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A knowledge creation approach to environmental education in early childhood: Creating a community of learners

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Abstract

The study investigated the creation of a community of learners to integrate environmental education into early childhood curriculum. Two centres were used for the study (one kindergarten, one childcare centre). The participants were four kindergarten teachers, eight childcare staff, along with five focus group parents and six focus children from each centre. The qualitative research was conducted in two phases over one year. In phase one a case study approach was employed to allow teachers to gain confidence in the research process. During this time a two week environmental education integrated curriculum was implemented at both centres. At the conclusion of phase one a nascent community of learners was emerging. After a transition stage when the research was shared with the researcher, the teachers at both centres made the decision to lead the research in phase two using a participatory action research approach. This resulted in a growth in professional knowledge of research processes. The teachers aimed to collaboratively create a community of learners with the parents by valuing their involvement, social capital and funds of knowledge. A project approach to environmental education based on children's environmental interests, the emergent curriculum, and the use of documentation was implemented at both centres. A conceptual artefact in the form of a community of learners was created. Bereiter's knowledge creation metaphor and the sociological concepts of parental social capital and funds of knowledge guided the data analysis. Environmental knowledge creation by all participants in the community of learners was a significant finding. The research process resulted in all the participants (teachers, children and parents) creating their own environmental knowledge and gaining a heightened awareness of environmental education in early childhood curriculum.

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Table of contents

Chapter One: Introduction

Focus of the study 1

A theoretical rationale for the study 1

My position: myself as researcher 4

Research questions: a background to choice 6

Research questions: the final choice 7

Phase one 7

Phase two 7

Thesis structure 8

Chapter Two: Literature Review

Introduction 11

Environmental education: ideological and political considerations 11

Environmental ideologies 12

Approaches to environmental education 13

Environmental education approaches in early childhood education 14

Pedagogy: meaning and definition 16

Pedagogy in the New Zealand context 18

Curriculum: *Te Whāriki* 19

Integrated curriculum 23

Theoretical underpinnings 23

Inclusive of all children and connected to their lives 23

Challenging to children and adults 24

Communal and collaborative 24

Courageous 25

Integrated curriculum: *Te Whāriki* 25

Teachers' knowledge about curriculum 27

The project approach 27

Documentation: socio-cultural assessment 29

Current perspectives on learning 30

A community of learners 32

Sociological concepts 35
Social capital 35
Funds of knowledge 38
Metaphors of learning 40
The knowledge creation metaphor 41
Conceptions of children's knowledge construction 44
Co-construction of knowledge 44
Inter-subjectivity 45
The zone of proximal development and cultural tools 46
Domain knowledge 47
Research on children's environmental learning 50
Environmental interviews 51
Context 52
Children's drawings 53
The sonic environment 53
Conclusion: rationale for the study 54

Chapter Three: Methodology
Introduction 58
Research questions 59
Phase one 59
Phase two 59
Methodology 60
The research process 60
Case study 60
Action research 62
Participatory action research 64
Participation 68
Research design 69
Justification of research design 70
Ethical considerations 72
Ethical paradigms 72
Codes of ethical research 72
Informed consent 73

Confidentiality 73
Privacy 73
Researcher's role 74
Selection of centres 76
Description of centres 77
Selection of participants: kindergarten/childcare 78
Participants: teachers/caregivers 78
Participants: parents 79
Participants: focus children 80
Methods 81
Observations 81
Target observations 82
Teacher contribution to data collection: documentation 83
Teacher contribution to data collection: learning stories 84
Document and records review 85
Semi-structured interviews 85
Focus groups 87
Data analysis 89
Coding and analysis 89
Organisation of data 90
Content analysis 90
Thematic analysis and data generated categories 91
Triangulation of data 94
Cultural bias 95
Generalisability 95
Summary 96

Chapter Four: Environmental Education: The Way We Were
Introduction 97
Kindergarten children's first interview 97
Children's baseline knowledge of the natural environment 97
Kindergarten parents' first interview 99
Parents' knowledge and awareness of environmental education 99
Parents' attitudes towards the environment 101

Parents' action: recycling 101
Parents' influence on children's knowledge 103
Kindergarten teachers' first interview 105
Childcare children's first interview 109
Children's baseline knowledge of the natural environment 109
Childcare parents' first interview 110
Parents' knowledge and awareness of environmental education 110
Parents' attitudes to the environment 111
Parents' action – recycling 112
Parents' influence on children's knowledge 112
Childcare: teachers' first interview 113
Summary of the first kindergarten and childcare interviews 116

Chapter Five: Knowledge Creation: First Steps in Environmental Education
Introduction 118
"A sailor went to sea, sea, sea" 118
Environmental topic of interest at the kindergarten: the rocky shore 118
The EEIC: an integrated curriculum 119
Knowledge creation: children's theories 119
Knowledge creation: butterflies 120
Knowledge creation: the rocky shore 121
Knowledge creation: habitats 123
Kindergarten children's second interview 123
Integrated curriculum environmental concepts 126
Pollution 126
Conservation 127
Children's environmental learning 128
Emergent curriculum 128
Potential parental social capital and funds of knowledge 129
Teaching strategies 130
Kindergarten parents' second interview 130
Funds of knowledge 130
Social capital 132
Kindergarten teachers' second interview 133

Working as a team 133
Teachers' role – curriculum 134
"Birds, a real flyer" 136
Environmental topic of interest at the childcare centre: birds 136
The EEIC: An integrated curriculum 137
Knowledge creation: birds 138
Communal collaborative 138
Knowledge creation: bird habitats 139
Childcare children's second interview 140
Potential parental social capital and funds of knowledge 141
Teaching strategies 141
Childcare parents' second interview 142
Social capital 142
Funds of knowledge 144
Childcare teachers' second interview 144
Working as a team 144
Teacher role – curriculum 145
Researcher role 147
Summary of kindergarten and childcare second interviews 148
Relationships: getting to know you 149

Chapter Six: Empowerment: The Teachers Take Charge
Introduction 151
Decision time: phase two 151
Participatory action research in practice 153
Researching environmental topics of interest 154
Kindergarten: participatory action research 154
Empowerment: the project approach 154
Collaboration: a project approach to a community of learners 156
The sea life project 156
Aquarium excursion: desperately seeking Nemo 156
Henrietta's newsletter 5.7.04 157
Documentation 158
Emergent curriculum: kindergarten 160

Mat time discussion 160
Learning story: our wormery 161
Te Whāriki curriculum goals achieved: teacher evaluation 161
Learning story: emergent curriculum 163
Teaching strategies 163
Childcare: participatory action research 164
Empowerment: the project approach 164
Topics of environmental interest 166
"Spring": an unsuccessful topic 166
Collaboration: a project approach to a community of learners 168
The bird project revisited 168
The sea creatures project 169
Learning experiences 170
The sea creature project continues: anecdotes from the teachers 170
Emergent curriculum: childcare 171
The insect project: teacher anecdotes 172
Teaching strategies 172
The project approach: a critique 173
Relationships: shared understandings 174
Summary 175

Chapter Seven: Collaboration and a Community of Learners
Introduction 177
Collaboration in a community of learners 178
Children's learning: a socio-cultural approach 180
Inter-subjectivity 182
Children's learning: a knowledge creation approach 184
Creating a community of learners: parental collaboration 187
Parental involvement in a community of learners: teacher perspective 189
Excursions 189
Documentation 189
Children's environmental interests 189
Parental involvement and contribution 190
Parental involvement: parent perspective 191

Home-centre links 191
Supporting children's environmental interests at home 193
Appreciating the teachers' contribution 193
Affective attitudes 194
Parental transformation: a change in attitudes 195
New learning 196
Awareness of environmental education 196
Awareness of children's learning processes 197
Teacher transformation: new environmental learning 198
The strengths and limitations of focus group 199
Community of learners: transformation 200
Combined commitment 201
Chapter summary 203

Chapter Eight: Discussion and Conclusion
Introduction 205
Baseline environmental knowledge 205
Knowledge creation 206
A socio-cultural/knowledge creation approach 206
Te Whāriki: a critique 208
Collaborative participation 210
A community of learners 212
Relationships 215
Implications for teachers 216
Reflections on methodology 220
Contributions of the study 220
Limitations of the study 221
Future directions for research 221
Conclusion 223

Reference list 224

List of Appendices
Appendix 1 Initial permission letters 248

Appendix 2	Consent process	252
Appendix 3	Field notes coversheet	269
Appendix 4	Observation schedule	270
Appendix 5	Interview questions	274
Appendix 6	Participants' keyword responses	280
Appendix 7	Bird learning story	287
Appendix 8	What we have been learning	289
Appendix 9	Brooke's learning story	290
Appendix 10	Curriculum web: birds	292
Appendix 11	Curriculum web: sea creatures	293

List of Figures

Figure 1	A model of teaching and learning environmental education	15
Figure 2	Phase two: participatory action research – both centres	68
Figure 3	Phase one: beginnings of a community of learners	177
Figure 4	Phase two: a community of learners is created	200

List of Tables

Table 1	Project outline	71
Table 2	Details of participants	81
Table 3	Coding for research methods	90
Table 4	Additional categories to main themes	91
Table 5	Analysis of further themes across three interviews and two phases	92-93
Table 6	Overall major theme across three interviews and two phases	93
Table 7	Kindergarten children's identification of different Environments	98
Table 8	Kindergarten teachers' anticipated role - curriculum	108
Table 9	Childcare focus children's identification of different environments	109
Table 10	Childcare teachers' anticipated role - curriculum	116
Table 11	Relationships: getting to know you	149

Table 12	Planning using a project approach: kindergarten	156
Table 13	Planning using a project approach: childcare	166
Table 14	Relationships: shared understandings	175
Table 15	Relationships: combined commitment	202

Chapter One: Introduction

Within early childhood centres in New Zealand, *Te Whāriki* the early childhood curriculum, (Ministry of Education, 1996) offers teachers an opportunity to introduce environmental education into their centre's early childhood curriculum. Environmental education can increase children's awareness of the need to care for our environment. Furthermore, it allows children to create their own knowledge through the learning experiences offered within the early childhood curriculum. This knowledge creation process (Bereiter, 2002) is further enhanced when teachers use strategies to implement environmental education and parents contribute their knowledge through a community of learners.

