interview questions (Mutch, 2005). As qualitative research is often concerned with an in-depth study of a particular group or a small number of individuals, the selection of participants would be non-random and this leads to the difficulty of making generalisations to other populations, contexts and situations (Hibberts & Johnson, 2012). Analysis of qualitative data may also lead to results that are "more prone to researcher biases, errors and idiosyncrasies than quantitative data analysis" (Hibberts & Johnson, 2012, p. 124).

Both quantitative and qualitative data have their own strengths and weaknesses as described above. In any research study, these strengths and weaknesses need to be considered before choosing which type of data can adequately inform the research question. Often a mixture of data types allows the strengths of each to be captured and weaknesses to be allayed. To access their strengths and avoid their weaknesses, a mixture of quantitative and qualitative research data were gathered in this research study through a variety of methods, which are discussed next.

3.4 Data Collection Methods

Quantitative data collected using a questionnaire with clear statements and closed questions were analysed using simple statistical analysis. Qualitative data were also captured using the questionnaire through open ended questions to solicit participants' own words relating to actual experiences. A second qualitative data collection method was focus group interviews with a small selection of participants. All qualitative data were analysed using a thematic approach.

3.4.1 Questionnaire

A questionnaire is comprised of a series of questions used to solicit responses from participants in a self-completion exercise (Scott & Morrison, 2005). Questionnaires are widely used, are useful tools for obtaining information, and can be administered without the presence of the researcher (Cohen et al., 2007; Mutch 2005). The absence of the researcher may encourage greater honesty as there is no influence from the researcher (Cohen et al., 2007). This method of research can involve using many types of questionnaire items, which can include: closed questions, open ended questions, scales of data, rank ordering, multi-choice questions and rating scales (Cohen et al., 2007). Questionnaires have the ability to reach a large number of participants from a wide geographical area (Mutch, 2005). In this study, questionnaires were supplied to consenting teachers from two secondary schools who administered them to their students for me, once consent had been obtained from students.

In this study, a questionnaire was used as a primary data gathering tool (See Appendix A). Data from closed responses in the questionnaire were collected from students using a modification of semantic differentials and adopting a five-point scale with two descriptors at the extremes. Oppenheim (1992) suggested that differentials could be constructed to allow respondents the opportunity to provide a response to "reflect an attitude or feeling" that they might not necessarily be able to "put into words" (p. 239). The differentials in the questionnaire were constructed to cover a series of sustainability issues with opposing views at the extremes. These issues had been drawn from the literature and were directly related to principles of sustainability as discussed in Section 2.10. Table 3.1 outlines how each differential is related to eight of the twelve principles of sustainability.

Table 3.1

Questionnaire Differentials Related to Principles of Sustainability

Questionnaire Differentials	Principles of Sustainability
2.c. Businesses and companies benefit by looking after the environment in which they operate / It costs more money than it saves when businesses and companies look after the environment in which they operate **2.h.** Economic growth should be given priority over protection of the environment / Protection of the environment should be given priority over economic growth **2.o.** Economic growth should be given priority over cultural and social concerns / Cultural and social concerns should be given priority over economic growth.	1. Sustainability comprises environmental, economic, cultural, social, political and inter-generational conceptions, and these are interdependent. 2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.
2. a. The loss of one species of living thing in an environment is likely / unlikely to upset the balance of life in that environment. **2.b**. It is important that all systems (e.g. water, nutrients) that support life in an environment are maintained/ Life forms will adapt no matter what occur in that environment. **2.d**. Technology in the future is likely to be able to solve most of the world's environmental problems / cause more environmental problems	3. Environmental sustainability is underpinned by interdependence, biodiversity and the maintenance of ecological life-supporting systems.
2.e. Each person on Earth today is entitled to a / It is not possible for each person on Earth today to have a / fair share of resources that exist (e.g. oil, minerals, food). **2.f**. People today should be / should not be able to use as much of a resource as they need, even if the resource may run out/because it might run out. **2.l**. Workers are entitled to be treated fairly by their employer and receive a living wage to meet their needs / Workers have to take less than a living wage if their employer can't afford to pay them more.	4. Social sustainability is underpinned by equity and social justice.

2.i. Everyone should be entitled to express their views about how they want to live their lives / Some people's views about how they want to live their lives are not worthy of consideration. **2.j**. Everyone's views should be respected and taken into consideration when decisions are made that impact on people's lives / People in positions of authority should make decisions for their people.	5. Political sustainability is underpinned by democracy.
2.m. Art, customs, traditions and language of all cultures are important and should be preserved / Mixing of art, customs, traditions and language from different cultures to create a single culture is desirable. **2.n.** A Maori worldview that emphasises how we are connected to the environment shows us how we should live our lives / is mythical and not relevant today.	6. Cultural sustainability is underpinned by the protection of cultural diversity.
2.f. People today should be / should not be able to use as much of a resource as they need, even if the resource may run out/because it might run out. **2.g.** People today need to manage the way they use resources so that there are resources left for future generations / People in the future will need to find their own resources	7. Economic sustainability is underpinned by management of finite resources.
2.g. People today need to manage the way they use resources so that there are resources left for future generations / People in the future will need to find their own resources **2.k.** Decisions made by people today should not impact negatively on future generations / should consider current generations first as we don't know what future generations will need.	8. Inter-generational sustainability is underpinned by a vision for future generations.

A five-point scale was used in the semantic differentials where (1 = strongly agree with) the view on the left and (5 = strongly agree with) the view on the right are

opposed, with a neutral position (3 = evenly balanced view) in the middle. Respondents were instructed to place their view along the scale by circling a number from 1 to 5, and were asked not to circle any number if they were unsure. This gave respondents an opportunity to indicate that they had no opinion, rather than compelling them to make a choice they were not comfortable with (Cohen et al., 2007). In order to eliminate a type of "halo effect" (Oppenheim, 1992, p. 231), the scale was reversed for some differentials (sustainable view on a different side) and totally changed on others, with the sustainable view in the centre and unsustainable views at the extremes. In this way it was hoped that respondents would make considered choices when answering these questions and not just check all scales down one side of the column.

A limitation with this method of data collection is the intensity of a response given and the interpretation arising from those responses, and it cannot be assumed that the interval between categories is equal (Cohen et al., 2007). One student's "agree" could be of the same intensity as another student's "strongly agree". The strength of feeling of a student to "strongly agree" with a sustainable idea could be quite different to another that "strongly agrees" with the alternating unsustainable idea. Cohen et al. (2007) suggest that using a five-point scale limits choice as many respondents may not want to be seen as extremists but in this study, whilst hard to be sure whether this was a factor or not, findings suggest that students were prepared to choose the extreme options.

Rating scales provide an "opportunity for a flexible response with the ability to determine frequencies, correlations and other forms of quantitative analysis" (Cohen et al., 2007, p. 327) and analysis was used to compare this quantitative rated data with qualitative data gathered from open-ended questions in the questionnaire and focus group interviews.

Three open-ended questions were included in the questionnaire to give respondents an opportunity to "freely formulate an answer" (Muijs, 2012, p. 149)

and provide a response in their own way. As open-ended questions are more time consuming to respond to, there is a tendency for this type of question not to be answered, so only a small number were included. Cohen et al. (2007) suggest that these types of questions may contain "the 'gems' of information that might otherwise not be caught in the questionnaire" (p. 330). As with the differentials, the issues to be examined had been drawn from the literature and were directly related to principles of sustainability. Table 3.2 outlines how each open-ended question is related to three of the twelve principles of sustainability.

Table 3.2

Open-ended Questions related to Principles of Sustainability

Open-ended Questions	Principles of Sustainability
1. What does the word sustainability mean to you? **5**. What might a sustainable future look like to you?	1. Sustainability comprises environmental, economic, cultural, social, political and inter-generational conceptions, and these are interdependent.
4. Please explain why you chose the model you did in Q3 and how it demonstrates sustainability for you.	2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.
5. What might a sustainable future look like to you?	8. Inter-generational sustainability is underpinned by a vision for future generations.

One multi-choice closed-question was included in the questionnaire. How it relates to a principle of sustainability is outlined in Table 3.3.

Table 3.3

Multi-choice Closed Question related to Principle of Sustainability

Multi-choice Closed Question	Principle of Sustainability
3. Choose a model of sustainability which best represents what you understand about sustainability.	2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.

After completion of the questionnaire, a group of students from each school was invited to take part in focus group interviews. Six focus group interviews were originally planned but only two were carried out due to timing restraints. Focus group interviews are discussed next.

3.4.2 Focus Group Interview

Bell (2005) and Sharp (2009) agreed that an interview is a 'conversation with purpose' which has been "initiated by the interviewer for the specific purpose of obtaining research-relevant information" (Cohen et al., 2007, p. 351). The focus group interview is used to centre attention on a particular issue and is valuable "when in-depth information is needed" (Bell, 2005, p. 162) and may include participants with similar interests or characteristics. Coleman (2012) suggested that the focus group interview is guided by the interviewer and can be focused in two ways: in terms of the topic to be discussed, and in terms of the make-up of the group. Focus group interviews are challenging to manage "with interviewers acting as moderators" (Coleman, 2012, p. 255) and these interviews can be structured or unstructured. The data gathered may be more in-depth than would be possible in a one-to-one interview, as participants are able to respond to each other's contributions and may feel more comfortable responding in a group situation (Coleman, 2012). But the reverse is also possible, as some respondents may influence the discussion and make it difficult for other group members to contribute (Bell, 2005), or may feel shy about revealing their true thoughts in front of others.

A question guide with prompts was prepared to form the basis of the interview. As with the questionnaire the issues to be examined had been drawn from the literature and were directly related to principles of sustainability. Table 3.4 outlines how each question is related to the twelve principles of sustainability in the theoretical framework for this thesis.

Table 3.4

Focus Group Questions related to Principles of Sustainability

Focus Group Questions	Principles of Sustainability
1. What kind of actions have you taken at school – to do with sustainability? **2.** Can you tell me about them?	9. Constructivism acknowledges the importance of prior learning. 10. Social constructivism acknowledges the importance of social learning. 11. Knowledge is necessary for informed decision making. 12. Knowledge and values are identified as necessary for taking action.
3. What aspect/s of sustainability does the action/s address? **4**. From what you have found out from the action taken at school can you tell me what you understand by the word sustainability – can you write a definition of sustainability for me (as a group)? **5.** Which model of sustainability would you choose to help me understand your definition of sustainability?	1. Sustainability comprises environmental, economic, cultural, social, political and inter-generational conceptions, and these are interdependent. 2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.
3. What aspect/s of sustainability does the action/s address? • Environmental • Social • Political • Cultural • Economic • Future	3. Environmental sustainability is underpinned by interdependence, biodiversity and the maintenance of ecological life-supporting systems. 4. Social sustainability is underpinned by equity and social justice. 5. Political sustainability is underpinned by democracy. 6. Cultural sustainability is underpinned

	by the protection of cultural diversity. 7. Economic sustainability is underpinned by management of finite resources. 8. Inter-generational sustainability is underpinned by a vision for future generations.
6. What might a sustainable future look like to you?	8. Inter-generational sustainability is underpinned by a vision for future generations.

A semi-structured form was adopted for the interview to allow me to rephrase questions, alter wording, content or order of the questions, but with the purpose always kept in mind. This flexibility also gives the respondents the opportunity to ask questions and allows the interviewer to motivate the respondents to discuss experiences and feelings (Cohen et al., 2007).

The focus group interviews were conducted after the completion of the questionnaires with the intent of providing a vehicle for respondents to develop some of the ideas expressed in the questionnaire and for a collective, rather than an individual, view of sustainability to be captured (Cohen et al., 2007). Although focus group interviews produce less data than interviewing individuals on a one-to-one basis, they do produce a large amount of data in a short space of time and in this case provided the opportunity to collect more qualitative data on "attitudes, values and opinions" (Cohen et al., 2007, p. 376) after the completion of the questionnaire.

During the focus group interview, students were asked to speak one at a time and sometimes at my invitation in order to give everyone the same opportunity to contribute to the discussion. I took brief notes during the interview and sometimes asked for clarification of points during the discussion.

Mutch (2005) and Bell (2005) stressed that focus group interviews require skill and experience to conduct. My inexperience and the relationships that had previously existed between me and the respondents led to some data gathered being biased and this data was not used. The recording with the use of smartphone technology and transcription of the interviews did not prove as difficult as suggested by Mutch (2005).

3.5 Sample

The 43 participants were recruited from Year 12 and Year 13 students from two rural secondary schools in the upper half of the North Island of New Zealand with which I have personal contact. I am currently teaching at one school and had been a teacher at the other during the last five years. Between 30% and 35% of students are of Māori descent in both schools. Participants were recruited from a pool of 45 from two classes of Year 12 students studying either geography or biology at one school (27 participants). At the other school classes, participants were recruited from a pool of 28 Year 12 and Year 13 students studying geography and science (16 participants). Eight students from the pool of 28 students were in both geography and science classes. Sustainability is part of the geography curriculum in each school and students in the science course had been also been exposed to sustainability learning. Teachers were recruited from colleagues and former colleagues to administer the questionnaire and arrange assembly of the focus groups. Students were given up to 30 minutes to complete the questionnaire and this was conducted during class time. Focus groups consisted of four Year 12 female biology students in one school (Focus Group 1) and two Year 12 female geography students in the other (Focus Group 2). Focus group interviews lasted approximately 20 minutes and were held during class time and break time. Permission to carry out the survey was sought from the principal of each school, from teachers and from students who were willing to complete the questionnaire and take part in a focus group interview. All students who participated were over the age of 16 and could provide their own consent. Consent forms and accompanying letters are in Appendix B.