Focus of the study

The focus of this study was to investigate how environmental education could be implemented and integrated into the early childhood curriculum at two early childhood centres (one kindergarten, one childcare centre). The creation of a community of learners comprising of teachers, children and parents was used to introduce and promote environmental education into the early childhood curriculum. The research focus was the 'day to day' teaching and learning of a curriculum in which environmental education was an integral part. Furthermore, I wanted to investigate the environmental knowledge contributed by the parents, not only as part of the community of learners, but the influence this knowledge had on the child's environmental learning.

A Theoretical Rationale for the Study

Environmental education has an established history especially with regards to United Nations involvement that has spanned a quarter of a century. However, it is largely ignored in early childhood curriculum both internationally and nationally, Davis and Elliott (2003) and Prince (2004) being the exceptions in the Australasian region. Environmental education in New Zealand has been instigated at the primary school level. Chapman (2004) for instance, offers an historical overview of environmental education including the impact on New Zealand schools of the introduction of the publications on environmental education by the Ministry for the Environment. These publications entitled *Learning to care for the environment* (Ministry for the

Environment, 1996, 1998), offered recommendations about the introduction of environmental education into the primary school curriculum. These recommendations resulted in the launch of *Guidelines for environmental education in New Zealand schools* (Ministry for the Environment, 1999).

Despite this initiative Chapman's (2004) research thesis is far from optimistic about environmental education in schools, or its integration into *The New Zealand Curriculum Framework* (Ministry of Education, 1993). He suggests that "environmental education lacks a substantive engagement with sociology or curriculum theory" and if this does not occur "things are unlikely to change" (Chapman, 2004, Abstract, p. i). The participants in his research were individual teachers endeavouring to introduce environmental education into the schools where they worked. It is argued here, that the creation of a community of learners using a participatory action research (PAR) approach by all of the teachers in each centre would be a more effective and empowering way to introduce environmental education into the early childhood curriculum than individual teachers working in isolation.

Specifically, this study aimed to use a socio-cultural (Rogoff, 1995) and knowledge creation perspective on learning (Bereiter, 2002) to conduct the research. Bereiter argues that people create their own knowledge as opposed to acquiring it or learning through participation. This knowledge creation approach to learning is advocated in this study as it supports the creation of a community of learners. Children learn as a result of their cultural and social background and therefore socially construct their knowledge. The conceptual framework draws on the theoretical perspectives of Cole (1996), Rogoff (1995), Vygotsky (1978) and Wertsch, Del Rio and Alvarez (1995). The socio-cultural and social constructivist view of learning suggests children learn in socio/historic contexts (Driver, Asoko, Leach, Mortimer, & Scott, 1994) through social interactions with adults and other children. Cognition is 'distributed' (Pea & Gomez, 1992; Salomon, 1993) so the child is connected socially to the activities of everyday life. The resultant learning is holistic in nature and reflects shared meanings (Bruner, 1990; Lee & Smagorinsky, 2000; Salomon, 1993). A significant concept of socially constructed learning is the co-construction of knowledge where adults and children learn together as equal partners in the learning process (Palinscar, 1998). This occurs through establishing inter-subjectivity where the adult and child have

shared meanings about a topic of mutual interest (Anning & Edwards, 1999; Drummond, 2000; Newson & Newson, 1975; Rogoff, 1995).

The notion of a community of learners has its roots in socio-cultural theory (Head, 2003). "Children live their lives in two worlds: that of home and community and that of school [centre]" (Flor Ada cited in McCaleb, 1997, foreword p. viii). Ideally these two worlds should be in harmony thus creating a collaborative community of learners. Living in two worlds, however, can be fraught with difficulties; not the least being that those in society tend to view society through a binary lens, good and bad, acceptable and unacceptable. This includes making a judgement about a child's home and background. In the case of this study it involved working with children in two centres in lower socio-economic locations. To counteract this negative view, McCaleb (1997) advocates the combination of the two worlds to create a community of learners.

The creation of a community of learners is enhanced by the knowledge input of the home and community. Two concepts that contribute to understanding this process are funds of knowledge (Gonzales, Moll, & Amanti, 2005b; Moll, 2000) and social capital (Coleman, 1987, 1988; Field, 2003; Lin, Cook, & Burt, 2001). Funds of knowledge consist of bodies of knowledge (skills, ideas and practices) within households, for example vocational knowledge. Coleman (1987) describes social capital in education as the norms, the social networks and relationships that are of value to a child growing up. These two concepts illustrate the wealth of knowledge in the home and community that can be harnessed to enhance children's environmental learning through the creation of a community of learners.

Research from the cognitive constructivist perspective supports the existence of children's foundational domain knowledge. Domain knowledge is a network of information about a specific area and is a co-ordinated whole rather than discrete pieces of information. Wellman and Gelman (1992) have posited the idea that children can possess domain specific knowledge that suggests children have their own naïve theories about an area such as physics or biology. Furthermore, Wellman and Gelman (1998) argue that foundational domain knowledge views knowledge as complete bodies of knowledge. This research investigated the concept of children's

foundational domain knowledge base as it relates to environmental education. Internationally, a variety of early childhood models exist with specific education goals. However, it is *Te Whāriki* (Ministry of Education, 1996) that is unique to the New Zealand context and was therefore used in both centres. This national curriculum is based on four principles, five strands, and associated goals that support a socio-cultural approach to children's learning. This is reflected in the aspirations for children upon which this document is founded. "To grow up as competent and confident learners and communicators, healthy in mind, body and spirit, secure in the knowledge that they make a valued contribution to society" (Ministry of Education, 1996, p. 10).

To summarise, the research study used a socio-cultural (Rogoff, 1995) and knowledge creation (Bereiter, 2002) approach to learning. Teachers, children and parents creating their own environmental knowledge in a socio-cultural context formed the central tenet of the research process. The creation of a community of learners to promote environmental education within the early childhood curriculum was the vehicle that enabled this process. The concepts of social capital and funds of knowledge provided a framework within which to interpret the research data.

My Position: Myself as Researcher

"Any gaze is always filtered through the lenses of language, gender, class, race and ethnicity. There are no objective observations, only observations socially situated in the worlds of the observer and the observed" (Denzin & Lincoln, 1994, p. 24).

Mutch (2005) points to the cogency of declaring your 'position' of 'self' when conducting educational research. She stresses the importance of being 'up front' about your personal position and the impact it will have on your choice of topic and subsequent interpretation. This 'personal biography' (Denzin & Lincoln, 1994) will also outline issues of gender, class, ethnicity and life experiences. Therefore, coming from an interpretivist approach to data analysis, I, the researcher, needed to be transparent about declaring my position to avoid cultural bias. This necessitated describing my values and cultural framework.

My writing and research on environmental education has been influenced by my life experiences to date. I have come from a long line of teachers. I am a middle aged, middle class pakeha female who is also a mother and grandmother. One of my enduring values is that I hold deep religious convictions and these have influenced my choice of topic. The aesthetic beauty of the Creator's handiwork never ceases to amaze me. This has been the driving force in my desire to educate people to protect our precious environment for the enjoyment of future generations. Nuttall (2004) suggests that personal interest should not be the only reason for a choice of topic and I agree. However, the reality is that my values did influence my choice of topic because that is who I am. My intense interest in the natural environment and environmental education is what has sustained me as a researcher through the many years of doctoral study.

Declaring my position as a researcher, therefore, meant realising that as a researcher I would become part of the field of study (Edwards, 2001). I needed to be self-reflexive and to take responsibility for my beliefs and values and to be aware that they could influence the research process (Grieshaber, 2001). This required particular sensitivity on my part because of the cultural mix of the families that attended these centres. The impact of the lower socio-economic locations of the centres and issues of power were another consideration. I believed that participatory action research with its collaborative approach to research would go some way to addressing issues of power. I realised that as a researcher my position within the early childhood community meant I was in a more powerful position than the research participants. For that reason in this collaborative research I was aiming for "a state of symbiosis: research that is mutually beneficial to both the researcher and the researched and that hurts no one in the process" (Goldstein, 2000, p. 6).

Self-reflexivity requires the researcher to deconstruct the gender, class, power and race perspectives that are integral to the research design and process. It is an assumption to believe I share the same world experiences as those I research. For this reason when analysing the data, I consulted with those interviewed to ensure that the transcriptions of the taped interviews or my observations were an accurate representation of what was said or occurred (Edwards, 2001; Grieshaber, 2001). I took cognisance of the view of Lather (1991) when writing up the lived experiences

of the research participants. She suggests there should be an "emphasis on writing as the enactment of the social relations that produce the research itself" (Lather, 1991, p. 112).