The sample is not representative of Year 12 and Year 13 secondary students in the country as it was small and the sample was not taken over the whole country. Most respondents taking the survey and all respondents involved in the focus group were known to me personally and this may have led to some bias on the part of the respondents to provide answers that they may have thought I wanted. Bias was minimised as much as possible and this is discussed in Section 3.7.

3.6 Data Analysis

The questionnaires and focus group interviews produced both qualitative and quantitative data which were analysed differently. Open-ended questions from the questionnaires and interview questions produced qualitative data which were analysed using a thematic approach. In addition, quantitative data from closed questions and differential statements from the questionnaires were analysed using a simple statistical approach to identify prevalence of perspectives across the sample.

A thematic approach was used to analyse data from open-ended questions in the questionnaire. Responses were coded using a manual colour and numerical coding system in a Microsoft Excel spreadsheet. Coding was related to themes that emerged from the literature and the collated data. The questionnaires generated a large amount of data and judgments were used to sift and then place selections into the related themes.

Initially statements were placed in a Microsoft Excel spreadsheet, read and each statement divided into sections related to words and/or phrases used by participants. Each section was analysed to determine its content and initially colour coded and given a numerical code according to the related words and phrases used. Statements that contained more than one example of the same word/phrase were read and analysed again, and either recoded if sufficiently different or removed if similar. Themes were then assigned to the examples to match the colour and number used. The nature of these themes came from the

participant responses and these themes were placed into categories which had been identified in the literature. The frequency of these themes was analysed using simple sorting in the spreadsheet. As one response usually contained two or more themes, the number of themes coded for was larger than the sample size. From further analysis of the spreadsheet, it was also possible find the frequency of interrelated themes.

Following the initial analysis that generated themes from student responses, another spreadsheet was constructed and key conceptions of sustainability that had been identified from the literature were searched for in this data, i.e. environmental, economic, social and inter-generational. Judgments were made to categorise data into conceptions of sustainability and the frequency of conceptions and frequency of interrelated conceptions were found. Further analysis was carried out to identify conceptions of sustainability that had been highlighted as aspects of sustainability in the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010), i.e. environmental, economic, social, political and cultural. The frequency of these conceptions and the frequency of interrelated conceptions were found by analysis in a spreadsheet using colour and numerical coding.

Examples of words and/or phrases from students' responses in the questionnaire were included to demonstrate how some judgements were made in the analysis process during coding. Other illustrative quotes from the questionnaires were also included to illustrate findings in this research. The focus group interviews with students were transcribed and judgments made to select illustrative quotes from responses to be included to illustrate the findings.

The quantitative data from the differential statements from the questionnaires were analysed to produce frequencies, a mean and standard deviation for each different differential. Although the sample size was small (43 participants) by calculating these values it was possible to find the 'average' view within the

responses and the spread of opinions held by students, and any anomalies that existed.

A combination of twelve differential statements was used to produce a sustainability rating for each respondent to score their view of sustainability. The differential statements were ordered and placed in a Microsoft Excel spreadsheet. Values were attributed to the choices made by students in the questionnaire. The sustainable view corresponded to a value of five and the unsustainable view corresponded to the value 1, with degrees of agreement in between. Differentials that could not be manipulated to produce these values were not used. By adding together each individual's set of values it was possible to calculate an overall score for each participant. Although a purely arbitrary value, this score gave an indication of the individual's view of sustainability.

The sustainability rating of each respondent was compared to the number of conceptions of sustainability they held. A simple regression analysis was carried out in a Microsoft Word chart to find the existence of a relationship between the two.

The findings and interpretation of the findings are presented in Chapter 4 in written and graphic form. Three sections responding to themes related to the research issue of what are secondary school students' conceptions of sustainability are presented as follows:

- Student conceptions of sustainability
- Student views about sustainability issues
- Student conceptions of sustainability compared to student views about sustainability issues

3.7 Trustworthiness

A research study should always be examined to assess its reliability and validity (Bell, 2005) so as to measure the consistency and truthfulness of research findings. But concepts of reliability and validity are unable to be addressed in naturalistic research (Shenton, 2004) where people are the subjects of that research. Lincoln and Guba (1985) identified four criteria for trustworthiness to establish the extent to which a qualitative study is truthful and accurate: credibility, transferability, dependability and confirmability. Shenton (2004) stated that the criteria of dependability and credibility are suggested in preference to reliability and internal validity.

Dependability of a study is addressed by adequate research procedures, thoroughness of data collection, analysis and interpretation that are clearly articulated for others to understand (Mutch, 2005; Shenton, 2004). In this study, a clear methodological description is provided to allow it to be repeated by a future researcher "if not necessarily to gain the same results" (Shenton, 2004, p. 71). The same questionnaire was presented to all the secondary school students in a similar manner (Oppenheim, 1992) and I presented the same question guide with prompts to both focus groups. However, the nature of the semi-structured focus group interview meant that the respondents had a large part in the shaping of the interview and each interview was unique (Bush, 2012).

Credibility involves the believability of the findings and Mutch (2005) suggests triangulation and member checking as two common techniques to promote confidence in a study. Triangulation was used in a small way in the research to enhance some of the findings. Data from the questionnaires were compared with data obtained from the focus group interviews. Triangulation was again used when comparing individual student responses to sets of questions regarding each principle of sustainability. Member checking was not possible as questionnaires were anonymous and interviews involved several participants. Peer review of research questions was carried out by the researcher's supervisor before data collection commenced. Careful instrument design and interviewing of a sample

of the respondents after the questionnaire was administered enhanced credibility. Each principle of sustainability was related to at least two questions in the questionnaire as sets of questions are more consistent than single option items (Oppenheim, 1992).

Bias is often the cause of the un-trustworthiness of interviews as interviewers "overstate or understate" (Cohen et al., 2007, p. 150) certain findings. By their very nature, interviews are highly subjective and there is always the danger of bias (Bell, 2005). There are several causes of bias in an interview situation (Cohen et al., 2007) and both the interviewer and the interviewee may have biased views and, in this study, this is most likely because of the very nature of sustainability. Bush (2012) suggests that the characteristics of the interviewer and the interviewee are sources of bias and elimination of bias is difficult. But if the interviewer is aware and constantly making decisions to limit bias (Cohen et al., 2007), these effects are able to be lessened. Examples of this would be through careful formulation of questions, training of the interviewer, and care when interpreting findings. Cohen et al. (2007) also suggested identifying and stating the position of the interviewer. In the current study, the interviewer is from a small rural secondary school in the northern half of the North Island of New Zealand and is a teacher of sustainability. Therefore, bias has been identified, and minimised as much as possible in this study.

The two other factors that can enhance trustworthiness in an interpretive study are confirmability and transferability. Castle (2012) suggested that confirmability refers to having enough documentation and description of data to convince others that the study findings can be confirmed by the evidence that is presented. In this study, steps taken to reduce the effect of bias and providing clear methodological descriptions allows for "research results to be scrutinised" (Shenton, 2004, p. 73).

Transferability refers to the extent to which the findings of this study are applicable to other situations (Castle, 2012). This determination is made by others who read this thesis but provision has been made to supply as detailed descriptions as possible to allow comparisons to be made.

Shenton (2004) stated that frameworks for ensuring trustworthiness of qualitative research have been in place for many years although some critics are unwilling to accept the "trustworthiness of qualitative research" (p. 63). In all aspects of this research trustworthiness and bias were carefully considered in order to contribute to the authenticity of this study.

3.8 Ethics

Ethics approval was granted by the University of Waikato in August 2013 to collect all data described in this thesis. As ethics is a major concern in all research involving humans, the premise to do no harm is of paramount importance for the researcher (Bell, 2005; Hopkins & Ahtaridou, 2008). Mutch (2005) provides a list of twelve ethical concerns to consider: informed consent, voluntary participation, right to withdraw, permission, coercion, deception, confidentiality, anonymity, privacy, participant safety, researcher safety and dissemination. While the list is not exhaustive it provides a good starting position for researchers and from that list several concerns are discussed as being of relevance in this research.

Busher and James (2012) acknowledge the advantages and disadvantages of the researcher being known to participants, as in this case. Written consent was obtained from the principal, teachers in charge of a class and from participants after being given an outline of the nature of the research and what would be done with findings. Participants were advised that participation was voluntary and they had a right of withdrawal from the study. The consent forms for principals, teachers and participants and accompanying letters are included in Appendix B. I did not have any direct contact with any students immediately prior to the

administering of the questionnaire, which could have been seen as coercion on my part. Questionnaires were administered by consenting teachers after consent had been given by students. One completed they were returned to me, and any identifying marks removed and replaced with numbers to safeguard anonymity. Focus groups were comprised of students that I was not currently teaching. Some of these students I had taught previously but probably would not teach in the future, and in this way I hoped to mitigate the power imbalance that might have existed.

In ensuring confidentiality, Cohen et al. (2007) stated "that although researchers know who has provided the information or are able to identify participants from the information given, they will in no way make the connection known publicly" (p. 65) and this was done through the use of pseudonyms, schools being not identified in any reporting of the data and all documents being handled and stored in accordance with the ethics committee requirements.

3.9 Summary

An interpretive approach was employed in this study, with the use of quantitative and qualitative data gathered from questionnaires and focus group interviews. All data gathered was related directly back to twelve principles of sustainability which had emerged from the literature and which provided the means to explore secondary school students' conceptions of sustainability. Qualitative data was analysed and coded against themes which had also emerged during analysis and from the literature. Quantitative data was analysed using simple statistical approaches to find frequencies and variance.

An ethical stance was maintained throughout all stages of the research to protect the participants and the researcher. Coupled with consideration of four criteria of trustworthiness, I hoped these steps would contribute to the robustness of this study. The findings of the study are presented in the next chapter.

Chapter 4: Findings

4.1 Introduction

This chapter presents the findings of the research project of secondary school students' conceptions of sustainability. The data were collected from 43 secondary school students in Year 12 and Year 13. The findings are presented in three sections:

- Student self-identified conceptions of sustainability
- Student views about sustainability issues
- Student conceptions of sustainability compared to their views about sustainability issues

Secondary school students' conceptions and understandings were explored through the use of a questionnaire and two focus group interviews as identified in Chapter 3. The data were analysed using a thematic approach and simple statistical tests.

4.2 Students' Self-identified Conceptions of Sustainability

4.2.1 Coding of Students' Self-identified Conceptions of Sustainability

In response to the open-ended question "What does the word sustainability mean to you?" data were collected and analysed to determine secondary students' conceptions of sustainability. Analysis by manual colour and numerical coding enabled the development of themes to capture the conceptions of sustainability mentioned by students. As one response usually contained two or more conceptions, the number of conceptions coded for was larger than the sample size (n = 43). Only one student did not provide a response to this question.

Students supplied a wide variety of responses when asked what sustainability meant to them. Summers et al. (2004) had identified seven main categories of sustainability when exploring student teachers' conceptions of sustainable

development: nature, purpose, human focus, timescale, geographical scale, controversy and aesthetics. Six of these categories had been used by Walshe (2007) in a study of Year 8 students' conceptions of sustainability, but she found no evidence for controversy.

In this study, 14 recurring themes were generated during coding of student responses and these themes were placed into four categories following the work of Summers et al. (2004), being the nature of sustainability, the purpose of sustainability, a human focus of sustainability and a timescale aspect of sustainability (See Table 4.1).

The nature of sustainability refers to the essential characteristic or characteristics by which sustainability was recognised by respondents, using four aspects or pillars of sustainability commonly described, e.g. the environment, society, economy and culture. The purpose of sustainability refers to respondents' views of what sustainability is about, and themes that emerged included resources, maintaining something, keeping something in balance, providing an everlasting supply, considering impacts and being self-sufficient. The category of human focus was used for responses that specifically mentioned humans and their needs, e.g. future generations, present generations or generally meeting the needs of people (this could also be placed in the category of purpose). The timescale aspect of sustainability refers to when respondents indicated sustainability was future-focussed.

Table 4.1

Main category and contributing conceptions of sustainability arising from manual coding of student responses with response examples

Main category	**Conception of sustainability from student responses**	**Examples from student responses**
Nature	Environment	"flora and fauna" "nature" "planet"
	Society	"human health and well-being" "social"
	Economy	"comfortable existence" "economic benefits"
	Culture	"cultural aspects"
Purpose	Resources	"produce" "source" "materials"
	Maintaining something	"preserve" "look after" "keep running"
	Something in balance	"a balanced network"
	Everlasting supply	"renewable"
	Impact	"little … damage" "won't harm" "not destroy"
	Self-sufficiency	"practically run itself"
Human Focus	Meeting needs of people	"meet their needs"
	Future generations	"future generations"
	Present generation	"live in today" "we" "people living here"
Timescale	The future	"years to come"

Using the categories from Summers et al. (2004), this study found evidence for these four categories in the students' responses: nature, purpose, human focus and timescale. There was no evidence for geographical scale, controversy or aesthetics. Students in this study were from Year 12 and Year 13 but were not engaged in any specific study of sustainability, when comparing this study with that of the student teachers' ideas of sustainable development (Summers et al., 2004) and the Year 8 students who were studying sustainable tourism (Walshe, 2007). This may have some bearing on the lack of emergence of categories of geographical scale, controversy and aesthetics. From the focus group interviews in this study, it was established that students interviewed felt that they had never been involved in any sustainability projects, although some remembered learning about sustainable fishing at school in Year 10 (Focus Group 1).

4.2.2 Frequency of Occurrence of Conceptions of Sustainability

Coded responses were analysed to determine the number of times a different conception of sustainability was mentioned. Analysis of the frequency of occurrence of conceptions of sustainability responses appears in Table 4.2. The frequency of occurrence of each conception mentioned shows that students referred to the purpose of sustainability (48% of mentions) more frequently than the nature of sustainability (32% of mentions). Overall the percentage was equal (8%) when the total percentage of mentions was divided by the number of different, expressed conceptions of sustainability in each main category. When students referred to the conception of sustainability it appears they are equally concerned with the nature (8%) and the purpose (8%) of sustainability, and less concerned with the human focus (5%) and timescale (4%).