Research Questions: A Background to Choice

The research I conducted for my Master's degree is outlined in a practitioner friendly publication for use in early childhood centres and the junior classes in primary school (Prince, 2004). It outlined a meta-cognitive approach to the introduction of environmental education into the early childhood curriculum. This was achieved by offering a week of environmental learning experiences. As I had implemented the programme myself I had not experienced how the teachers themselves would have approached the same task. What knowledge would they have brought and what strategies would they have used to implement a similar programme?

In the research I had examined children's attitudes towards the natural environment. I also investigated their knowledge about the natural environment including their domain knowledge. This was a child's perspective of environmental education but what about the parental and community influences on children's environmental knowledge base? Can you really see children's learning in an individualistic way out of context from their family and wider community? I have always thought that parents had a great deal of knowledge to contribute to their children's learning and to the early childhood education programme. I believe it is arrogant for those of us working in the early childhood sector to assume that children's learning begins and ends at the centre. Parents possess social capital and funds of knowledge that are invaluable for children's learning both at home and at the early childhood centre. If this was to occur in the research, how could the parents be involved in the learning at the centre that would not position them as a 'parent help' but instead represent a true collaboration between the teachers and the parents that would benefit the children's environmental learning?

These questions represented my thinking about how I constructed the questions for this study. After reading McCaleb's (1997) book on creating a community of learners I realised this was potentially a way to combine teachers, children and their parents in a collaborative way to introduce environmental education into the early childhood

curriculum. In the first phase of the research a community of learners concept would allow me to gain insights into the children's environmental learning in the socio-cultural context of their home and centre settings. The second phase of the research would afford the teachers the opportunity to create a community of learners in their respective centres through a participatory action research approach. Such a community of learners would demonstrate true collaboration between the teachers and the parents and allow the teachers to value and recognise parental knowledge while providing an opportunity for the parents to be a part of their children's environmental learning both at home and at the centre.

Research Questions: The Final Choice

The above thoughts translated into the five main questions that would be investigated in both phases of the research, about all three participant groups in a community of learners: the children, the parents and the teachers.

Phase one

1. What constitutes the environmental education knowledge base of preschool children?
2. What knowledge does the family contribute to children's environmental education learning and knowledge base?
3. How do teachers perceive their role in the implementation of environmental education into the early childhood curriculum?

Phase Two: *The community of learners*

In phase two the teachers were to lead the research using a participatory action research process to create a community of learners knowledgeable about the environment.

4. What contribution do early childhood teachers make to children's environmental learning and knowledge base?

A final question investigated the participatory action research approach and the community of learners.

5. In what ways does participatory action research methodology and the creation of a community of learners concept evolve to promote environmental education within the early childhood education setting?

These questions were designed to fulfil the aim of the research: to create a community of learners comprising the families, teachers and children to promote environmental education in early childhood curriculum, and to enhance the children's environmental learning and knowledge base.

Thesis Structure

Chapter one outlines the background to the research. It emphasises the importance of environmental education in the early years and within the early childhood curriculum in particular. A theoretical rationale for the doctoral research and my position as researcher is outlined. A background to the choice of questions and the final choice of research questions is explained.

Chapter two, the literature review, outlines environmental ideologies and approaches to environmental education in early childhood. It examines early childhood curriculum and pedagogy and teachers' knowledge about the curriculum. Current perspectives on learning, such as a community of learners and sociological concepts are also investigated. The three metaphors of learning are discussed with particular emphasis on the knowledge creation metaphor. Children's knowledge construction, their domain knowledge and research on their environmental education learning are explicated.

Chapter three outlines the methodological underpinnings of the research. Participatory action research, a derivative of action research, is expounded as the chosen methodology. A description of the research design and the ethical considerations provides information about the two early childhood centres (Ocean kindergarten and Sanctuary childcare), involved in the research. The participants involved at both centres (teachers, children and parents) are presented. The methods used, data analysis and interpretation are also presented.

Chapter four reports on the results of the first of three interviews conducted during the duration of the year long research. The teachers, focus children and parents were interviewed to ascertain their attitudes towards the natural environment and their baseline knowledge of environmental education.

Chapter five discusses the implementation of the two week environmental education integrated curriculum (EEIC) at both the kindergarten and the childcare centre. The second interview (of three) at the conclusion of the EEIC with the focus children, and focus group interviews with the parents and teachers at both centres are explained. The EEIC provided the opportunity to demonstrate children's environmental knowledge creation as well as the teachers' initial attempt to include the parents in a nascent community of learners. It also outlines the potential of the teachers to take charge in the second phase of the research using a participatory action research process.

Chapter six outlines phase two of the research. The teachers at both centres used participatory action research to implement a project approach to environmental education. Through the children's environmental interests, the emergent curriculum and documentation, the teachers put in place a curriculum. Children's knowledge creation within a socio-cultural context resulted. The chapter also outlines the collaborative approach both centres used to get the parents 'on board' and supporting the project approach. A discussion on the teachers' efforts to include the parents in the curriculum and to value their social capital and funds of knowledge about the natural environment is outlined.

Chapter seven explores the process that occurred in creating a community of learners to promote environmental education in the early childhood curriculum. Collaboration and the contribution of participatory action research are outlined. The involvement of the parents in the creation of a community is discussed from both the parents' and teachers' perspectives. Children's socio-cultural learning and the inter-subjectivity that all the teachers, children and parents had about creating a conceptual artefact, (a community of learners) to promote children's knowledge creation, is posited. The participatory action research process resulted in a transformation in attitudes and new environmental learning for the parents and teachers alike at both centres. Moreover, a conceptual artefact, in the form of a community of learners, was created.

Chapter eight discusses the entire research process and draws together the findings of the preceding four chapters. To illuminate the discussion examples are drawn from both groups of participants at both centres. It is argued that through a participatory

action research process a conceptual artefact in the form of a community of learners was created. As part of this process, all of the participants (teachers, children and parents) of the community of learners created their own knowledge about environmental education in the early childhood curriculum. Implications for teachers, reflections on methodology and areas for future research will be explained.

Chapter Two: Literature Review

Introduction

This literature review outlines the theoretical underpinnings of the research. It examines environmental ideologies and approaches to environmental education. Early childhood curriculum and pedagogy are debated and research and theories on early childhood curriculum reviewed. The discourse on teachers' knowledge about curriculum is critiqued. Current perspectives on learning, as well as a theoretical overview of a community of learners and the sociological concepts allied to this conceptual artefact, are examined. The three metaphors of learning with particular emphasis on the knowledge creation metaphor are critically discussed. Conceptions of children's knowledge construction and domain knowledge will be reviewed. Finally, research on children's environmental learning is critiqued.

Environmental education: Ideological and Political Considerations

Kohlberg and Mayer (1972, p. 450) view educational ideology as "a set of concepts defining desirable aims, content, and methods of education". On the other hand Sumner (1979) explains it as a 'world view' that espouses a system of concepts, beliefs and values. Ideology, when conceptualised as a 'world view', serves three functions. First, it shapes the adherent's views of the political, social, economic and educational systems. Second, it provides a set of moral rules by which social events can be judged. Third, these moral rules become embedded in the practices and values of the ideology. To this end, the actions of those who subscribe to the ideology are governed and controlled by it. This world view of ideology provides a positive perspective of the functions of ideology (Fien, 1993).

Conversely, ideology can also have a pejorative interpretation. It can equally be interpreted in a negative sense, in that it can render as 'natural' relations of wealth and power in society. This distorted view of reality can be absorbed uncritically by subordinate groups who take for granted the positive ideological world view. The dominant ideology therefore, practises hegemony or cultural domination over society as a whole. Resistance to this hegemony is difficult, if not impossible as the dominant ideology promotes the vested interests of those in power (Johnson, 1989).

An educational ideology provides a philosophical framework to guide educational practices. Fien (1993) has outlined four environmental management positions associated with environmental ideologies. They are cornucopian, accommodation, eco-socialism and gaianism.

Environmental ideologies

Environmental ideologies feature on a continuum from technocratic (human-centred) to eco-centric (nature-centred). Four management positions with regard to the use of the natural environment parallel this continuum. Each of the four management positions, cornucopian, accommodation, eco-socialism and gaianism, highlight an ideological position pertaining to the relationship between humans and nature (Fien, 1993).

The cornucopian position suggests that the natural environment is rather like the 'Garden of Eden' and is there to be exploited for human benefit. Human ingenuity and technology will ensure that nature will provide for human needs indefinitely. Humans stand in opposition to nature in an exploitative technocratic relationship.

An assumption is made in the accommodation position that resource exploitation can continue. How this assumption can be realised is by making suitable economic adjustments and passing minimal environmental legislation. The latter offers compensation to those who suffer from adverse social or environmental effects. These minimal adjustments ensure that a technocratic approach to the natural environment is retained. This position has advanced albeit minimally, from the cornucopian position, to consider the human/nature relationship.

At the eco-centric end of environmental ideology, eco-socialism views the natural environment as socially constructed. This position critiques both the cornucopian and accommodation positions by a firm desire to remake society so that economic production is based on harmony between people and nature, as well as individuals and groups within society (Ryle, 1988). Although this may seem like an equitable position, nature is still seen as the vehicle for economic production.

Gaianism (Lovelock, 1979) as an environmental position moves beyond the eco-socialism position of a harmonious relationship between humans and nature, to embrace a fully eco-centric position. Gaianists believe that only when humans recognise their spiritual 'oneness' with nature, will they fully experience a satisfactory quality of life and appreciate the value of the non human world for its own sake. Nature in this position does not exist for human exploitation rather it is there to be enjoyed for its untouched intrinsic beauty.

Approaches to Environmental Education

According to Fleer (1998), environmental education is seen as education *about* (knowledge and care of the environment), education *in* (hands on experience) and education *for* the environment (informed action). These ideas are also theorised by Fien (1993). He highlights one difference in the terminology of the approaches. This concerns education *in* the environment. Fien prefers the term *through,* instead of *in* the environment, but the same tenets apply.

Education *about* the environment places emphasis on the learning of facts and concepts as well as generalising about environmental processes and problems. This has strong links with a technocratic environmental ideology. This combination of ideologies leads those who practise this educational approach to view both education and environmental management as neutral but instrumental processes. At its most conservative this approach promotes a cornucopian environmentalism (Fien, 1993).

Education *in* (or *through*) the environment uses the environment as a medium to promote gaianist principles. Children are encouraged to appreciate the aesthetic beauty of nature for its own sake (Carson, 1956; Wilson, 1993b). This is evident in the early years' curriculum where the theories of Rousseau and his belief in nature as the vehicle for child development are given credence. Dahlberg, Moss and Pence (1999, p. 45), however, critique this construction of early childhood. The view that the child is seeking 'virtue, truth and beauty' through free play and creative expression is considered 'sentimentalization' of the 'golden age' of childhood. Despite this critique, Rousseau's theories can provide a starting point for environmental education, that is, nature as a vehicle for child development. However, current research theories would give greater attention to the role of the adult, and this

concept underpinned this study. Children can learn *in* or *through* the environment by co-constructing meanings regarding the environment with adults in the early childhood centre. This can promote the development of respectful attitudes towards nature that reflect gaianist ideology (Davis & Elliott, 2003).

Education *for* the environment is consistent with an eco-socialist ideology. The objectives of this approach include the development of a political and moral awareness as well as knowledge, skills and commitment to analyse environmental issues (Davis, Rowntree, Gibson, Pratt, & Eglington, 2005). It promotes a democratic way to make decisions and to solve environmental problems. This approach is not without its critics, not the least its alleged anthropocentric perspective. To counter this criticism, Gough (1997) proposes an eco-centric approach that will replace education *for* the environment. He argues that humans need to learn to live *with* the environment thus eliminating the need for education *for* the environment.

Environmental education approaches in early childhood education

Early childhood curriculum links well with the environmental education approaches outlined above. *Te Whāriki*, the New Zealand early childhood curriculum, (Ministry of Education, 1996), espouses an holistic approach to teaching and learning. This philosophical approach to curriculum is further elaborated by Hutchinson (1998) with regard to environmental education. His holistic view of education has an important link with an ecological view of human development (Bronfenbrenner, 1979). From an environmental education perspective, this means that phenomena in nature are viewed as interconnected within an interdependent universe (Sterling, 1993). The search for meaning is the principal aim of a child's experience of the curriculum. Hutchinson (1998) has suggested that one of the best-known traditions of holistic education is the Rudolf Steiner philosophy used in Waldorf schools. After an analysis of the philosophies in six early childhood services, Prince (2000) found that only the Steiner centre made specific mention of environmental education.

Palmer and Neal (1994, p.39) propose a diagram of interconnected circles as a model of teaching and learning in environmental education. Like Fleer (1998) and Fien (1993), they identified three models of environmental education. Their diagram is adapted for use at the early childhood level (see Figure 1 below). In this holistic view

of teaching and learning the arrows indicate the connection. The triangular arrows indicate the two way process that culminates in individual environmental learning. Starting at the bottom left hand corner, hands on experience *in* or *about* the environment, leads to care and respect, as can the latter lead to hands on experience. Care and respect can lead to age appropriate action (Hart, 1997), as can age appropriate action contribute to care and respect. Finally, age appropriate action can promote hands on experience *in* the environment and lead to age appropriate environmental action *for* the environment.

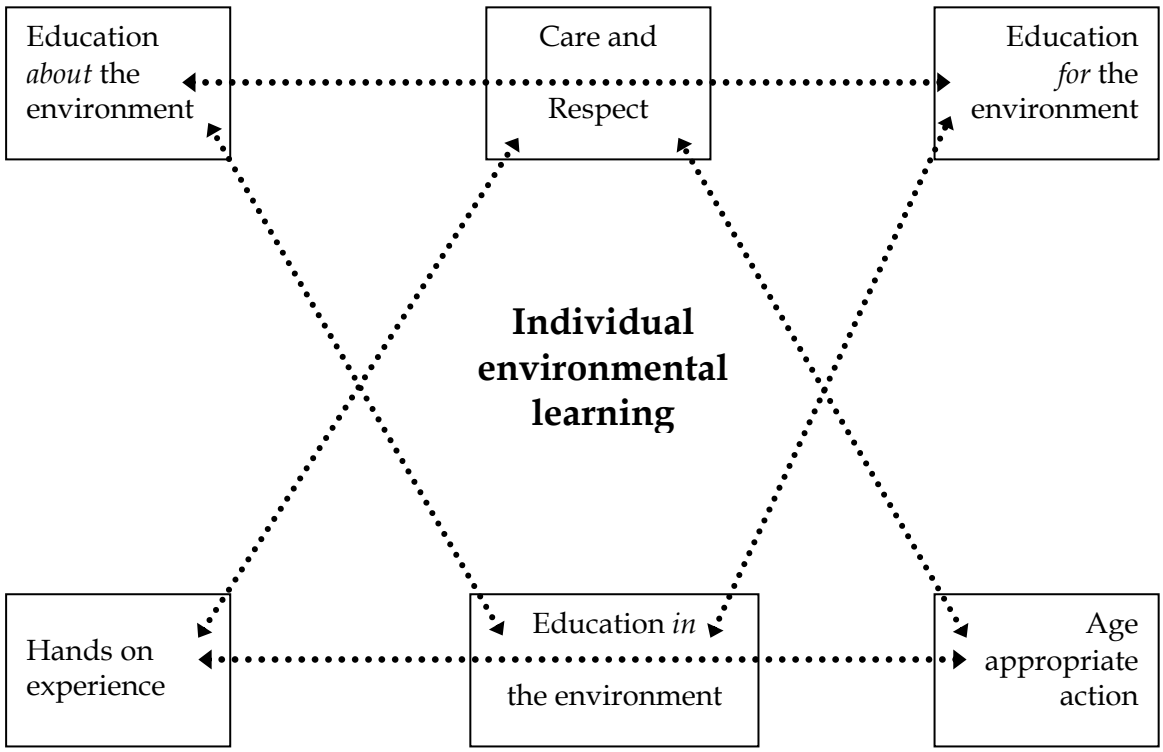

Figure 1: A Model of Teaching and Learning Environmental Education

(adapted from Palmer & Neal, 1994, p. 39).

Many factors and circumstances have led to the need to conduct research on environmental education in early childhood education. The popular cliché 'only one earth' suggests that the entire planet is an interdependent system. This balance can be upset easily by human interaction with it and subsequent contamination of it. If the earth is contaminated beyond repair it is the only earth we hand on to future generations.

The issues of the environmental degradation of air, waterways, land and forests precipitate a sense of urgency to find a solution. Children can be caught up in the worldwide slogan to 'think globally and act locally'. A note of caution must be acknowledged here. Children, especially the preschool children this research involved, must not feel a burden of guilt about these worldwide problems or a need to be environmental activists. As the *Independent Commission on Education* stated "children should not be worriers or warriors" (cited in Hart, 1997, p. 9). Age appropriate action, as discussed earlier, can minimise environmental anxiety in children. It can help them to act in environmentally meaningful ways supported by their early childhood centre, family and community. It is proposed this environmentally proactive approach is consistent with the socio-cultural and knowledge creation way children learn. An example of this was evident as a result of research conducted by Prince (2000). Four year old (kindergarten aged) children, with the support of their teachers, became involved in a recycling programme at their centre, culminating in a City Council award for their efforts.

In summary, both ideological and environmental education approaches are pivotal to the implementation of environmental education into the early childhood curriculum. The environmental ideologies and management positions (cornucopian, accommodation, eco-socialism and gaianism) provide the rationale for the inclusion of environmental education approaches. These approaches, outlined as education *in* or *through, about* and *for* the environment, offer the model to implement environmental education into the early childhood curriculum.

Pedagogy: Meaning and Definition

In the early childhood education community in New Zealand there is a continuum of understanding of what is pedagogy. This continuum ranges from a dismissive 'that's just edu-speak', to a reasonable conception of what is meant by pedagogy. This confusion about the meaning of pedagogy is not confined to the New Zealand context but is a worldwide phenomenon. The BERA Early Years Special Interest Group (British Educational Research Association Early Years Special Interest Group, 2003), when referring to research suggest as a term that "…pedagogy is by no means universally used by early years researchers or indeed, even defined in the same way"

(p.7). If researchers are divided in their understanding of the meaning of pedagogy it is little wonder that teachers experience difficulty in articulating what constitutes pedagogy in early childhood education. Add to this confusion, the possibility that teachers' lack of understanding could be compounded by the fact that in their mind the word pedagogy has negative connotations of the strict disciplinarian. Furthermore, a complication in fully understanding the meaning of pedagogy often arises because early childhood teachers confuse pedagogy with curriculum. This difficulty in separating the two concepts serves to further confuse early childhood teachers about the meaning of both pedagogy and curriculum.