Table 4.2

Numbers and percentages of conceptions of sustainability mentioned by students

Main Category	Conception of sustainability	Number of mentions	Percentage of mentions	Percentage of mentions Number of conceptions in category
Nature	Environment	23	32%	8%
	Society	6		
	Economy	3		
	Culture	2		
Purpose	Resources	14	48%	8%
	Maintaining something	26		
	Something in balance	2		
	Everlasting supply	2		
	Impact	5		
	Self-sufficiency	2		
Human Focus	Meeting needs of people	1	16%	5%
	Future generations	12		
	Present generation	4		
Timescale	The future	5	4%	4%

The frequency of mentions of each particular conception of sustainability is compared in Figure 4.1 and this clearly demonstrates that maintaining something, environment, resources and future generations are mentioned more frequently than any of the other conceptions.

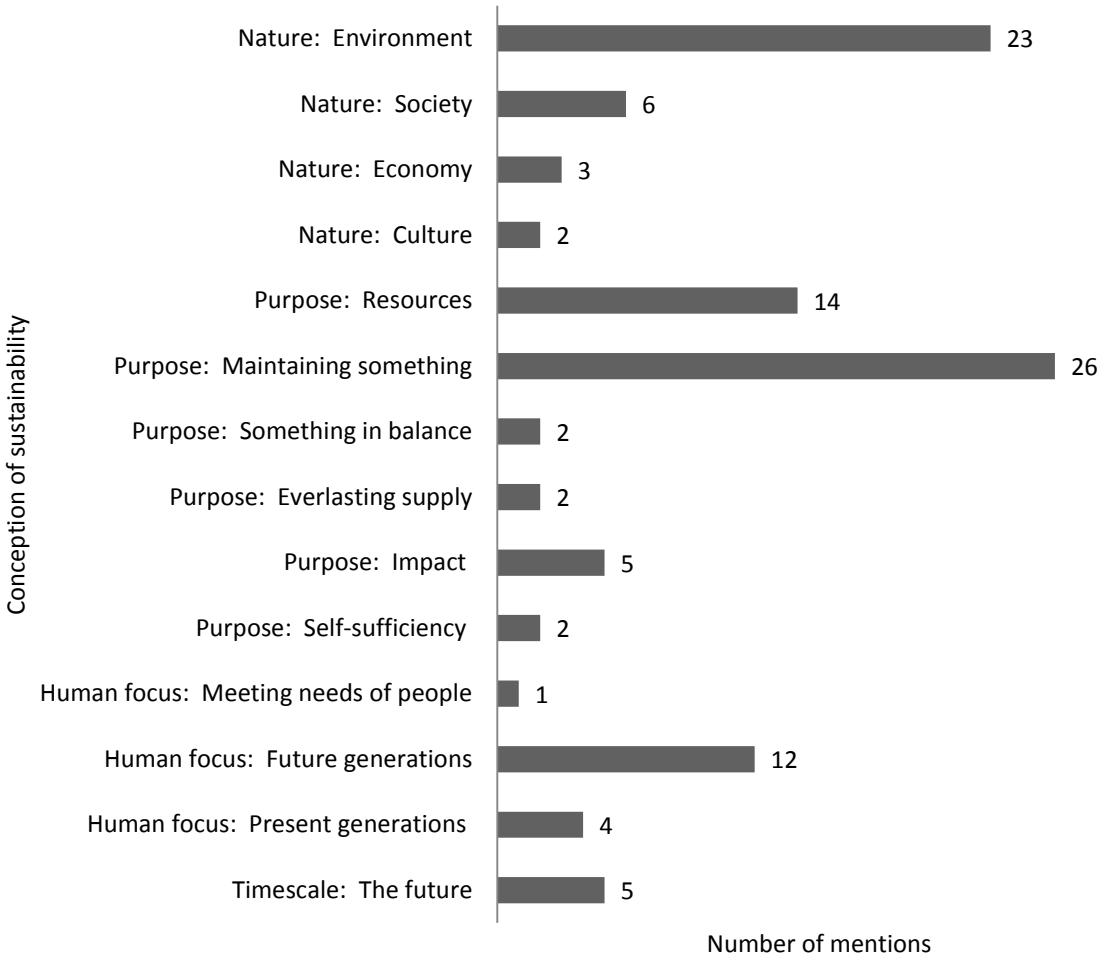


Figure 4.1. Frequency of occurrence of mentions of the conceptions of sustainability arising from coding of responses to the question "What does the word sustainability mean to you?"

When students referred to the purpose of sustainability they most frequently mentioned maintaining something (26 mentions) and this conception ties in most closely with dictionary definitions of the word sustain (Collins, 2001; Farlex, 2013; dictionary.com, 2014b). Sustainability is often used in the media to refer to the longevity of an activity, asset or business. For example, much coverage was given to government incentives for film and television productions to deliver sustainability of foreign and local ventures (scoop, 2013), and the decrease in the daily recreational bag limit in the Snapper 1 fishery to protect the sustainability of

snapper stocks (Deane, 2013) received much media attention in 2013. Even if students were not directly interested in these issues it is likely that discussions at home and in the community may have involved reference to high profile examples such as these.

Not all students were specific about what they thought was to be maintained and often referred to something or things. This is a response that is echoed by a website popular with students which produced the answer "Sustainability is a widely used term that describes something's ability to endure" (ask.com, 2013, para 1) to the question asking what sustainability was. It is possible that students searching for a definition of the term may find this basic meaning and not be inclined to find out more.

In the nature of sustainability category, the environment was referred to more frequently (23 mentions) than any of the other conceptions. This could be explained by the affinity most New Zealanders have with their environment and their involvement in outdoor activities such as camping, tramping, boating, fishing, hunting etc. Threats to the environment get lots of media attention, e.g. threats to Maui's dolphin (Dickey, 2013), kauri dieback disease (3news, 2014), mining of conservation land (NZPA, 2010), climate change (scoop, 2013), and dirty dairying (Television New Zealand, 2014). Groups promoting environmentalism like Greenpeace and Sea Shepherd (3news, 2014) receive wide coverage in the media, and the Green Party has 14 members in the New Zealand Parliament at present (Green Party of Aotearoa New Zealand, 2014). About 20% of New Zealand's overseas revenue comes from international tourism, with the natural environment being a major attraction (Pawson, 2012). Accordingly, the environment is of major importance to all New Zealanders and an area of priority in all circles of education. It is mentioned in several sections of the *New Zealand Curriculum* and is referred to in the vision, values, key competencies and in the learning areas of: health and physical education, mathematics and statistics, science, social science and technology (Ministry of Education, 2007).

Resources received 14 mentions in the nature of sustainability category. New Zealand is a resource-based economy and a large portion of its economy is based on natural resources (Pawson, 2012) with exports from the agriculture, horticulture, forestry and fishing industries being major contributors. The importance of resources in our economy, and consequently to the lives of ordinary New Zealanders, could account for its prominence in this category. The introduction of the Resource Management Act in New Zealand in 1991 brought about many changes to the way natural resources could be used and how the effects of human activities were managed. Much media attention follows breaches of the Act and any controversial planning decisions (Williams, 2013) and consequently brings the issue of resource management into the public arena quite often. Accordingly, the management of resources is important to all New Zealanders and reference is made to this in the *New Zealand Curriculum*. "Students also learn that Earth provides all the resources required to sustain life except from the Sun, and that, as humans, we act as guardians of these finite resources" (Ministry of Education, 2007, p. 28). Management of resources also appears as achievement objectives in the learning areas of social science and technology (Ministry of Education, 2007).

The conception, future generations (12 mentions), was the fourth most frequently mentioned conception of sustainability, referred to by over a quarter of the students in the survey. These twelve students all used the term "future generations" which comes directly from the WCED definition (WCED, 1987) and the one that is used commonly by educators (Birdsall, 2006). This phrase is also commonly used in the media but not always in reference to sustainability.

4.2.3 Interrelated Conceptions of Sustainability

Following the examination of responses of conceptions of sustainability, each student response was analysed to find the frequency of combinations of conceptions. This was done to establish if students hold simple or complex conceptions of sustainability. It could be assumed that the higher the number of

conceptions of sustainability mentioned by students in their response, the more complex the conception of sustainability they hold. Birdsall (2006) used a sustainability analysis tool to describe students' conceptions of sustainability and found that interrelated ideas about sustainability represented a more complex conception. A count of one, two, three, four and five conceptions of sustainability was generated from each student response, and these were analysed to find the frequency of occurrence of interrelated conceptions.

Responses from a small number of students were unable to be categorised and in one case a student did not provide a response at all, but 40 of the 43 students in the study provided a conception of sustainability. These conceptions ranged from simple to complex and Figure 4.2 shows the frequency of occurrence of interrelated conceptions of sustainability. The average number of conceptions of sustainability mentioned by students was 2.5.

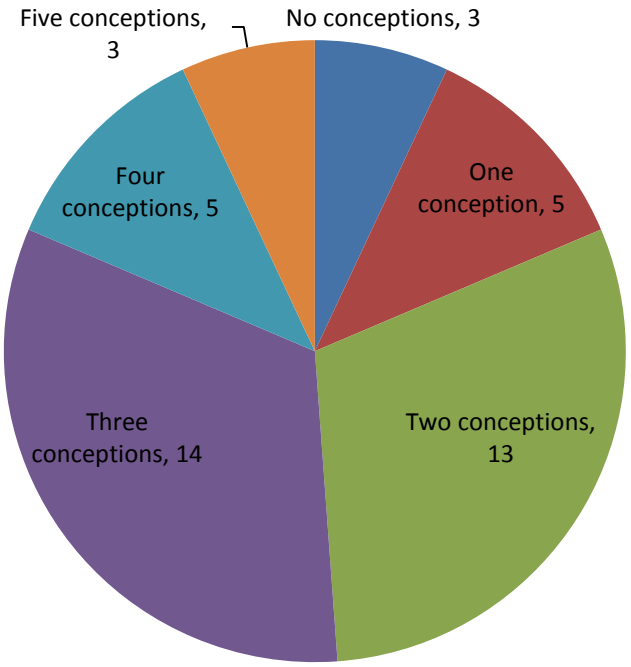


Figure 4.2. Frequency of occurrence of interrelated conceptions of sustainability mentioned by students in response to the question "What does the word sustainability mean to you?"

A small number of students (5/43) mentioned only one conception of sustainability in their response: maintaining something, environment, the future or being self-sufficient. This indicates that these students may hold a simple and unsophisticated conception of sustainability.

Examples of student responses with one conception of sustainability included:

Student 9: "The word sustainability means something is self-sufficient – it can operate without waste."

Student 13: "Being able to sustain something into the future."

The majority of students (32/43) recorded responses with two (13/43), three (14/43) or four (5/43) conceptions of sustainability and therefore indicated a more developed conception of sustainability. Comparison of student responses illustrates how conceptions of sustainability are developing in complexity.

Examples of student responses showing two interrelated conceptions of sustainability:

Student 2: "The word sustainability means to preserve something for future generations."

Student 16: "Preserving things in efficient ways for future generations."

Examples of student responses showing three interrelated conceptions of sustainability:

Student 1: "Doing all I can to sustain and maintain environments or process for preservation and future use."

Student 32: "Preserving and reusing materials – maintaining our environment."

Examples of student responses showing four interrelated conceptions of sustainability:

Student 18: "Having the ability to maintain good aspects of the world's environment, resources, population."

Student 28: "Maintaining safe and beneficial environment, both economically and socially – better and healthier lifestyle for society."

A smaller number of students (3) mentioned five conceptions; in balance, environment, economy, society and present generation, and maintaining something, meeting needs, society, present and future generations. This indicates these students were able to articulate a complex conception of sustainability.

Examples of student responses with five interrelated conceptions of sustainability show a sophisticated conception of sustainability:

Student 19: "To me, sustainability is when the world's state of environment, society and economy is in balance, and provides the people living here on earth with a sustainable, comfortable existence."

Student 37: "A balanced network of social, environmental and economic benefits – keeps up with the society we live in today and is well aware of the constant cultural evolution occurring."

4.2.4 Interrelated Conceptions of Sustainability: environmental, economic and social conceptions with an inter-generational focus

In the literature, a feature of the development of sustainability is the bringing together of environmental, social (including cultural and political) and economic conceptions of sustainability, with an inter-generational focus. The extent to which these conceptions of sustainability were recognised by individual respondents was also examined to determine if students were identifying these particular conceptions in their responses. While this analysis reveals the frequencies of environmental, economic, social and inter-generational

conceptions, it also reveals the extent to which individual responses recognised these four conceptions or combinations of them. Table 4.3 shows the frequency of occurrence of these conceptions of sustainability and how they were interrelated in student responses. For the purpose of this analysis I have categorised evidence of these conceptions in student responses where possible, e.g. resources into economic, needs into society, present generations into society, the future into inter-generational.

The responses of six of the 43 students were unable to be categorised in this way and these students showed no evidence of these conceptions of sustainability. This indicates that most students (37/43) recognised one or more of these conceptions of sustainability, i.e. environmental, economic, social or inter-generational.

Table 4.3

Frequency of occurrence of the combinations of environmental, social, economic and inter-generational conceptions of sustainability

Number of interrelated conceptions of sustainability	Conception of sustainability mentioned	Frequency of mentions	Total number of students identifying interrelated conceptions of sustainability
0		6	6
1	Environmental	8	18
	Social	0	
	Economic	4	
	Inter-generational	6	
2	Environmental Social	0	10
	Environmental Inter-generational	4	
	Environmental Economic	2	
	Social Inter-generational	1	
	Social Economic	0	
	Economic Inter-generational	3	
3	Environmental Social Economic	6	9
	Environmental Social Inter-generational	1	
	Environmental Economic Inter-generational	2	

The environmental conception of sustainability was referred to the most often when only one conception was recorded, with eight students referring only to this conception. Inter-generational and economic conceptions were the other conceptions recorded when students only referred to one conception.