So, what is pedagogy? Bowman, Donavan and Burns (2001) view pedagogy in a broader global sense as "… the deliberate process of cultivating development within a given culture and society" (p.182). In their view it has three components. First, curriculum content, second teaching methods and finally, the socialisation of children. Siraj-Blatchford and Sylva (2000) highlight three similar aspects of pedagogy but localise it to the early childhood setting. They suggest that pedagogy encompasses the three aspects of teaching, learning environments and routines. Furthermore, Siraj-Blatchford (2004, p. 138) suggests pedagogy is: "… the interactive process between teacher and learner and the learning environment (which includes family and community)." Moreover, Siraj-Blatchford, Sylva, Muttock, Gidden and Bell (2002, p. 27), define pedagogy as, "the *practice (*or the *art,* the *science* or the *craft)* of teaching."

In order to separate the two terms, Siraj-Blatchford et al. (2002) argue that curriculum is distinct as a term, while also being complementary to pedagogy. This outline suggests these two concepts work hand in hand in the early childhood education setting as separate entities but mutually complementary. Siraj-Blatchford et al. (2002) also offer this explanation of pedagogy. They argue that the term 'teaching' is the word most closely associated with pedagogy. However, in their view, in order to meet educational goals in early childhood, pedagogy must also be 'instructive'. Curriculum, on the other hand, is "all the knowledge skills and values that children are meant to learn in educational establishments" (p. 27). In their view this also includes the notion that curriculum is everything that interfaces with the child, both intentional and unintentional. This notion is reinforced in *Te Whāriki*, New Zealand's

national curriculum document. "The term 'curriculum' is used in this document to describe the sum total of experiences, activities and events, whether direct or indirect, which occur within an environment designed to foster children's learning and development" (Ministry of Education, 1996, p.10).

Pedagogy in the New Zealand context

How is early childhood pedagogy viewed in New Zealand considering some teachers' confusion about the meaning of the term? *Te Whāriki* (Ministry of Education, 1996) is considered to be a socio-cultural document and has been in use in early childhood centres for almost a decade (Nuttall, 2003). Historically, play based programmes have dominated early childhood curriculum and education provisions in New Zealand. For this reason there has been a mismatch between what is advocated as a socio-cultural approach to children's learning and what is happening in practice (Cullen, 2003). The proactive role of the teacher as pedagogue rather than facilitator of children's play has proved elusive to achieve (Nuttall, 2003).

However, research is contributing to a better understanding of the benefits of a socio-cultural approach to learning for both children and teachers in early childhood centres (Jordan, 2003). According to Jordan (2004b), the socio-cultural approach to learning in early childhood involves both scaffolding children's learning and co-constructing meaning with them about early childhood curriculum. Children in her study underwent a 'transformation of participation' (Rogoff, 2003) as their thinking became more complex through being involved in child-initiated topics of interest using a project approach. Significant outcomes of the research were: the use of higher order thinking skills, better home-centre links, as well as better communication between parents and teachers. When children create their own knowledge in a community of learners (McCaleb, 1997), they also learn through 'intent participation' (Rogoff, 2003). This occurs when children observe and listen in on adults' communication, collaborating in learning experiences related to their topic of environmental interest. Teachers' eagerness to learn more about a socio-cultural approach to children's learning has sparked an interest in the Reggio Emilia approach to early childhood education. This was evidenced by the attendance of many early childhood practitioners at the *Provoking encounters, transforming thought* conference held in Auckland (12-15 July 2005).

Co-construction of knowledge is a pivotal aspect of a socio-cultural approach to teaching and learning for both adults and children (Jordan, 2004a). The co-construction of curriculum has been researched both in New Zealand (Jordan, 2004a; Nuttall, 2003), and internationally (Anning & Edwards, 1999). Cullen (2004) emphasised the importance of adults co-constructing professional knowledge about inclusive practice in early childhood settings (Cullen & Bevan-Brown, 1999). This co-construction of professional knowledge and shared meaning was not only important for teachers but for early intervention professionals and others closely associated with the inclusion of children with special rights. Moreover, the use of *Te Whāriki* (Ministry of Education, 1996) and socio-cultural theory for the education of children with disabilities is strongly advocated by MacArthur, Purdue and Ballard (2003).

Curriculum: Te Whāriki

The notion of the child as 'rich' and competent is embedded in the Reggio Emilia approach to early childhood curriculum (Dahlberg, Moss, & Pence, 1999; Edwards, Gandini, & Forman, 1998). It also adds weight to the belief that teachers can empower children by using a socio-cultural approach to learning.

The four *Te Whāriki* (Ministry of Education, 1996) principles of empowerment, holistic development, family and community and relationships are all relevant to the research. It is however the principle of family and community that most strongly accords with the creation of a community of learners to promote environmental education in early childhood curriculum (Zellermayer & Tabak, 2006). This thesis argues that teachers need to value the potential household funds of knowledge (Gonzales, Moll, & Amanti, 2005b; Moll, 2000) and social capital (Field, 2003; Halpern, 2005) families in their centres can contribute to the enhancement of environmental knowledge and an environmental education integrated curriculum.

The socio-cultural underpinnings of *Te Whāriki* (Podmore, 2004; Smith, 1996) emphasise children's individual empowerment to learn, as well as to benefit from responsive and reciprocal relationships they have with both the teachers and the centre environment. This approach does not view development as separate domains, rather

each domain works holistically in unison with the others. This is consistent with the notion of the rich and competent child who is powerful in the ability to learn, as outlined by Dahlberg et al. (1999).

Holistic development as a principle of *Te Whāriki* (Ministry of Education, 1996, p.14) refers to "the holistic way children learn and grow". For indigenous cultures, holistic development has deep significance. For instance, within Māori culture in New Zealand holistic development refers to physical, mental, spiritual and emotional aspects of a child's being (Reedy, 2003). Similarly, this notion is espoused in Aboriginal culture as a child's mind, body and spirit (Williams-Kennedy, 2004). For both cultures the land is integral to their beliefs, especially its protection and sustainability. These aspects of holistic development and a child's understanding of the tenets of environmental education are relevant to this study.

Te Whāriki (Ministry of Education, 1996) draws on Bronfenbrenner's (1979) theory to explain children's levels of learning and to provide an underpinning philosophy of learning. Bronfenbrenner (1979) proposed an ecological contextual view of children's development. It is made up of four systems, the microsystem, mesosystem, exosystem, and macrosystem, and at the centre is the child. The systems above equate to the levels. The first level is the learner and his or her immediate environment. Level two contains the major settings in the learner's life. These include their home, the early childhood centre and the wider community. These settings will be the most important aspect of this study as they will have an impact on the children's ability to create their own environmental knowledge. The third level, although more remote from the learner, has an impact on their learning experiences. These are work settings, the neighbourhood, social settings and the world media. The conditions associated with these aspects of adults' lives, can influence how they care and educate their children. The final level and the most distant from the child, encompasses the values held by the nation about early childhood care and education as well as the rights and responsibilities of children (Ministry of Education, 1996). An example of this would be the value placed on sustainable life styles.

Historically there have been many influences on curriculum especially the developmental focus (Cullen, 1994, , 1999). Teachers, therefore, need to be aware of

how curriculum has changed over time from a developmental focus to a socio-cultural approach. A play based philosophy that reflected Piaget's cognitive developmental theory stressed the 'lone scientist' approach, and that children needed to interact with their environment to learn. In keeping with this view of children's learning, early childhood teachers planned activities that would challenge children to construct their own knowledge. Cullen (1999) has critiqued the emphasis on developmental theory that has formed the basis for teacher knowledge to guide curriculum. She argues that the developmental theory basis of teachers' knowledge has been challenged in the 1990s, by the emergence of early childhood curriculum statements. The latter suggested that teachers take into consideration bodies of knowledge (road safety for instance) that emphasise a socio-cultural approach to early childhood curriculum content.

Drummond (2000) argues that teachers need to view children from a positive model (Vygotsky, 1978) rather than a deficit model (Piaget, 1964). For this reason she suggests teachers concentrate on children's strengths rather than their weaknesses, their capabilities, rather than their incapacities. In her view this supports the notion of the powerful child's ability to feel, think, know and understand. These powers, she argues, should be the starting point of any early childhood curriculum. This socio-cultural approach to early childhood curriculum, as outlined by Drummond (2000), further challenges a Piagetian approach. She suggests therefore that teachers need to view children from a socio-cultural perspective and credit them with both the intellectual and emotional powers to become competent and capable learners. This is essentially the *Te Whāriki* (Ministry of Education, 1996) perspective and is reflected in the learning story assessment approach developed by Carr (2001) and promoted by the Ministry of Education through professional development (Ministry of Education, 2004).