Examples of student responses with one conception of sustainability:

Student 35: "Working with the environment."

Student 23: "Maintaining the environment, rather than destroying it."

Student 8: "A resource that is in everlasting supply."

Student 17: "A renewable and reliable source."

Student 16: "Preserving things in efficient ways for future generations."

Student 6: "Harvesting something where you keep it for future generations."

Students identifying one conception of sustainability generally gave responses that were brief. The importance of the environment to New Zealanders, the reality we have a resource based economy and the high profile of these areas in the media could account for the prominence of environment and resources in these student responses. Following on from this, emphasis has been placed on environment and resources in the *New Zealand Curriculum* (Ministry of Education, 2007) and students in Year 12 and Year 13 may have been exposed to these ideas throughout their schooling career in science, social science, mathematics and statistics, health and physical education, and technology. The use of the term future generations could be related to its wide use in the media but it must be noted that this term appears in the WCED definition (1987) and this definition is the one that is used commonly by educators (Birdsall, 2006). This phrase does not appear in the *New Zealand Curriculum* but the future is a major focus in this document with its inclusion as one of the eight principles that should underpin all school decision making (Ministry of Education, 2007).

The responses in the category of two interrelated conceptions most referred to by students were the environmental and inter-generational conceptions (4 responses), and the economic and environmental conceptions (3 responses). These results contain the high visibility conceptions of environment, economics and inter-generational conceptions and it may reflect a student who has been exposed to a wider variety of influences than those that have only one conception of sustainability in their response. This exposure may have come from their family and community, the media, social media and/or school.

Examples of student responses with two conceptions of sustainability:

Student 1: "Doing all I can to sustain and maintain environments or process for preservation and future use."

Student 14: "Mean to keep flora and fauna for future generations."

Student 20: "Maintaining a certain amount of produce for the future."

Student 3: "Sustainability means to me maintaining an idea or process in order to use it for the future – involves adopting ways of thinking and behaviour that allow people to meet their needs without preventing future generations from meeting theirs."

Some responses given by students containing two conceptions were brief, but some were quite detailed and complex in nature. One response in particular, that of Student 3 above, shows a definite link to the WCED definition (WCED, 1987), but it still has only two interrelated conceptions of sustainability able to be identified within it. Without specific mention of environment or economy, this response was categorised to include the social and inter-generational conceptions.

A response with the three conceptions of environmental, social and economics came from six students and was the most popular choice in this category of three interrelated conceptions of sustainability.

Examples of student responses with three conceptions of sustainability:

Student 18: "Having the ability to maintain good aspects of the world's environment, resources, population."

Student 29: "The use of as little resources as possible with an endeavour to get the most economical use out of them while still maintaining respect for the environment, social and cultural aspects of the resource."

Student 15: "Sustaining something for the future whether it can be cultural or natural."

Student 39: "Keeping the environment in a way in which we will still be able to use its resources in years to come."

The social conception is one that has not been of high visibility in the categories of one, two or three interrelated conceptions and its inclusion in a response may indicate a higher degree of understanding of the conception of sustainability.

The average number of conceptions of sustainability in this analysis of student responses was 1.5 and no students identified the interrelationships between all four conceptions of sustainability, i.e. environmental, economic, social and inter-generational. It is evident that the bringing together of the four conceptions of sustainability may have been difficult for students to achieve and may be related to them not being involved in any sustainability projects, as indicated by members of the focus groups. It has been identified from the literature that people interpret sustainability according to their own values (Birdsall, 2010; Jickling, 2000) and in this research question students may have had no context on which to base their responses. In the next section students were given the general context of a vision for the future on which to base their responses.

4.2.5 Interrelated Conceptions for a Sustainable Future

In the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010), four (expanded to five) conceptions of sustainability that are fundamental to a sustainable future have been identified as: environmental, economic, social and cultural (inclusive of political). These conceptions are referred to as aspects of sustainability in the EfS Senior Secondary Curriculum Guide and are specified as understandings that the Ministry of Education hopes "will remain with our students long after they have left school" (Ministry of Education, 2010, p. 7). As this study was concerned with New Zealand secondary school students, the extent to which students recognised these conceptions of sustainability was examined in a question which asked "What might a sustainable future look like to you?" Analysis revealed the frequencies of environmental, economic, social, cultural and political conceptions of sustainability, and the extent of the interrelatedness of these conceptions. Table 4.4 shows the frequency of occurrence of the conceptions of sustainability identified in the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010). The average number of conceptions in a response was 1.6 out of 5.

Table 4.4

Frequency of Occurrence of Conceptions of Sustainability Identified for a Sustainable Future

Number of inter-related conceptions for a sustainable future	Conception of sustainability mentioned	Frequency of mentions of conception of sustainability	Total number of students identifying interrelated conceptions
0		7	7
1	Environmental	7	
1	Economic	4	
1	Social	1	12
1	Political	0	
1	Cultural	0	
2	Environmental Economic	12	
2	Environmental Political	1	
2	Environmental Social	2	16
2	Political Economic	1	
3	Environmental Economic Social	4	
3	Environmental Political Social	1	6
3	Environmental Social Cultural	1	
4	Environmental Economic Social Political	1	1

The environment was the conception that was identified by most students, as a sole conception (7 students) and in interrelated categories (22 students). Economics was the second most mentioned conception, 4 students mentioning it

as the sole conception and 19 students mentioning it in an interrelated category. The popularity of environment and economics is in line with the high profile of these two conceptions in the literature and the popular media, and corresponds to analysis of interrelated conceptions of sustainability already undertaken, i.e. See Table 4.3. The low frequency of the social, cultural and political conceptions was not unexpected as analysis already undertaken revealed similar findings, i.e. See Table 4.3.

Although all students answered the question, the responses of 7 students were unable to be categorised and these students identified no conceptions of sustainability in their responses. Similarly, no student identified all five conceptions. The degree to which students identified more than one conception of sustainability indicated that over half of the students (24/43) displayed a vision of the future that takes into account several conceptions of sustainability. Examples of student responses indicate that the more conceptions of sustainability a student could identify, the better their understanding of sustainability appears, although some anomalies were apparent.

No conceptions:

Student 3: "The world being without problems, difficult to achieve if people don't conform."

Interestingly, Student 3 gave a definition of sustainability that was close to the WCED definition, although only two interrelated conceptions of sustainability could be identified in the analysis (See 4.2.2). This student appears to have an understanding of sustainability but may have run out of time to answer the last question more fully or they may have felt that the answer they gave to the first question was implied in their answer to this question. This student appears to show deep concern for people/society and expressed this in a way that was not typical of other students in this survey.

One conception:

Student 17: "Enough <u>resources</u> to live off and to survive, in all environments."

Student 35: "Non-affluent countries will rise from poverty."

Two conceptions:

Student 34: "One where resources such as food will still be healthy and accessible for all – endangered species are given protection and the environment in general is impacted in a minimal way as possible."

Student 29: "Moderate economic growth with as little environmental impact as possible."

Three conceptions:

Student 5: "A sustainable future would be when the economy, environment, and society all are treated equally and a decision is not made without considering the ramifications on the other 2."

Student 7: "Enough resources to feed most of the population, flora and fauna to be looked after with riparian planting, pests to be eradicated, a sustainable amount of people on earth, a source of power that doesn't use limited resources, a water purifier system."

Four conceptions:

Student 31: "A healthy environment with a lot of forests and wide open spaces – no dark dirty pollution in the air or unnecessary grey ugly buildings taking up beautiful places – a well-balanced economy, enough money around for everyone to work hard for what they need – no divides in society (no race divides or class divides) and governments who listen to the needs of the country and its people."

Student responses to the question about a sustainable future demonstrate that the majority of students (24/43) have an understanding that holds some, but not all, conceptions of sustainability that the Ministry of Education hopes students will have (Ministry of Education, 2010). It appears that most students have been exposed to ideas about sustainability (particularly the environment and economics), and these could have come from many places, their family and community, the media, social media, and/or school. Examples of the interrelated

conceptions of sustainability which include the social, cultural and political conceptions are fewer and this could reflect a situation where these three conceptions are not as visible for this group of respondents.

Following on from students' visions for a sustainable future, in the next section students are given another context on which to base their responses. This context is in the form of the principles of sustainability which have been identified from the literature. Students' views on issues underpinned by the principles are investigated.

4.3 Student Views about Sustainability Issues

A set of twelve theoretical principles of sustainability have been drawn from the literature to inform the construction of survey instruments in the development of this research. These principles can be found in Chapter 2 and are repeated below:

1. Sustainability comprises environmental, economic, cultural, social, political and inter-generational conceptions, and these are interdependent.

2. Sustainability can be described by the strong sustainability model where the economy is situated within society and society is situated within the environment.

3. Environmental sustainability is underpinned by interdependence, biodiversity and the maintenance of ecological life-supporting systems.

4. Social sustainability is underpinned by equity and social justice.

5. Political sustainability is underpinned by democracy.

6. Cultural sustainability is underpinned by the protection of cultural diversity.

7. Economic sustainability is underpinned by management of finite resources.

8. Inter-generational sustainability is underpinned by a vision for future generations.

9. Constructivism acknowledges the importance of prior learning.

10. Social constructivism acknowledges the importance of social learning.

11. Knowledge is necessary for informed decision making.

12. Knowledge and values are identified as necessary for taking action.

Each principle of sustainability was examined in turn using sets of differential statements that examined students' views, which in turn could be based on knowledge, attitudes or a combination of both. Oppenheim (1992) stated that using single options is not a reliable way to identify attitudes in a survey. A series of differential statements were presented to students to gauge their views on issues relating to the principles of sustainability (listed as 2 to 8 above – ideas relating to Principle 1 were examined in Section 4.2). A pair of statements was provided, one of which represented a sustainable view and the other an unsustainable view, and students were asked to rate their agreement between the statements. Analysis was carried out to determine if students were in agreement with the sustainable view, in agreement with the unsustainable view, or had taken a balanced approach to each issue. A five point scale, where strongly agree with the sustainable view is 1 and strongly agree with unsustainable view is 5, has been used to find the mean and standard deviation for each statement pair. How the questionnaire differentials relate to the principles of sustainability appear in Table 3.1 of Chapter 3. All statements can be found in the questionnaire in Appendix A.

Student ideas about Principles 9, 10, 11 and 12 were investigated in the focus group interview but no data became available as no students in either focus group conducted had been engaged in any sustainability actions.

4.3.1 Environmental Sustainability Principle 3

Environmental sustainability, as described in the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010), is underpinned by interdependence, biodiversity and the maintenance of ecological life-supporting systems. The data in Tables 4.5 and 4.6 show the majority of secondary students agree with or strongly agree with the sustainable view on the environmental sustainability issues canvassed. Of the students who take the sustainable view to these issues, the majority have chosen the strongly agree option.

Table 4.5

Student views on Environmental Sustainability Differential 2.a

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
The loss of one species of living thing in an environment is likely to affect the balance of life in that environment.			The loss of one species of living thing in an environment is unlikely to affect the balance of life in that environment.			
strongly agree	agree	evenly balanced	agree	strongly agree		
24	16	2	1	0	1.5	0.7
(total = 40)			(total = 1)			

Nearly all of the students acknowledge the importance of interdependence, with 40 out of 43 students supporting the view that the balance of life in an environment would be upset by the loss of one species. The concept of interdependence emphasises the relationships between all living things, including people, and the biophysical environment. This concept is one which students might be familiar with through the study of science at all curriculum levels at school (Ministry of Education, 2007) and one which would be reinforced outside school and often receives media attention, e.g. threats to Maui's dolphin (Dickey, 2013) and kauri dieback disease (3news, 2014).

Table 4.6

Student views on Environmental Sustainability Differential 2.b

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
It is important that all systems (e.g. water, nutrients) that support life in an environment are maintained.			Life forms will adapt no matter what occurs in their environment.			
strongly agree	agree	evenly balanced	agree	strongly agree		
27	7	7	1	1	1.7	1.0
(total = 34)			(total = 2)			

Most students (34 /43) agree that the maintenance of ecological life-supporting systems in the environment is important. It is interesting to note that seven students selected the evenly balanced view and two chose the unsustainable option which supported the idea of species adapting to a changing environment. This could be interpreted as students interpreting the theory of evolution incorrectly and/or being confused about the time scale involved. Interestingly, one student chose the unsustainable view for both differentials, and another student agreed with the sustainable view for 2.a and the unsustainable view for 2.b.

Interdependence and the maintenance of life-supporting systems are issues that students should be familiar with through the study of science at all curriculum levels at school (Ministry of Education, 2007). It is perhaps not surprising then that the majority of students take the sustainable view if the delivery of the science curriculum has been in accordance with the *New Zealand Curriculum*.

4.3.2 Social Sustainability Principle 4

The conception of social sustainability has been examined in three parts to fall into alignment with conceptions of sustainability in the EfS Senior Secondary Curriculum Guide for EfS (Ministry of Education, 2010). Cultural and political differentials have been analysed separately from the purely social conception, and shows the difference in views that students take on these sustainability issues. In the EfS Senior Secondary Guide, social sustainability is underpinned by equity and social justice where groups and individuals " should have equal opportunity in relation to rights, resources and services" (Ministry of Education, 2010, p. 10). The data in Table 4.7 shows half of the students (21 out of 42) agree with or strongly agree with the idea of equity when applied to resources. One student did not record a response for this differential.

Table 4.7

Student views on Social Sustainability Differential 2.e

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
Each person on Earth today is entitled to a fair share of the resources that exist (e.g. oil, minerals, food).			It is not possible for each person on Earth today to have a fair share of the resources that exist (e.g. oil, minerals, food).			
strongly agree	agree	evenly balanced	agree	strongly agree		
16	5	12	8	1	2.4	1.2
(total = 21)			(total = 9)			

This result is interesting in that "equity, through fairness and social justice" is a value that appears in the *New Zealand Curriculum* (Ministry of Education, 2007, p. 10) and as such, one which should be encouraged in schools. One explanation

for this could be the importance placed on consumption in our capitalist society, so this may not be an unusual standpoint for some students to take.

It is interesting to note that twelve students took the evenly balanced view that corresponds with the idea that even though everyone is entitled to a fair share of resources it is not possible for this to occur in societies where wealth is disproportionate. The views of students show much more agreement with a sustainable view of the political and cultural sustainability issues in the following sections.

4.3.3 Political Sustainability Principle 5

Political sustainability is underpinned by democracy according to the EfS Senior Secondary Curriculum Guide and it "refers to political systems where power is vested in the people" (Ministry of Education, 2010, p. 11). The data in Table 4.8 shows the majority of students (34/43) agree with or strongly agree with the view that democracy is the preferable option in society. In a democratic society like New Zealand a result that is in line with the idea of free expression and respect for all people's views is not un-expected.

Table 4.8

Student views on Political Sustainability Differential 2.i

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
Everyone should be entitled to express their views about how they want to live their lives.			Some people's views about how they want to live their lives are not worthy of consideration.			
strongly agree	agree	evenly balanced	agree	strongly agree		
24	10	8	0	1	1.7	0.9
(total = 34)			(total = 1)			

Eight students agreed with the evenly balanced view that supports the idea that even though people should be able to express their views, these might not be worth considering. The one student that strongly agreed with the unsustainable view in 2.i also strongly agreed that people in authority should make all the decisions, 2.j.

Table 4.9

Student views on Political Sustainability Differential 2.j

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
Everyone's views should be respected and taken into consideration when decisions are made that impact on people's lives.			People in positions of authority should make decisions for their people.			
strongly agree	agree	evenly balanced	agree	strongly agree		
27	12	0	1	3	1.6	1.1
(total = 39)			(total = 4)			

Students' responses are polarised in differential 2.j and no students have chosen the evenly balanced view in this instance. It is interesting that four students agree that people in authority should make decisions for them and students choosing this option may be from an authoritarian background or an ultra-conservative religious family. Interestingly, two students who strongly agreed with this view in 2.j, agreed and strongly agreed that everyone should be entitled to express their views about how they want to live their lives (2.i), a view that seems to contradict their view that people in authority should make all the decisions.

It is stated in the *New Zealand Curriculum* that students "will be encouraged to value: equity, through fairness and social justice;" (Ministry of Education, 2007,

p. 10) and the high degree of agreement with the political issues canvassed could be explained by the implementation of the curriculum in schools.

4.3.4 Cultural Sustainability Principle 6

In the EfS Senior Secondary Guide, cultural sustainability is underpinned by the protection of cultural diversity that "encompasses the diverse world views that inform different ways of thinking and knowing" (Ministry of Education, 2010, p. 11). The data in Table 4.10 shows the majority of students (33/43) agree with or strongly agree with the view cultural diversity should be preserved.

Table 4.10

Student views on Cultural Sustainability Differential 2.m

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
Art, customs, traditions and language of all cultures are important and should be preserved.			Mixing of art, customs, traditions and language from different cultures to create one single culture is desirable			
strongly agree	agree	evenly balanced	agree	strongly agree		
25	8	8	1	1	1.7	1.0
(total = 33)			(total = 2)			

Interestingly, eight students chose the evenly balanced view and only two students chose the unsustainable option that a single culture would be desirable. This could be explained by conflicts in the world that are often along ethnic lines and students may see cultural differences leading to conflict.

Diversity is a value in the *New Zealand Curriculum* (Ministry of Education, 2007) which encourages students to value "our different cultures, languages, and heritages" (p. 10), so it is not surprising that students are taking a sustainable view to the issue highlighted in 2.m above. The increasing diversity of New Zealand society may also explain these findings as students are exposed to more diverse cultures at school and in their community.

Table 4.11

Student views on Cultural Sustainability Differential 2.n

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
A Māori worldview that emphasises how we are connected to the environment shows us how we should live our lives.			A Māori worldview that connects us to the environment is mythical and not relevant today.			
strongly agree	agree	evenly balanced	agree	strongly agree		
3	7	17	10	6	2.8	1.1
(total = 10)			(total = 16)			

Responses to the differential that dealt specifically with a Māori worldview reflects that a larger proportion of students (16/43) thought that a Māori worldview was not relevant today, when compared with those (10/43) who acknowledged its relevance and importance. This is interesting as between 30% and 35% of the population of both schools are of Māori descent, although no specific statistics were gathered from the survey participants to reveal the proportion of Māori respondents. More than a third (17/43) of students took the evenly balanced view to this issue. This could reveal a situation where the majority of students were uninformed about this subject even though the *New Zealand Curriculum* states that all "students have the opportunity to acquire knowledge of te reo Māori me ōna tikanga" (Ministry of Education, 2007, p. 9)

and most of these students would have been in a school learning environment since the *New Zealand Curriculum* was introduced.

4.3.5 Economic Sustainability Principle 7

Economic sustainability is underpinned by management of finite resources in the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010). The data in Table 4.12 shows the majority of students (33/43) agree with or strongly agree with the view that people should manage resources so that they are not depleted.

Table 4.12

Student views on Economic Sustainability Differential 2.f

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
People today should not be able to use as much of a resource as they need, because the resource might run out.			People today should be able to use as much of a resource as they need, even if the resource may run out.			
strongly agree	agree	evenly balanced	agree	strongly agree		
15	18	5	2	2	2.0	2.0
(total = 33)			(total = 4)			

Management of resources has a high profile in New Zealand as we have a resource based economy (Pawson, 2012) and depletion of resources often draws much media attention, e.g. fishing quota (Dean, 2013). With the high profile of resource management and the introduction of the Resource Management Act (Ministry of Education, 1999) and references to finite resources in the *New Zealand Curriculum* (Ministry of Education, 2007), it might be not un-expected that students would take a sustainable view to the management of finite resources.

It is interesting that only a small number of students (4) took a more selfish view to resource use, and five students made an evenly balanced choice. The students choosing the evenly balanced view may be conflicted between present needs and future needs and were unable to decide.

4.3.6 Inter-generational Sustainability Principle 8

Inter-generational sustainability is underpinned by a vision for future generations. The data in Table 4.13 and Table 4.14 shows the majority of students agree with or strongly agree with the view that present generations should take responsibility for how future generations will be affected by decisions that are made today, especially when it comes to the use of resources.

Table 4.13

Student views on Inter-generational Sustainability Differential 2.k

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
Decisions made by people today should not impact negatively on future generations.			Decisions made by people today should consider current generations first as we do not know what future generations will need.			
strongly agree	agree	evenly balanced	agree	strongly agree		
16	14	7	3	3	2.1	1.2
(total = 30)			(total = 6)			

The majority of students (30/43) are in agreement that present generations need to consider their impact on the lives of future generations and only a small minority (6/43) take the more selfish or uncertain view that present generations are more important or that their needs are more known. Four of the six students choosing

this latter view did not agree with a similar option when referring to resources and future generations (2.g) and one student failed to choose a differential. These students may have interpreted the differential 2.k in a way that was unintended by the researcher.

Table 4.14

Student views on Inter-generational Sustainability Differential 2.g

Sustainable view			**Unsustainable view**		**Mean**	**Standard deviation**
People today need to manage the way they use resources so that there are resources left for future generations.			People in the future will need to find their own resources.			
strongly agree	agree	evenly balanced	agree	strongly agree		
30	10	2	1	0	1.4	0.7
(total = 40)			(total = 1)			

When considering resources, 40 students agreed or strongly agreed that present generations should leave resources for those in the future. The high profile of the management of resources in New Zealand may account for such findings in relation to future generations.

The *New Zealand Curriculum* (Ministry of Education, 2007) highlights a focus on the future in the principles, and the guardianship of finite resources in the science learning area. If the curriculum is being implemented in accordance with Ministry of Education expectations, these results may be a reflection of this occurring.

4.3.7 Strong Sustainability Principle 2

Sustainability can be described by the strong sustainability model (Model A in Table 4.17) where the economy is situated within society and society is situated within the environment. In this model economy is constrained by society and society is constrained by the environment. Consideration must be given to all three when examining issues of sustainability (Ministry of Education, 2010). The data in Table 4.15 and Table 4.16 shows the spread of opinion generated in examples below where the view of strong sustainability is at one extreme and the view of weak sustainability is at the other.

As both differentials were concerned with economic growth and how this could be prioritised over the environment (2.h) and cultural and social concerns (2.o), it is interesting to note that only a small minority of students would prioritise economic growth. This may reflect a view that economic growth causes many of the problems that exist and is never part of the solution, even though the WCED stated that they were "both equally relevant for improving the lot of humankind" (WCED, 1987, p. 32).

Table 4.15

Student views on Strong Sustainability Differential 2.h

View of weak sustainability			**View of strong sustainability**	
Economic growth should be given priority over protection of the environment.			Protection of the environment should be given priority over economic growth.	
strongly agree	agree	evenly balanced	agree	strongly agree
3	3	10	15	12
(total = 6)			(total = 27)	

A majority of students identified with the idea that protection of the environment should be given priority over economic growth as 27/43 students chose this option, reflecting strong sustainability. The importance placed on the environment in our society reflects this view.

Table 4.16

Student views on Strong Sustainability Differential 2.o

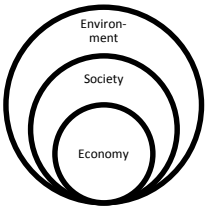
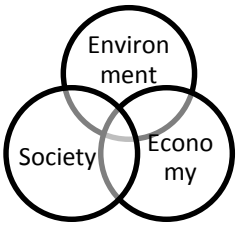
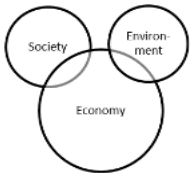
View of weak sustainability			**View of strong sustainability**	
Economic growth should be given priority over cultural and social concerns.			Cultural and social concerns should be given priority over economic growth.	
strongly agree	agree	evenly balanced	agree	strongly agree
3	5	20	7	8
(total = 8)			(total = 15)	

A large proportion of students (20/43) chose the evenly balanced option which does not give priority to economic growth or cultural and social concerns. An almost equivalent proportion of students (15/43) supported the view that cultural and social concerns should be prioritised over economic growth, reflecting strong sustainability, and only a minority (8/43) chose options to reflect weak sustainability.

Table 4.17 shows the results of questioning related to graphic representations of the models of weak and strong sustainability. Five of the eight students who chose the strong sustainability model did so because they thought the size of the environment demonstrated its importance.

Table 4.17

Frequency of model of sustainability chosen by secondary school students and reasons for choice

Model	Model Graphic	Number of respondents choosing model	Reason linked to interaction of conceptions	Reason linked to balance between conceptions	Reason linked to interaction and balance	Reasons linked to size showing importance	Reason linked to size showing importance and balance
A		8	3			5	
B		32	8	11	4	8	1
C		1				1	

In the questionnaire the majority of students (32/41) chose the model of weak sustainability (Model B), with reasons relating to balance, interaction and importance being mentioned most often. This indicates that students are aware that the three conceptions relate to each other but are not aware that the model indicates sustainability can only exist where the three circles overlap.

Students have demonstrated from their responses to the differentials and the model questions that they may have been confused by what the models of

sustainability represent. But they are aware of the conceptions that come together to form these sustainability models: environment, society and economy. This could be explained by a response from the focus group that shows a lack of familiarity with the models of weak and strong sustainability. These models were presented to students without any descriptions about the nature of the relationships that they were representing and may have been misinterpreted (PCE, 2002). No students in the focus group interviews knew of the background to the models or had been exposed to any of them before this survey. But some students had knowledge of Venn diagrams from maths (Focus Group 2) and may have been familiar with the type of relationships that exist between sets in statistics (Ministry of Education, 2007) and were able to transfer this knowledge to this unfamiliar situation.

After exploring the responses to sets of differentials it became clear that a pattern was emerging in the way groups of students viewed certain sustainability issues. How individuals viewed these sustainability issues and the related principles of sustainability is discussed next.

4.3.8 Sustainability Rating

Scoring of individual respondents' opinions was done to give an indication of their view of eight sustainability principles using the differentials from the questionnaire, except 2.d, 2.h and 2.o which could not be manipulated to produce a score. Each view was given a score so an overall sustainability rating could be calculated for each individual and these scores appear in Table 4.18.

Table 4.18

Rating of Sustainability View

Opinion	Strongly agree with sustainable view	Agree with sustainable view	Balanced view	Agree with unsustainable view	Strongly agree with unsustainable view
Score	5	4	3	2	1

Each individual had their sustainability rating calculated by adding together all scores for the 12 differentials used. A sustainability rating that approximates 36 would identify a student whose views were balanced between the extremes of strongly agree with the unsustainable view for all differentials (12) and strongly agree with the sustainable view for all differentials (60).

Figure 4.3 illustrates the sustainability rating of all students in the survey and the shape of this graph shows that most students have high scores and generally agree with the sustainable view of the issues identified in the 12 differentials. Only three students recorded a sustainability rating less than 36 and this indicated that a small minority of students do not hold a view that agrees with the eight sustainability principles. The mean score of 49 (SD 6.2) shows that most students selected sustainable choices on the issues presented to them and they hold a view that supports most of the eight principles of sustainability.