Te Whāriki (Ministry of Education, 1996), a socio-cultural curriculum, recognises that socio-cultural learning is embedded in cultural and community contexts, thus is consistent with Bronfenbrenner's (1979) theory. This theory also influences the curriculum. An example of this socio-cultural approach is the diverse meanings that children bring from their home environment to the early childhood centre. Home-

centre links to promote environmental education and create a community of learners will be an integral part of this study. This should not only enrich and extend the children's learning, but that of the community of learners. In this holistic view of development (May & Carr, 2000) the child is not seen as separate from the learning that occurs in the context of the early childhood centre, but central to it. Cullen (2003) suggests that the current debate on *Te Whāriki's* holistic approach to curriculum is in response to an over reliance on developmental psychology. Cullen (2001) argues a need for a socio-cultural approach (Goncu & Katsarou, 2000) that acknowledges post-modern views of children's meaning making (Dahlberg, Moss, & Pence, 1999). Furthermore, Cullen argues that *Te Whāriki* identifies principles for learning rather than content to be taught and these guide curriculum planning based on children's interests (Hedges, 2002; Jordan, 2004a). The strength of the curriculum, May and Carr (2000) argue, is that it is based on the interests of infants, toddlers and young children. When children are interested in a topic of environmental interest this raises issues of teachers' subject content knowledge. In order for teachers to support the children's interests they must research the relevant subject content knowledge to allow children to create their own environmental knowledge. In a socio-cultural approach to curriculum this will mean co-constructing knowledge with children and establishing shared meanings about the topic of environmental interest. Teacher subject content knowledge and the process of learning are also advocated internationally in reviews of research on learning by Bowman et al. (2001) and Bransford, Brown and Cocking (1999). Teachers planning curriculum based on children's environmental interests will be an essential part of this study and central to this planning will be teachers' subject content knowledge (Jordan, 2004a).

Cullen (2003) cautions against taking a narrow view of children's socio-cultural inspired interests and highlights different approaches to identifying and planning for children's interests. She contrasts the play based self-selected interests, with those based on teacher observation and parent identification that can be supported by the project approach. By taking the latter approach a closer collaboration between home and centre results (Hedges, 2002; Jordan, 2004b).

Integrated Curriculum

Theoretical underpinnings

New (2000) in her publication: *An integrated curriculum: Moving from the what and the how to the why,* discusses the progress of an integrated curriculum through the 1990s to the turn of the century. She records a move from a developmental focus for integrated curriculum to a socio-cultural one. The progression she describes is from a child-centred approach (New, 1992) focussing on the *whole child* and emphasising child development, to the *child in context* approach that is socio-cultural in emphasis (New, 2000). The latter takes into consideration children's rights, needs and potential and recognises their contribution as democratic citizens (Dahlberg, Moss, & Pence, 1999).

The context of children's lives is not a one-dimensional developmental view that considers the child in the centre setting only. It takes a broader view of context and considers children's lives both inside and outside of the centre setting. Taking this view of the child allows for the contributions of all members of a community of learners, teachers, children and parents, as well as the resources of a community and institutions.

In her argument for a *child in context* approach to integrated curriculum, New (2000) examines four qualities she believes epitomise an integrated curriculum for the 21st century. It should be first, inclusive of all children and connected to their lives, second, challenging to children and adults, third, communal and collaborative, and finally, courageous. These four qualities will now be examined in further detail as they relate to integrated curriculum.

Inclusive of all children and connected to their lives

The quality of connectedness means acknowledging the diversity of children who attend the centre and planning learning experiences that are inclusive of all children and related to their lives. *Te Whāriki* promotes inclusion. Contribution, goal one, states: "children experience an environment where there are equitable opportunities for learning irrespective of gender, ability, ethnicity, or background" (Ministry of Education, 1996, p. 66). The children and parents should be able to see their culture

and what they value reflected in the centre environment. Moreover, they should feel welcome and accepted in the centre environment. The Reggio Emilia centres of Italy epitomise this approach where children are respected as individuals, while being strongly connected with other children, adults and their school community (Anning, 2004). An allowance is made for children's interests to reflect what is valued in their context, both inside and outside the centre. This type of integrated curriculum is both inclusive and connected to the context of the children's lives and learning environment.

Challenging to children and adults

Providing an integrated curriculum that is challenging to children will mean supporting their interests throughout all areas of the curriculum and allowing for those interests to extend into long-term projects. This approach will challenge children's thinking and imagination and, through quality interactions, lead to a greater understanding of a topic based on their interests. To support children's interests, teachers are often challenged to learn more about children's topics of interest. This requires systematic researching to gain information that is relevant and meaningful for the questions posed by children. It reflects a co-learning approach to knowledge acquisition with adults (Hedges, 2002; Jordan, 2003). It also tells children that adults do not know the answers to everything and need to find out. Furthermore, it models a 'let's find out together' approach to learning (Prince, 2004).

Communal and collaborative

This quality of an integrated curriculum is considered by New (2000) to be pivotal to the successful implementation of an integrated curriculum. She argues: "such a curriculum also has the potential to promote a coming together of parents and teachers, the school [centre] and the larger community based on nurturing of collaborative and reciprocal relationships" (New, 2000, p. 275). This encapsulates a community of learners and the benefits gained by the participants of that community, that is the teachers, children and parents.

Relationships are the cornerstone of the Reggio Emilia approach. Bayes (2005) conducted research in four early childhood centres that participated in a professional

development programme based on the Reggio Emilia approach to early childhood education. The relationships that occurred between the teachers, parents and children were pivotal to the success and quality of the programme provided. Furthermore, the centre environment transformed into a more collaborative and communal community of adults that served the children both during the research and into the future.

Courageous

New (2000) argues it takes courage for early childhood teachers to move beyond interpreting curriculum as "curriculum is what happens" (Dittman, 1974), to a curriculum that encompasses "how things ought to be" (New, 2000, p. 278). This serves to strengthen her argument that here is an integrated curriculum that has moved beyond the 'what' and 'how' to the 'why' of curriculum provision. She believes that an integrated curriculum should not only outline what and how a curriculum is taught, but to what end. She asserts that morality is the basis of the pedagogical decisions made by teachers. This includes being courageous and respectful of children's right to their own thinking (Ball & Wilson, 1996). This would include acknowledging that children have their own theories of the world that should be accepted.

The public display of documentation in New's (2000) view takes courage on behalf of the teachers, particularly when some teachers may fear their mistakes (in observations) are open to public scrutiny by parents (Gorham & Nason, 1997). However, this misconception is fading in New Zealand, with the many displays of documentation seen, especially of learning stories and narratives. In summation, the four qualities of the integrated curriculum outlined by New (2000) were integral to this study and formed the theoretical basis for the implementation of the EEIC by the teachers at both centres.

Integrated Curriculum: Te Whāriki

Te Whāriki (Ministry of Education, 1996) is not only a socio-cultural curriculum, but is also an integrated one. An integrated curriculum means that the learning experiences offered in the programme would not only take cognisance of children's holistic development (Cullen, 2003) but would also be integrated into the core curriculum areas within the centre (Arce, 2000). This approach means that the content knowledge of art, maths and environmental education is not separated into

subject areas, rather it is integrated across all areas of the curriculum. This approach supports the notion that environmental education is not a subject per se but should be an integral part of the curriculum (Florgaitis, Daskolia, & Liarakou, 2005).

It can be argued that the best way to ensure a curriculum is integrated is to plan it around a theme (Kostelnik, Soderman, & Whiren, 2004). The use of themes in early childhood education in New Zealand has had bad press in recent years. It strikes horror into the hearts of early childhood teachers who envisage adult imposed annual curriculum plans connected to seasons or holiday festivals. In their minds it sees teachers 'doing' Spring for a week or so, with scant regard for children's interests. To avoid this imposed view of themes, the themes must be based on children's interests and have meaning and significance for them. The above use of adult planned themes does not acknowledge diversity and is not the approach advocated in this study.

Because of the reluctance of early childhood education practitioners to countenance the use of themes (or in some cases units), I have decided to replace the word theme with topic. So this research will refer to the topic approach to environmental education and a topic of interest, although it is recognised that many authors use theme as their terminology for describing the basis of an integrated curriculum (Arce, 2000; Kostelnik, Soderman, & Whiren, 2004) .
The use of teaching topics allows teachers to plan focussed learning experiences relating to the chosen topic of interest in an integrated curriculum and taking place over a designated timeframe. The advantage of such an approach is that children's environmental knowledge will be generalised from one learning experience to another (Eliason & Jenkins, 2003).

Concept development according to Eliason and Jenkins (2003) is also enhanced through the connections children make through an integrated curriculum on the topic of environmental education. When children learn in an integrated curriculum based on a topic of environmental interest, the knowledge gained transcends individual subjects and produces holistic cohesive understandings. Rather than absorbing discrete bits of information on a topic, children connect this information into a complete understanding about the natural environment. Children seek to understand their world and create knowledge about it through everyday interactions and

experiences offered in the early childhood setting. This can be achieved through a topic approach and the integrated curriculum.

There are other advantages to using a topic approach for teaching children about the environment. Because of the integrated curriculum children can gain knowledge of the topic of interest in many different ways, regardless of their individual learning styles. The options of large group, small group and individual learning experiences offered in an integrated curriculum allow children to become totally immersed in a topic of personal interest (Katz & Chard, 2000). Because the topic approach is based on children's interests this allows for a continual change in the curriculum to support children's changing interests throughout the year. The increasing emphasis on teacher subject content knowledge and a socio-cultural approach to curriculum (Ministry of Education, 1996) that supports the children's interests through the project approach adds weight to this argument (Hedges, 2002; Jordan, 2004a). It can also strengthen group dynamics in a centre as all the children are focussed on the same topic of interest at the same time. This makes for inter-subjectivity and a shared understanding of the topic of interest (Kostelnik, Soderman, & Whiren, 2004). In this study the topics of interests were environmental in nature.

Teachers' Knowledge about Curriculum

The project approach

The project approach (Helm & Katz, 2001; Katz & Chard, 2000) is a way that children can investigate a topic of interest that will satisfy their curiosity and desire to learn more about that environmental topic. A project consists of an investigation into a topic of interest instigated by the teacher's observations of the children's environmental interests, passions and preferences. This is how most topics of interest arise within a socio-cultural pedagogical approach. However, sometimes the teacher will choose the topic of interest for the children (Arce, 2000). In this instance, teachers need to be aware of not imposing 'themes' on children, or topics that are devoid of interest for them. Projects occur in small groups but are often centre wide and the topics of interest last for a few days or weeks (Jackman, 2005). A project approach helps develop skills and knowledge in children and is particularly helpful in answering their questions on an environmental topic of interest. Simmons, Schimanski, McGarva, Cullen and Harworth (2005) researched children's working

theories of the world and questions were an integral part of the process. This approach could be a valuable way to answer children's questions on the environment.

Helm and Katz (2001) suggest projects allow children to engage in self-motivated learning and they can satisfy their curiosity in a meaningful way. Both teachers and children share in the joy of learning together about a topic of mutual interest. Projects also have the potential to involve parents as they become interested in what the children are learning (Meade, 2001). They can offer resources to support the children's knowledge creation and talk to the children about their environmental learning.

A project approach occurs in three phases (Helm & Katz, 2001). The first phase is choosing a topic and creating a web of possible learning experiences that the teachers will offer to support the children's environmental topic of interest. Children's questions and comments can also form part of the web. For example 'birds eat worms' or 'why do birds make nests?' (Arce, 2000). The web is only a tentative plan and can be added to as children's ideas and questions 'emerge' as part of the emergent curriculum (Jones & Nimmo, 1994). The topic of interest would be able to be integrated into all curriculum areas to allow for integrated learning in a variety of forms across the curriculum. The second phase leads to deeper investigation of the topic of interest. Research on topics of interest was carried out by both the children and the teachers in order to gain further information in this study.

In a project approach a variety of learning experiences related to the topic of interest are also offered. In the third phase as the project reaches its climax it is time to review the children's learning. This is often done through conversations about photos taken on excursions. For instance, two-way inter-subjectivity between teachers and children was a feature of research by Jordan (2004b). Display boards of documentation on the topic of interest, including examples of the children's creative endeavours, are also a feature of the project approach. It is then time to observe new interests that may have arisen out of the topic of interest, or embark on a completely new interest and the three-phase process begins again. The project approach as discussed here was integral to the research design and methodology of this study.

Documentation: socio-cultural assessment

Loris Malaguzzi (1920-1994) was the founder of Reggio Emilia preschools in Emilia Romagna, a province in Northern Italy. The Reggio Emilia approach to early childhood education has gained international recognition as a meaningful way for children to learn. The mainstay of the approach is the short and long term projects undertaken by the children. The children are challenged to ask questions, hypothesise, test their theories, explore and play within a culture of the pedagogy of listening. Documentation of the children's learning is one of the principal teaching strategies allied with this approach. Malaguzzi believed the public display of children's learning was a way to promote the culture of the pre-school to the wider community. Furthermore, documentation is seen as integral to the project approach. It is a way to display the children's artistic creations as well as their learning on a topic of interest. This documentation is also a source of provocation to stimulate further learning for the children (Edwards, Gandini, & Forman, 1993).

The project approach and the use of documentation is now a feature of many early childhood programmes. Learning stories (Carr, 2001) and documentation as a form of assessment, as outlined in the early childhood assessment exemplars (Ministry of Education, 2004), are now widely used. Allowing children to ask questions to hypothesise and to test their theories of the world is also a feature of the project approach. Ryder and Wright (2005) outlined how this action research process occurred for them as one of the Centres of Innovation. Theoretically they acknowledged the influences of Malaguzzi (Edwards, Gandini, & Forman, 1993) and Katz and Chard (2000). In their view, starting with the children's interests is the key to sustained projects on children's topics of interest. Furthermore, they found that the project approach strengthened parent-teacher-child relationships, especially through the extensive documentation that occurred as part of the research process. These findings are significant for this study's design.

Planning an integrated curriculum from children's environmental interests, whether by teacher observation or parental identification, as the starting point of a project on a topic of environmental interest, was pivotal for the centres involved in this study. Teachers needed to be aware of how the emergent curriculum and children's topics of interest evolved through the three stages of the project approach.

Current Perspectives on Learning

The socio-cultural and social-constructivist views of learning suggest that children learn in socio/historical contexts through interactions with adults and other children. The resultant learning is holistic in nature and reflects the shared meanings created through adult-child co-construction of knowledge. Socio-cultural and social constructivist theories are derived from the work of Vygotsky (1978) who believed that cognitive development was the transformation of biologically determined processes into higher psychological functions. These functions are transformed in the context of socialisation and education. Central to this transformation is the utilisation of cultural tools, language and social structures for the development of higher mental functions (Diaz, Neal, & Amaya-Williams, 1990). Although authors such as Rogoff (1998) and Edwards (2003) distinguish social constructivism and socio-cultural theories, other authors of early childhood education literature do not make this distinction. According to Fleer, Anning and Cullen (2004, p. 175) "Socio-cultural perspectives take into account the social, historical and cultural dimensions of every day activities and seek to better understand children within this richly framed research context". For the purposes of this research this will be the definition of socio-cultural as it will be applied to the research situation under study.

According to Driver et al. (1994), social constructivism is the process by which children can make sense of the world through their interactions in social contexts. Cognition is therefore 'distributed' so the child is connected culturally to the activities of everyday life (Pea, 1988; Pea & Gomez, 1992; Salomon, 1993). Through relationships with peers, groups, families, schools and early childhood centres, children are 'encultured' into the symbols and valued knowledge of their society (Brown, Collins, & Duguid, 1989) and culture (Goncu, 1999). The research incorporates elements of both social constructivist and socio-cultural theories. Therefore, it emphasises the importance of relationships and social interactions as well as the social, historical and cultural dimensions outlined by Fleer et al. (2004). As socio-cultural is the predominant theoretical term in New Zealand early childhood literature this is the terminology of choice for this thesis.

An example of New Zealand research using a socio-cultural approach (Rogoff, 1990; Valsiner, 1998) is the *Picking up the pace project* (Ministry of Education, 2002).

This research had an early childhood component (as well as primary school links) and involved the local communities in the promotion of literacy achievement. It was, in turn, part of a larger project *Strengthening education in Mangere and Otara* (SEMO). Although focussed on literacy, this research had significant parallels with this study. The emphasis on community involvement in children's education fitted well with the key concept of the creation of a community of learners to promote environmental education in the early childhood curriculum.

As discussed earlier, *Te Whāriki* (Ministry of Education, 1996) is a socio-cultural document. Learning in early childhood centres happens in groups through socially constructed learning in a socio-cultural context. Research that investigated young children's enculturation into childcare, and the cultural event of meal times, was undertaken by Brennan (2005). In this qualitative research, one early childhood centre was used with the children and teachers as participants. Data collection methods included participant observation, field notes, mental notes, interviews, conversations, artefacts and physical space. The latter two items were not a feature of this study. Although the research has methods and procedures similar to this study, the absence of a parent perspective, and the choice of one childcare centre to the exclusion of other early childhood provisions are limitations of Brennan's study.

Relationships between teacher and child proved to be a primary factor in the children's enculturation into the routines and rituals of childcare. Relationships played a major part in this study also, especially the triadic relationships of teacher, child and parent. Although a socio-cultural approach was espoused in Brennan's study, she found the cultural and structural aspects of childcare worked in opposition to successful curriculum implementation. For this reason, the two centre design of this study should go some way to alleviating this impediment. Brennan (2005) also argues that separating teachers and children from their community is contrary to notions of community. These are significant findings that highlight the importance of parents in children's lives. The creation of a community of learners in this study gave equal status to parents and, through participatory action research, valued parental knowledge and the culture of the children's homes.

A further example of socio-cultural research was conducted by Jordan (2004a). She investigated teachers' scaffolding of children's learning and their co-construction of understandings with them. Action research was employed in four early childhood centres where a variety of early childhood education provisions were represented. Teachers were involved in professional development on scaffolding children's learning and thinking. The teachers found that co-constructive interactions with children were more empowering than those using scaffolding. Scaffolding is the support of children's learning by a more capable peer or adult and involves pre-determined goals about what can be achieved (Wood & Attfield, 2005), whereas co-construction of knowledge suggests a more equal co-learning. Gibbons (2004) investigated children's learning through participation in a centre routine. She used Rogoff's (2003) planes of analysis (community, inter-personal, personal) to examine children's participation (and learning) in the socio-cultural routine of playcentre morning tea. This qualitative research used one early childhood provision (playcentre, two centres), and like Brennan's (2005) research, it investigated the cultural routine of group eating. Similar data collection methods to this study were observations, interviews, focus groups, and collection of relevant written material. The latter is comparable to the document analysis in this study. Furthermore, parents were an integral part of this research as philosophically playcentre is a parent-led provision. The expectations of this mealtime routine epitomises the passing on of cultural knowledge from one generation to another. Children learn both individually and in groups. This occurred through the community plane (the playcentre environment), the inter-personal plane (interactions during learning experiences) and the personal plane (through participation in the learning experiences). The associated three processes are described as apprenticeship, guided participation, and participatory appropriation. Although this study acknowledges the importance of participation in cultural events, it focuses also on knowledge creation as a process with particular reference to knowledge about the environment.