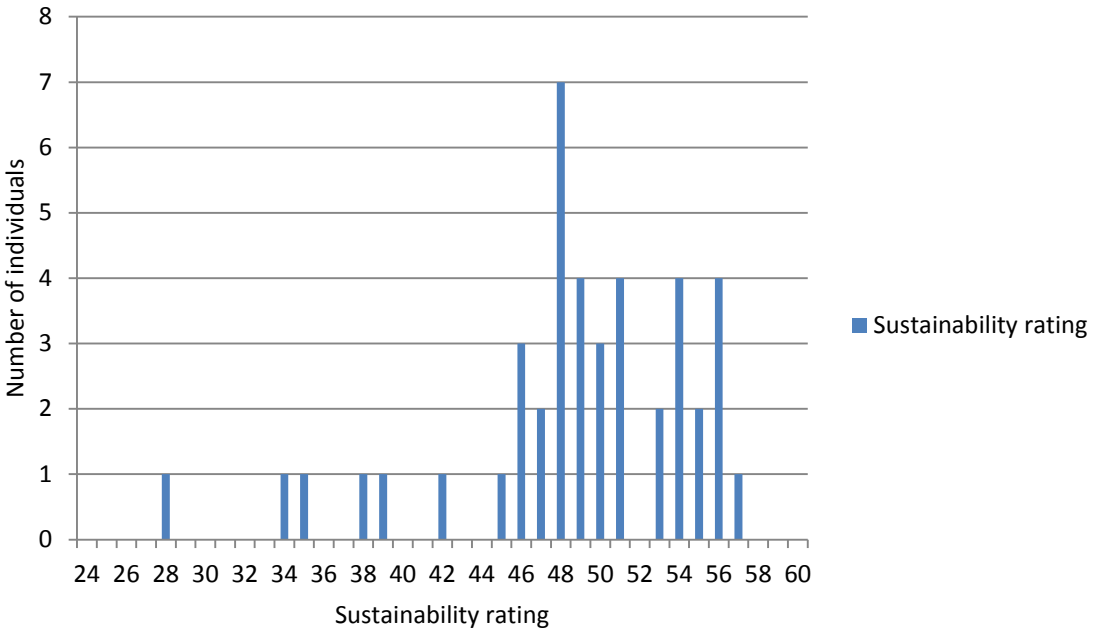


Figure 4.3. Sustainability rating of individuals

One explanation for this could be the importance that has been placed on sustainability within New Zealand schools with its high profile in the curriculum (Ministry of Education, 2007) coupled with the implementation of the curriculum in schools. It could also be a reflection of the visibility of sustainability internationally through the UN (WCED, 1987) and nationally through government departments (Laws, 2004).

4.4 Student Conceptions compared to their views about Sustainability Issues

Students' individual sustainability ratings were compared with the number of conceptions of sustainability identified by them in Figure 4.4. The response given when students were asked to respond to the question "What does the word sustainability mean to you?" was analysed and the conceptions of sustainability mentioned counted. The number of conceptions identified by each individual student is an indication of the complexity of their understanding of sustainability, i.e. the more conceptions a student was able to identify the more complex their

understanding of sustainability is. This relationship had been identified by Birdsall (2006) in a study of Year 8 students.

A sustainability rating was produced from the differentials to signal if students take a sustainable or unsustainable view to issues featured. For each individual respondent, this sustainability rating was compared to the number of conceptions of sustainability they held, to detect any trends. A modest fit where $R^2 = 0.1605$ was identified in this analysis (Cohen et al., 2007). This modest fit shows that generally a student with a complex conception of sustainability has a high sustainability rating, although some anomalies do exist.

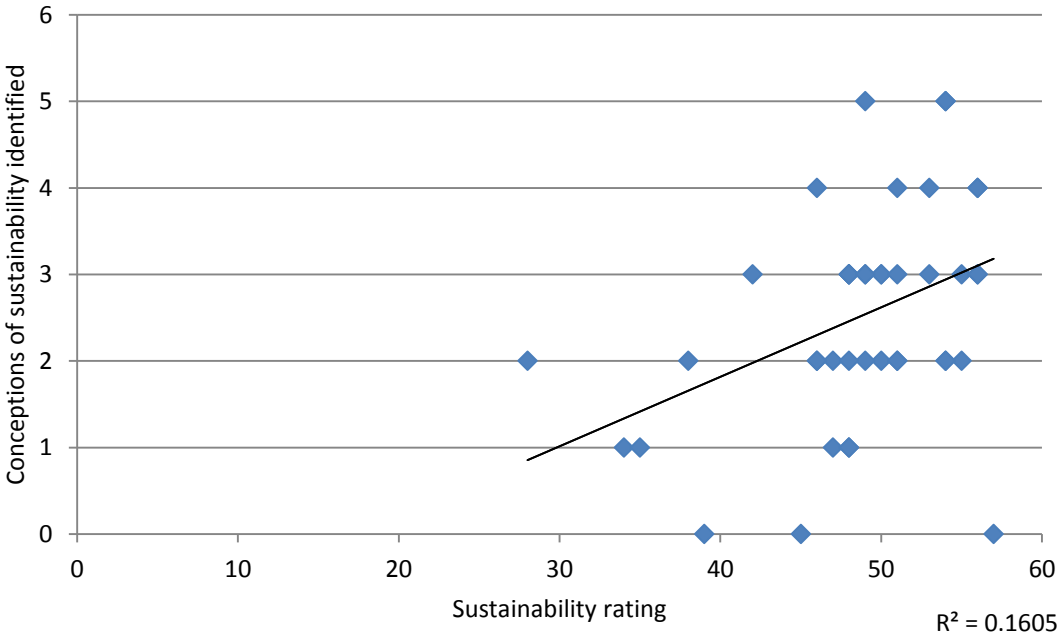


Figure 4.4. Conceptions of sustainability identified by individuals compared to their sustainability rating

Three students were unable to give a conception of sustainability that could be categorised. Two of these students had sustainability ratings under the mean (39 & 45) and one student scored the highest sustainability rating of 57. A possible

explanation of this data could be that these students have low levels of literacy and were unable to express themselves using written language or did not understand the language of the questionnaire and in particular the differentials. Removing these three students from the analysis and recalculating the R^2 value produced a value of 0.2092 which also demonstrates a modest fit (Cohen et al., 2007). Interestingly, the student with the lowest sustainability rating (28) was able to identify two conceptions of sustainability.

Excluding the student with the highest sustainability rating (57), there were 19 students that had a rating above the mean of 49. These students identified between two and five conceptions of sustainability, with the majority (13/19) identifying two or three conceptions. In this category most students seem to have a reasonable understanding of what sustainability is.

Four students had a sustainability rating at the mean of 49. One of these students identified five conceptions of sustainability, with the other three identifying one or two. In this category, students' understanding of sustainability is varied.

Excluding two students who did not identify any conceptions of sustainability, there were 17 students who had sustainability ratings below the mean of 49. None of these students were able to identify five conceptions of sustainability and only one identified four. A large proportion of the students (11/17) were able to identify either two or three conceptions, and the five remaining students were only able to identify one conception. In this category, most students have some understanding of sustainability but it appears to be not as high as those who have a sustainability rating above the mean of 49.

For the majority of students, these findings seem to reflect a relationship that supports the idea that the more conceptions of sustainability a student can

identify, the more a student knows about the concept of sustainability, the more they will be inclined to agree with the sustainable view of a sustainability issue.

4.5 Summary

The findings presented in this chapter have demonstrated that the majority of secondary school students (40/43) in the survey have some conception of sustainability, ranging from very simple (one conception) to quite complex (several interrelated conceptions). Students were equally concerned with the purpose and nature of sustainability and most frequently mentioned the conceptions of maintaining something, environment, resources and future generations. The average number of self-identified conceptions mentioned by students was 2.5.

The majority of students (37/43) recognised environmental, economic, social and inter-generational conceptions of sustainability that had been identified from the literature. Less than half of the students surveyed (19/43) were able to identify more than one of these conceptions and no students were able to identify all four. The average number of conceptions that had been identified from the literature that were mentioned by students was 1.5/4.

When the conceptions of sustainability that students held were compared with the conceptions of sustainability that the Ministry of Education stated were fundamental to a sustainable future, i.e. environment, economy, society and culture (including political), the average number mentioned by students was 1.6/5.

Other findings that emerged from the data were students' views on issues relating to the principles of sustainability that had been drawn from the literature. The majority of students identified with the sustainable view on the environmental,

political, cultural, economic and inter-generational issues presented to them. In questions regarding weak and strong sustainability most students identified the interrelatedness of the environment, society and economy in their responses, and agreed with strong sustainability in regard to prioritising the environment over the economy. But, only a minority agreed with strong sustainability by not prioritising culture and society over economy.

When the data associated with the student's views of questions of sustainability were analysed, it showed a generally high rating towards sustainability for most students. A sustainability rating coincides with their agreement with the principles of sustainability that were presented to them and shows that most students hold views which support sustainability.

When students' reported conceptions of sustainability were compared to their sustainability rating, a modest fit was identified. This finding demonstrates that students with a high sustainability rating may hold a more complex conception of sustainability than students with a low sustainability rating. A question can be posed that if students understand what sustainability is, i.e. they hold the complex conception of sustainability that is promoted by the Ministry of Education, will they have higher agreement with the principles of sustainability?

These findings are now explored and discussed in the final chapter of this thesis.

Chapter 5 Discussion

5.1 Introduction

This chapter focuses on the main findings described in Chapter 4 in relation to the literature that has been reviewed. The discussion is presented in three sections: student conceptions of sustainability, student views about sustainability issues, and the relationship between the students' conceptions and their views about sustainability issues. Conclusions of the study, implications and limitations are also presented.

5.2 Students' Conceptions of Sustainability

In this research students' conceptions of sustainability were examined from three angles:

- student self-identified conceptions of sustainability
- interrelated conceptions of sustainability
- Ministry of Education conceptions of sustainability for a sustainable future

Conceptions of sustainability that students initially identified came from their responses to the question 'What does the word sustainability mean to you?' These student self-identified conceptions were found by manual coding and the development of common themes amongst responses. Interrelated conceptions of sustainability that had been revealed from a review of the literature included: environmental, economic, social and inter-generational. These interrelated conceptions were searched for in student responses to the question above and analysed by manual coding. In the EfS Secondary School Curriculum Guide (Ministry of Education, 2010), four (expanded to five) conceptions of sustainability that are fundamental to a sustainable future have been identified as: environmental, economic, social and cultural (including political). These Ministry of Education conceptions were searched for in responses to the question 'What might a sustainable future look like to you?'

Analysis revealed differences between the conceptions of sustainability that students held and the conceptions of sustainability that educators and scholars see as important for students to hold.

5.2.1 Student self-identified conceptions of sustainability

Encouragingly, 40 out of 43 students surveyed held some conception of sustainability, and the complex nature of sustainability was mirrored in the wide range of responses provided by participants. This indicates that students have been exposed to ideas about sustainability from which they have developed their own conception. Meadows (1993) stated that Piagetian theory suggests conceptions are constructed through the processes of assimilation and accommodation, and are created from pre-existing structures of knowledge. Therefore, every individual will develop their own unique conceptions, and these understandings can be impacted upon by the values of each individual (Birdsall, 2010; Jickling, 2000). Learning occurs through social interaction (Duit & Treagust, 2003; Novak, 2002; Reiss & Tunnicliffe, 1999) meaning that student understandings about sustainability will be influenced by their interactions with others. The participants may have been exposed to ideas about sustainability from a range of sources: their family and/or community, the media, social media, teachers and/or peers at school, and each of these exposures may have had some bearing on the conception of sustainability that each participant held.

The wide range of responses recorded was sorted into 14 different conceptions of sustainability: environment, society, economy, culture, maintaining something, resources, something in balance, everlasting supply, impact, self-sufficiency, meeting needs of people, future generations, present generations and the future. These conceptions are similar to those that had been identified by students surveyed by other researchers (Birdsall, 2006; Brady, 2006; Summers et al., 2004; Walshe, 2007). On the other hand, some conceptions that had been recorded by other researchers such as aesthetics, seasonality, controversy and geographical scale (Summers et al., 2004; Walshe, 2007) were absent in this study. Students

in the focus group interviews felt that they had not been involved in any explicit sustainability projects at school and this may account for the absence of some conceptions which had been found by other researchers.

Recent research by Birdsall (2006) and Walshe (2007) has shown that if students possess a conception of sustainability it is likely to be only a simple, one dimensional conception. This is in contrast to findings from this study where only a minority of students (5/43) possessed a simple conception of sustainability. Simple conceptions referred to by respondents in this study were: maintaining something, environment, the future and being self-sufficient. All other students who held conceptions of sustainability held more complex conceptions with two (13/43), three (14/43), four (5/43) or five (3/43) dimensional conceptions. The students in this study were older than those in the studies by Birdsall (2006) and Walshe (2007), and may well have had more experiences from which to develop "new knowledge that they can use to make sense of the world" (Ministry of Education, 2009, p. 8) and to possibly develop their own conceptions of sustainability. The average number of dimensions of conceptions held by students was 2.5 and this compares to an average of 2.9 for post-graduate students in a similar study (Summers et al., 2004). Post-graduate students would have been exposed to more knowledge and they may well have had more experiences than secondary students, and therefore had the opportunity to develop more complex conceptions of sustainability. It is possible then that to develop complex conceptions of sustainability students need to be exposed to more knowledge.

Further analysis examined the extent to which students identified the combinations of commonly-held conceptions of sustainability in the literature and these findings are discussed next.

5.2.2 Interrelated conceptions of sustainability

Birdsall (2006) stated the WCED definition of sustainability (WCED, 1987) was one that provided the broad approach to sustainability that reflects the

interrelatedness of the environmental, economic and social conceptions of sustainability within an inter-generational setting. Analysis of student responses to the question 'What does the word sustainability mean to you?' into these four key conceptions of sustainability showed that the majority of respondents (37/43) identified at least one of them, with the environmental conception being the one that was referred to most often. This is consistent with findings of Brady (2006) and Summers et al. (2004) and may reflect the high profile of the environment and its importance in our society.

No student identified all four conceptions of sustainability although many students identified two (10/43) or three (9/43) components. The average number of conceptions of sustainability in student responses was 1.5/4. In this study it appears that students lacked the understanding of the interrelatedness of all conceptions of sustainability and this is in line with other research in this area (Birdsall, 2006; Brady, 2006; Summers et al., 2004; Walshe, 2007; Walshe, 2008). Walshe (2008) noted that few students in her study were able to show evidence of any understanding of the interrelatedness of conceptions within concept maps they drew but when interviewed some students attempted to link conceptions together.

Education for Sustainability is an area that can be taught and examined in the senior secondary school and the Ministry of Education has provided resources to encourage fair assessment in this area. An expanded list of conceptions of sustainability has been provided to support the teaching of Education for Sustainability achievement standards at Level 2 (Year 12) and Level 3 (Year 13) (Ministry of Education, 2010). Student conceptions of sustainability were compared with the conceptions of sustainability identified by the Ministry of Education (environmental, economic, social, cultural and political), and this is discussed next.

5.2.3 Ministry of Education conceptions of sustainability for a sustainable future

Environmental, economic, social, cultural and political conceptions of sustainability have been identified from the EfS Senior Secondary Curriculum Guide (Ministry of Education, 2010) as aspects of sustainability that are fundamental to a sustainable future and should be taught and learnt in the senior school. When asked "What might a sustainable future look like to you?' the majority of respondents (35/43) identified at least one of these five conceptions of sustainability, with the environmental conception being referred to most often. This is consistent with findings of Brady (2006) and Summers et al. (2004), and again may reflect the high profile of the environment for students.

No student identified all conceptions of sustainability, although many students identified two (16/43) or three (6/43). Only one student identified four and the average number of conceptions identified by students was 1.6/5. From these findings it is apparent that students lacked the understanding of the relatedness of all conceptions of sustainability and this is in line with findings from other studies (Birdsall, 2006; Brady, 2006; Summers et al., 2004; Walshe, 2007; Walshe, 2008). Several students involved in the focus group interviews remembered studying sustainable fishing in Year 10, but none felt they had been involved in any sustainability projects since then. If students are not studying EfS at the senior level, it seems unlikely they would be exposed to all five conceptions of sustainability and how they are related to each other in sustainability, and hence may not be able to identify them.

Most students in this study identified the environment as the most frequently mentioned conception and this could be interpreted as environment being the most understood, well known or important conception to them. To investigate these individuals' views of sustainability in more depth, student views of sustainability issues underpinned by the principles of sustainability were examined and this is now discussed.

5.3 Student Views about Sustainability Issues

A series of differential statements, each related to a principle of sustainability determined through literature review and defined in Section 2.10, was constructed to get a better understanding of how students viewed sustainability issues. Students' views on specific issues and how they viewed sustainability overall was used to determine students' views on sustainability issues. It was not possible to investigate four of the principles (9, 10, 11 & 12) related to actions due to lack of data.

5.3.1 Views of Sustainability Issues

The *New Zealand Curriculum* encourages students to not only explore sustainability issues but to use "new knowledge and technologies to secure a sustainable social, cultural, economic, and environmental future for our country" (Ministry of Education, 2007, p. 8). This can be interpreted as encouraging students to make sustainable choices by using their knowledge and understanding. For this to occur, students would need to possess a sustainable outlook when considering relevant issues. Each of the differentials was related to a principle of sustainability that had been drawn from the literature, and students were asked to rate their view on the differential. Most of the differentials were constructed to allow a choice that reflected either a sustainable view, an unsustainable view or a balanced/uncertain view.

Although the list of issues was limited, most students agreed or strongly agreed with the sustainable view for most of the environmental, social, political, cultural, economic and inter-generational sustainability issues presented to them in the differentials. Responses for agreed and strongly agreed were considered together as the variation in degrees of agreement was unable to be determined in the survey. Responses to the differential whether a Māori worldview was relevant to our lives today indicated that only a minority of students took a sustainable view on this issue. This seems at odds with a curriculum that "acknowledges the principles of the Treaty of Waitangi" (Ministry of Education, 2007, p. 9) and may reflect some confusion and/or lack of understanding by students about this view.

Two differentials dealt with the variance between strong and weak sustainability models and asked students to rate their view on these models. Strong sustainability is the model of sustainability that is promoted by the Ministry of Education to demonstrate the interrelatedness of all conceptions of sustainability and expresses the idea that "any sustainability-related issues must be considered holistically" (Ministry of Education, 2010, p. 8). Students showed preference for protecting the environment over economic growth, and a mixture of views relating to economic growth versus cultural and social concerns. These findings indicate that students appeared to have some affinity with strong sustainability but are not fully convinced about how it works.

In contrast to these findings, a majority of students chose the model of weak sustainability over strong sustainability with reasons relating to balance, interaction and importance mentioned most often when presented with graphic representations of both models. Students appear to be aware that environment, society and economics are conceptions of sustainability but are confused and /or uninformed about how they interact and relate to each other. Comments made by students in one focus group interview (Focus Group 2) indicate that students were unaware of the weak and strong models of sustainability and may have interpreted these models in a way that was unintended because of lack of knowledge of these models.

Findings show that most students would choose a sustainable option if presented with the choice. To further investigate the position of individuals, each respondent was given an individual score to rate their sustainability choices, according to their responses to these differentials.

5.3.2 Sustainability Rating

The findings indicate that the majority of students held sustainable views over a range of sustainability issues related to eight principles of sustainability. These students were scored highly in the sustainability rating in Section 4.3.8. A small

minority of students indicated less sustainable views on the issues and recorded lower scores. As many students demonstrated agreement with principles of sustainability, this suggests they are more likely to choose to agree with a sustainable view for other issues not presented in the survey than to choose to agree with an unsustainable view. This is in line with the key competency of participating and contributing in the *New Zealand Curriculum* where students are expected to be actively involved in communities because 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).

A final analysis was undertaken to examine the consistency of each student's conceptions about sustainability with their views on a range of issues underpinned by sustainability principles. The findings from this analysis are discussed next.

5.4 Relationship between Student Conceptions of Sustainability and their views about sustainability issues

Students' conceptions of sustainability were compared to their views about sustainability issues by graphing the number of conceptions of sustainability each student held, against their individual sustainability rating (a measure of their sustainability thinking on issues). Using this method, it was possible to show a modest fit existed between the two sets of data. This could be interpreted to demonstrate that the more complex a conception of sustainability that a student possesses, the higher their sustainability rating, i.e. the more they tend to make sustainable choices on issues, presumably based on their understanding of the principles of sustainability. It appears that students may still make sustainable choices without a deep understanding of conceptions of sustainability, but would they make more sustainable choices if they held more complex conceptions of sustainability? Certainly it is likely they would understand more about the interrelationships that exist between the conceptions of sustainability and be able to promote the strong sustainability model in decision making (Ministry of Education, 2010).

But having an understanding of the concept of sustainability may not be all that is needed for sustainable decision making and inevitably taking action for sustainability. Research has shown that increased environmental knowledge and environmental awareness does not always lead to pro-environmental behaviour (Kollmuss & Agyeman, 2002). Education was one factor in a complex framework consisting of internal influences such as motivation, values, attitudes, emotion, locus of control, responsibilities and priorities, and external influences such as institutional, economic, social and cultural factors to increase favourable behaviours (Kollmuss & Agyeman, 2002). Following on from this, it appears that an increase in knowledge and awareness about sustainability developed from an understanding of the concept of sustainability is necessary but not the only factor needed to increase sustainable choices for a sustainable future.

5.5 Conclusions

The majority of students (40/43) held some conception of sustainability, but this proportion fell slightly when compared with the conceptions that other educators and scholars thought students should hold, e.g. conceptions identified in the literature (37/43) and conceptions identified by the Ministry of Education (35/43). Summers et al. (2004) noted a similar discrepancy between the conceptions of sustainability that post-graduate students held and those a government-established body presented as important for these students to acquire.

Some students held complex conceptions of sustainability that indicated recognition of the interrelationship of conceptions. There were no students that indicated an expert understanding of sustainability, including all conceptions by the criteria applied. Teachers are in a position to help students build on their understanding of sustainability to form expert conceptions. For students to be able to develop these expert conceptions of sustainability identified in the literature (UNESCO, 2005) and by the Ministry of Education, they must be exposed to these expert conceptions of sustainability and this should occur during their schooling (Ministry of Education, 2007). If this teaching and learning does

not occur, then students will continue to hold alternative conceptions of sustainability (Meadows, 1993; Ministry of Education, 2009).

For teachers to provide learning experiences needed for students to develop expert conceptions they need to develop their own understandings first and hold the expert conceptions of sustainability that have been identified by educators and scholars. Once this has occurred, educators need to be supported to translate the complex ideas about sustainability so they can present these in a genuine context for their students (Eames et al., 2008).

From the analysis of students' views of sustainability issues and individuals' sustainability ratings, it would appear that the majority of students have some understanding of most, but not all, principles of sustainability surveyed. It also appears that although most students can identify connections exist between conceptions, they do not fully understand how the conceptions of sustainability are interrelated. Walshe (2007) noted that students in her study also lacked "the true understanding of these concepts that would enable them to see the interconnectivity between them" (p. 143), a feature that is reflected in findings noted here. It is only by being involved in programmes led by someone who understands the interrelatedness of the conceptions of sustainability that students can hope to be in a position to develop this understanding themselves.

The preference shown by students to prioritise the environment over other conceptions is a preference that has been identified in other studies (Brady, 2006; Summers et al., 2004) and could be due to many factors, e.g. the affinity most New Zealanders have with their environment through outdoor activities, the high profile of the environmental movement, threats to the environment receive a great deal of media attention, the importance of tourism to the economy, a large presence in parliament of the Green Party and/or its importance in education circles. The inability of some teachers to move from EE to EfS and develop their own understanding of sustainability education may have some influence on this

finding. Whatever combination of factors contributes to the importance of the environment for students, it is one which might be worthy of further study.

A modest fit existed between the number of sustainability conceptions held by a student and their sustainability rating on a range of issues. This indicates that a student who was able to identify a number of conceptions of sustainability is more likely to make a sustainable choice if given the opportunity. Following on from this, it can be concluded that students who are equipped with a complex conception of sustainability would be more likely to have the knowledge to prepare them to make the decisions for a sustainable future (Ministry of Education, 2007). Although not mandated in the curriculum, the importance of sustainability for students is clear (Ministry of Education, 2007), especially when coupled with international calls for education to provide a basis for a more sustainable society (UNESCO, 2005). As the future may depend on individuals making choices which are sustainable it appears that students need an understanding of sustainability. But is an understanding of sustainability enough? Education is one factor of many that contributes to an understanding of sustainability that will lead to active decision making for a sustainable future.

Encouragingly, most students in this study have some conception of sustainability, and most students agreed with a sustainable option when given the choice. This bodes well for a time in the future when these students are making sustainable choices for themselves, their family and their community. But what of the students who may not be making sustainable choices, what are the effects of a population making choices when they do not have any understanding of sustainability? The implications of the study are discussed next.

5.6 Implications

The future relies on people making sustainable choices. Human activity has caused "large-scale environmental and social damage" (Littledyke et al., 2009, p. xi) which has resulted from people making choices that have proven to be

unsustainable. If this type of thinking continues the same kind of damage will continue and the future for our country will be bleak. If people can make more choices that are sustainable then there may be a brighter outlook for future generations.

An understanding of sustainability gives people the opportunity to make informed decisions that are more likely to be focussed on sustainable outcomes. Students in this study demonstrated some understanding of sustainability but it was not as developed as the conceptions that are promoted by the Ministry of Education (2010). It is conceivable that if students hold complex, interrelated conceptions of sustainability that are promoted by the Ministry of Education then they will have a broader knowledge of sustainability issues and have the ability to make informed decisions about these and focus their decisions on sustainable outcomes.

Students are influenced by their experiences and exposure to knowledge when they form their individual conceptions of sustainability. Teachers need to present them with enough relevant opportunities for learning so that they may develop the accepted conceptions being promoted. Students need opportunities to develop understandings outside the classroom in their community and in surroundings that are important to them. Teaching and learning programmes need to be centred on local contexts so that students are able to make connections within their local area and develop the ability to apply this learning to new contexts. It is up to teachers to implement the *New Zealand Curriculum* and provide the learning experiences that will "secure a sustainable social, cultural, economic and environmental future for our country" (Ministry of Education, 2007, p. 8).

But teachers face many barriers when implementing teaching and learning programmes for sustainability education. One major barrier is their own understanding of sustainability and their ability to translate this complex conception into meaningful and relevant programmes to enable their students to develop their own understandings. Teachers may need professional development

support to implement the curriculum and integrate sustainability education effectively. This could come in the form of the re-instatement of EfS advisors and assistance to build and maintain communities of EfS teachers to support each other. Strong support also needs to come from "the appropriate managerial, social and organisational structures" (Bolstad, 2003b, p. 30) within the school to enable teachers to integrate sustainability into the curriculum either as a stand-alone programme or as a cross-curricular feature.

Resources such as the EfS Achievement Standards, EfS on TKI, EfS Senior Secondary Curriculum Guide and relevant publications are available but teachers may need professional development in order to take advantage of these. Findings from an earlier study supported the view that the existence of the achievement standards was critical to the establishment and continuation of sustainability education courses (Haines, 2012). Teachers in the study felt that the standards were difficult for students to achieve because students were challenged by the concepts of sustainability. Recent publications, e.g. *Education for Sustainability in the Primary Curriculum: A guide for teachers* (Littledyke et al., 2009), are important resources that teachers need to be aware of and use to implement sustainability education. The availability of resources and regular updating of resources was also a concern for teachers (Haines, 2012) and updating of the EfS Achievement Standards is occurring at present.

But having an understanding of sustainability may not be enough to secure a sustainable future. Together with developing an understanding of sustainability, students need to be able to develop their action competence and "learn to be active citizens in a democratic society" (Jensen & Schnack, 1997, p. 104). Students need to become good decision makers for a sustainable future and need to take action for this ideal. Again it may be up to teachers to build this into their programmes to prepare their students for a sustainable future. Students need support to become "actively involved in communities" (Ministry of Education, 2007, p. 13) as recommended by the *New Zealand Curriculum* and they need to be provided with genuine contexts in which this occurs. Strong support from

organisations like Enviroschools and local councils is essential in providing assistance and resources for this to take place but more funding is needed for this type of support to be available to all schools in New Zealand.

In considering the findings and implications of this research it is important to identify the limitations of this study. These are presented in the next section.

5.7 Limitations

This study was conducted on a very small scale. Only 43 students, from Year 12 and Year 13, attending two small rural secondary schools were surveyed by questionnaire and of those, only six were interviewed in a focus group situation. This sample cannot be representative of all secondary students in the country. The experiences of these students could not be considered typical of New Zealand secondary students as they live in small rural townships or on farms in the North Island of the country. This may have had a bearing on how they viewed sustainability and their understanding of this concept.

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Appendix A: Sustainability Questionnaire

Please answer the following questions as thoughtfully as you can. The answers you give are anonymous and no one will know what answers you have given. You do not have to answer all the questions and the answers will not be used for anything other than this research study.

1. What does the word sustainability mean to you?

_____

_____

_____

_____

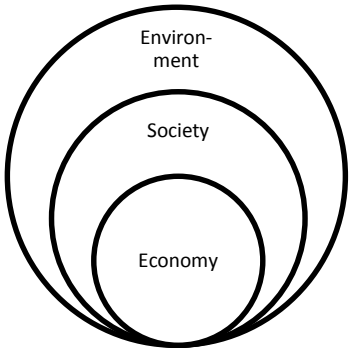
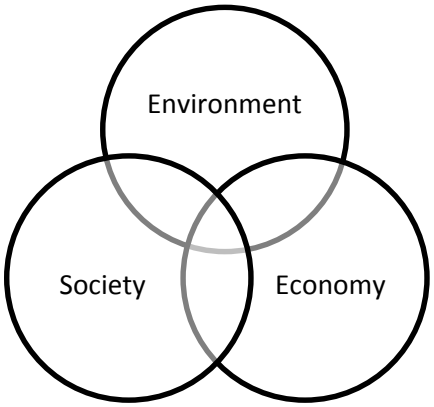
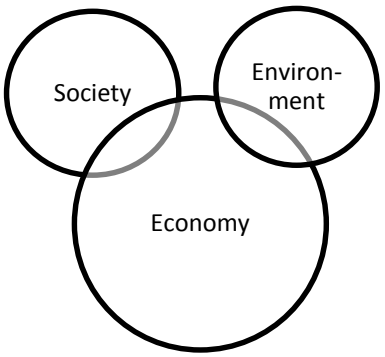
2. Here are 15 pairs of statements. Each pair has two different points of view on a topic. Place your view along the scale by circling a number between 1 and 5:

1 means you **strongly agree** with the statement in **Column A**
2 means you **agree** with the statement in **Column A**
3 means your view is **evenly balanced** between the two statements
4 means you **agree** with the statement in **Column B**
5 means you **strongly agree** with the statement in **Column B**
Do not circle any numbers if you are unsure

	Column A		Column B
a.	The loss of one species of living thing in an environment is likely to affect the balance of life in that environment.	**1 2 3 4 5**	The loss of one species of living thing in an environment is unlikely to affect the balance of life in that environment.
b.	It is important that all systems (e.g. water, nutrients) that support life in an environment are maintained.	**1 2 3 4 5**	Life forms will adapt no matter what occurs in their environment.
c.	Businesses and companies benefit by looking after the environment in which they operate.	**1 2 3 4 5**	It costs more money than it saves when businesses and companies look after the environment in which they operate.
d.	Technology in the future is likely to be able to solve most of the world's environmental problems.	**1 2 3 4 5**	Technology in the future is likely to cause more environmental problems.

e.	Each person on Earth today is entitled to a fair share of the resources that exist (e.g. oil, minerals, food).	**1 2 3 4 5**	It is not possible for each person on Earth today to have a fair share of the resources that exist (e.g. oil, minerals, food).
f.	People today should be able to use as much of a resource as they need, even if the resource may run out.	**1 2 3 4 5**	People today should not be able to use as much of a resource as they need, because the resource might run out.
g.	People today need to manage the way they use resources so that there are resources left for future generations.	**1 2 3 4 5**	People in the future will need to find their own resources.
h.	Economic growth should be given priority over protection of the environment.	**1 2 3 4 5**	Protection of the environment should be given priority over economic growth.
i.	Everyone should be entitled to express their views about how they want to live their lives.	**1 2 3 4 5**	Some people's views about how they want to live their lives are not worthy of consideration.
j.	Everyone's views should be respected and taken into consideration when decisions are made that impact on people's lives.	**1 2 3 4 5**	People in positions of authority should make decisions for their people.
k.	Decisions made by people today should not impact negatively on future generations.	**1 2 3 4 5**	Decisions made by people today should consider current generations first as we don't know what future generations will need.
l.	Workers are entitled to be treated fairly by their employer and receive a living wage to meet their needs.	**1 2 3 4 5**	Workers have to take less than a living wage if their employer can't afford to pay them more.
m.	Art, customs, traditions and language of all cultures are important and should be preserved.	**1 2 3 4 5**	Mixing of art, customs, traditions and language from different cultures to create one single culture is desirable.
n.	A Māori worldview that emphasises how we are connected to the environment shows us how we should live our lives.	**1 2 3 4 5**	A Māori worldview that connects us to the environment is mythical and not relevant today.
o.	Economic growth should be given priority over cultural and social concerns.	**1 2 3 4 5**	Cultural and social concerns should be given priority over economic growth.

3. Below are three models that are used to represent how the aspects of environment, society and the economy interact for sustainability. Choose the model that best represents what you understand about sustainability by circling the letter above the model.

A	B	C
		

4. Please explain why you chose the model you did in Question 3 and how it demonstrates sustainability for you.

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5. What might a sustainable future look like to you?

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Thank you for completing the survey. If you have any other comments please write them below.

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Appendix B: Letters and Accompanying Consent Forms

Letter to Principals and Accompanying Consent Form

9 September

The Principal

Dear ,

I am writing to invite you to permit senior secondary students at your school to participate in a research study that aims to discover what students understand by the term sustainability. The importance of sustainability is highlighted in the *New Zealand Curriculum* and I think it is important that teachers are aware of what students understand about sustainability and what alternative conceptions they may hold. This type of information can help teachers make the study of sustainability more relevant for students.

I would like your permission to involve senior students in Year 12 and Year 13 in this study.

Initially students would be asked to complete a 20 minute questionnaire and then two groups of three students would be involved in 20-30 minute focus group interviews. I would like to arrange for …….. to conduct the administering of the questionnaire at a convenient time. After completion of the questionnaire, I would like to conduct the focus group interview, at a convenient time. The focus groups will be audio recorded with participants' permission to help with analysis.

Data collected during the study may be used for the production of a thesis to complete my Master of Education at the University of Waikato, and in publications and presentations. I will not use your name, the name of your school or the names of participants in any publications. All data gathered will be stored securely. Senior students can decline to be involved in the research, decline to answer any particular question, and can withdraw any or all data they have provided immediately following the completion of the questionnaire, and /or before completion of a focus group interview. Withdrawal of consent for the study to proceed, at your school, can occur at any time before analysis of the data has commenced. If there is a withdrawal, I will destroy any data gathered from participants. A summary of study outcomes will be sent to you, and to participants on request.

I would appreciate your permission for my study to proceed as described. If you need any more details about the project, or issues arise for you during the project, please contact me (email: lizhaines07@gmail.com tel: 09 431 7453). If I am unable to resolve your concerns, you may contact my supervisor, Dr Chris Eames, at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357).

Yours sincerely,

Liz Haines

Research Consent Form - Principal

I have read the attached letter of information.

I understand that:

1. Student and teacher participation in the project is voluntary.
2. Participants have the right to withdraw as stated in the accompanying letter.
3. Data may be collected from participants in the ways specified in the accompanying letter. This data will be kept confidential and securely stored.
4. Data obtained from participants during the research project may be used in the writing of reports. This data will be reported without use of any names.
5. Consent for the study to proceed can be withdrawn before analysis of data.

I give my consent to the following for the study to proceed.

I can direct any questions to Liz Haines (email: lizhaines07@gmail.com tel: 09 431 7453).

For any unresolved issues I can contact her supervisor, Dr Chris Eames, at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357).

I give consent to be involved in the project under the conditions set out above.

Name:_____

Signed:_____

Date:_____

Please return this form to Liz Haines.

Letter to Teachers and Accompanying Consent Form

12 September 2013

Dear

I am writing to invite you to participate in a research study at your school that aims to explore what students understand by the term sustainability. The importance of sustainability is highlighted in the *New Zealand Curriculum* and I think it is important that teachers are aware of what students understand about sustainability and what alternative conceptions they may hold. This type of information can help teachers make the study of sustainability more relevant for students.

I have permission from the principal to involve senior students in Year 12 and Year 13 in this study and would like your help to carry out the research. Initially students would be asked to complete a 20 minute anonymous questionnaire and then two groups of three students would be involved in a 20-30 minute focus group interview. I would like you to conduct the administering of the questionnaire at a convenient time after students have given written permission to be involved in the research. After the completion of the questionnaire I would like to conduct two focus group interviews of three students each who have completed the questionnaire, approximately a week after the completion of the questionnaire. The focus groups will be audio recorded with participants' permission. Participant letters, consent forms and questionnaires will be delivered to you before commencement of the study. I will collect the consent forms and questionnaires from you after their completion.

Data collected during the study may be used for the production of a thesis to complete my Master of Education at the University of Waikato, in publications and presentations. I will not use your name, the name of your school or the names of participants in any publications. I will make sure that all data gathered will be stored securely. Senior students can decline to be involved in the research, decline to answer any particular question, and can withdraw up to handing in of the questionnaire, and/or before completion of a focus group. If there is a withdrawal, I will destroy any data gathered from that participant. A summary of study outcomes will be sent to you and to participants on request.

I would appreciate you consent to be involved as described. If you need any more details about the project, or issues arise for you during the project, please contact me (email: lizhaines07@gmail.com tel: 09 431 7453. If I am unable to resolve your concerns, you may contact my supervisor, Dr Chris Eames, at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357).

Yours sincerely,

Liz Haines

Research Consent Form - Teacher

I have read the attached letter of information.

I understand that:

1. Participation in the project is voluntary.
2. Participants have the right to withdraw as stated in the accompanying letter.
3. Data may be collected from participants in the ways specified in the accompanying letter. This data will be kept confidential and securely stored.
4. Data obtained from participants during the research project may be used in the writing of reports. This data will be reported without use of any names.

I give my consent to the following for the study to proceed.

I can direct any questions to Liz Haines (email: lizhaines07@gmail.com tel: 09 431 7453).

For any unresolved issues I can contact her supervisor, Dr Chris Eames, at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357)

I give consent to be involved in the project under the conditions set out above.

Name:_____

Signed:_____

Date:_____

Please return this form to Liz Haines.

Letter to Participants and Accompanying Consent Form

13 September 2013

Dear Student,

I am writing to invite you to participate in a research study about students' ideas about sustainability. I am hoping that teachers will be able to use this information to make the study of sustainability more relevant for their students.

I would like to involve you in this study. This would involve you completing a 20 minute questionnaire given by …….. I will be conducting focus group interviews with two groups of three students from your school and you may like to be involved in that as well. In the interview you will be asked questions about sustainability and any sustainability projects you have been involved in. The interview will take place about a week after the questionnaire is completed. The focus group interview will be recorded on my smart phone (audio only) with your permission and I will take notes during the interview.

Data collected during the study may be used in writing my thesis to complete my Master of Education at the University of Waikato, in publications and presentations. I will not use your name, the name of your school or the names of other participants in any publications. All data gathered will be stored securely. You can decline to be involved in the research, decline to answer any particular question and can withdraw up to handing in of the questionnaire, and/or before completion of a focus group if you are involved in one. If there is a withdrawal, I will destroy any data gathered from you. A summary of study outcomes will be sent to you on request.

I would appreciate your consent to be involved as described. If you need any more details about the project, or issues arise for you during the project, please contact me (email: lizhaines07@gmail.com tel: 09 431 7453). If I am unable to resolve your concerns, you may contact my supervisor, Dr Chris Eames, at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357).

Yours sincerely,

Liz Haines

Research Consent Form – Participants

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 immediately after the completion of the questionnaire.
3. Data may be collected from me in the ways specified in the accompanying letter. 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. This data will be reported without use of my name.

I give my consent to the following for the study to proceed.

I can direct any questions to Liz Haines (email: lizhaines07@gmail.com; tel: 09 431 7453.

For any unresolved issues I can contact her supervisor, Dr Chris Eames at the University of Waikato (email: c.eames@waikato.ac.nz tel: 07 838 4357)

I give consent to be involved in the project under the conditions set out above.

Name:_____

Signed:_____

Date:_____

Please return this form to your teacher who will return it to Liz Haines.