A Community of Learners

A socio-cultural concept of particular relevance to this research is that of a community of learners. Rogoff, Goodman Turkanis and Bartlett (2001b) view a community of learners as a school that "prioritises instruction that builds on children's interests in a collaborative way, where learning activities are planned by children as

well as adults and where parents and teachers not only foster children's learning but also learn from their involvement with the children" (p. 3).

Rogoff et al. (2001b) were involved in an innovative Salt Lake City Public School Programme that functioned as a community of learners. In the programme, adults and children learned together in an environment where decisions and choices about learning were co-constructed, inter-subjective experiences. The children's learning was neither one of adult control nor child freedom, as both children and adults planned the learning experiences together based on the children's interests. This collaboration between adults and children in a community of learners was a way to eliminate the dichotomy between adult controlled learning and child controlled learning.

McCaleb (1997) in her literacy research on building a community of learners outlined four major areas that are pivotal to the concept of a community of learners. These areas encapsulate the socio-cultural view of children's development and value the cultural and historical influence the family and community have on children's learning. Her four main areas (McCaleb, 1997, p. xii) coincide with the four principles of *Te Whāriki* (Ministry of Education, 1996, p. 14), the early childhood curriculum, and both will be outlined below. The *Te Whāriki* principles are in parentheses. She believes teachers need to:

1. Learn to develop their classrooms as communities of learners in which each student is valued (Empowerment: The early childhood curriculum empowers the child to learn and grow).
2. Learn how to affirm each student's cultural and linguistic identity by using the knowledge each brings to the school as the primary "text" for developing literacy (Holistic Development: The early childhood curriculum reflects the holistic way children learn and grow).
3. Learn how to achieve collaborative relationships in a way that respects the student's family and community as valuable contributors to the educational process (Family and Community: The wider world of family and community is an integral part of the early childhood curriculum).
4. Learn to view themselves, in their role as teachers as authentic human beings – not all-knowing authorities, but as co-investigators in a learning community

(Relationships: Children learn through responsive and reciprocal relationships with people places and things).

New Zealand teachers working in early childhood education settings are familiar with *Te Whāriki* and this explanation of a community of learners should resonate with them. In New Zealand, research on a community of learners is associated with the centres of innovation (COI). For instance Roskill South Kindergarten (Ramsey, Breen, Sturm, Lee, & Carr, 2005) outlined how the close relationship they had with their parents and families constituted a community of learners. For many of those in that community English is an additional language with 17 different home languages being represented.

Head (2003) highlights collaboration as a necessary component of a community of learners. He suggests that by using the theoretical underpinning of the zone of proximal development (Vygotsky, 1978) where children are encouraged to reach their potential with the assistance of the teacher and peers, more effective collaboration can occur in children's learning. Collaboration is the way to create a community of learners of children, teachers and parents. Konzal (2001) used a collaborative research process between the principal of a school, the parents and a college researcher. A year-long inquiry was conducted in which parents kept a journal of their children's kindergarten experiences. This community of learners excluded children and they were only alluded to in the vicarious writing of their parents. In contrast, this current study positions children on an equal footing to other participants of a community of learners (parents and teachers).

The notion of a community of learners is epitomised in the research of Brown and Campione (1994) and Brown, Metz and Campione (1996). In this model of teaching and learning, students are viewed as researchers and teachers in classrooms with multiple zones of proximal development that replicates a research community. Based on this model Head (2003, p. 59) summarises a community of learners' classroom thus:

> …a classroom operating as a community of learners is founded on five main principles: multiple zones of proximal development; a community of discourse; negotiation of meaning; mutual appropriation of ideas; and the common knowledge and individual expertise that grows out of its creation.

Perhaps the most comprehensive report on research on a community of learners originating in the work of the late Ann Brown and Joseph Campione (1994) is reported in the *Journal of Curriculum Studies* (2004). In a special issue of the journal several studies (Schoenfeld, 2004; Shulman & Sherin, 2004) examined the researchers' experiences of involvement in the Fostering of a Community of Learners (FCL) project. The papers outlined research conducted in various school academic subject areas. The research was examined through the 'lens' of pedagogical school reform and documented the students' collaboration in learner-centred learning communities. The students worked on tasks that required 'distributed' expertise amongst fellow classmates.

All of the above studies, with the exception of Meade (2005) and Konzal (2001) refer to communities of learners created in school classrooms. Even Konzal's research had links with school. The parents in her study documented their feelings about their children's transition from kindergarten to school. This present study builds on the research conducted in the COIs (Ramsey, Breen, Sturm, Lee, & Carr, 2005). However, the point of difference is that it documented the *process* of creating a community of learners rather than a community of learners being seen as a characteristic, as is the case of the six COIs that took part.

Sociological Concepts

To gain an insight into the knowledge that parents contribute to their children's environmental knowledge base, two sociological concepts, social capital and funds of knowledge, were used as analytical tools. The focus on a community of learners in this study illuminates the nature and meaning of these two concepts.

Social capital

In Field's (2003) view, social networks form the heart of social capital. These networks allow people to make connections with others and to work together to achieve things that would be difficult if embarked on alone. The common values and shared understandings within these networks constitute a form of capital and common vision that can be utilised to profit all members of the network (Lin, Cook, & Burt, 2001). Furthermore, the more people in your social network, the richer you are in

social capital. The old adage of 'it's not what you know it's who you know' sums up social capital. However, the key word is trust (Fukuyama, 1995; Putnam, 2000) . If people want to co-operate and collaborate to achieve mutual goals they have to trust each other and need to feel it is a worthwhile undertaking. Sharing similar values will increase the likelihood of the mutual goals being achieved. Field (2003) offers a succinct two-word summation of social capital: "relationships matter."
Social capital as a sociological concept has enjoyed recognition over the past two decades especially in political and academic circles. Although it encompasses notions of 'community' and 'social fabric' there is no unified definition. This confusion over definitions requires an explanation of the three basic components of social capital. Halpern (2005) describes them thus: "They consist of a *network;* a cluster of *norms, values and expectancies* that are shared by group members; and *sanctions* – punishments and rewards – that help to maintain the norms and network" (p.10). Indeed many interpretations in many different disciplines have come under the umbrella term of social capital (Halpern, 2005). Some in society would suggest it is just another fad (Lin, Cook, & Burt, 2001). However, to those who understand the concept, "…it is the most important and exciting concept to emerge out of the social sciences in fifty years" (Halpern, 2005, p. 1).

James Coleman (1994), the American sociologist, attracted considerable interest in his writings on social capital especially in the area of education. His study of educational success was conducted in American ghettos and showed how social capital was not only the domain of the rich but could significantly assist the poor to accrue the benefits of the educational system (Field, 2003). Coleman (1994) highlights the difference between human capital (an individual possession) and social capital (a group public good). He suggests social capital is:

> The set of resources that inhere in family relations and in community social organisation and that are useful for the cognitive or social development of a child or young person. These resources differ for different persons and can constitute an important advantage for children and adolescents in the development of their human capital (Coleman, 1994, p. 300).

Dika and Singh (2002) conducted a comprehensive review of the literature on social capital and its application in educational settings, and noted that the export of social

capital to education came through Bourdieu and Coleman as they both examined educational attainment. Whereas Bourdieu examined the cultural reproduction of inequalities in schooling, Coleman concentrated on the social capital within families of high school aged children. He argued that factors associated with social capital such as " two parents in the home, lower number of siblings, higher parental educational expectations and generational closure – led to lower incidence of dropping out of school" (Dika & Singh, 2002, p. 34).

Dika and Singh (2002) emphasised the recent increase of citations of social capital in educational literature. One interesting finding was the fact that citations of social capital were markedly absent in academic educational journals during the 1990s. Research trends were examined in three time periods 1990 - 1995, 1996 –1998, and finally 1999 –2001. Their review of published research literature revealed that in the final three years reviewed, references to social capital in academic literature had increased markedly. A finding that had implication for this study was the increasing use of qualitative methods, including case study approaches. The methods used in the qualitative research designs of the studies reviewed mirrored methods used in this study; that is observations, interviews, focus groups and document analysis. A similarity to this study was evident in the groups interviewed in four studies reviewed (Fritch, 1999a, , 1999b; Kahne & Bailey, 1999; Lareau & Horvat, 1999). These groups included focus groups of parents, community members and school personnel. Only one of the studies interviewed children.

There is considerable international research on social capital in many fields (OECD, 2001; Portes, 1998) including Australasian research. For instance Stone, Gray and Hughes (2003) conducted research on the relationship of family, friends and social ties in gaining employment in Australia. Robinson (2002) reported on two research papers using social capital for analysis (Gillon, 2002; Williams & Robinson, 2002) in New Zealand. Research on social capital per se is not the emphasis in this study; it is the theoretical concept and its application to a community of learners to promote environmental education that is of relevant interest.

Of particular relevance to this study are two studies (one international and one Australasian) that have been published since the review on research by Dika and

Singh (2002). These studies used social capital to interpret their findings. First, McNamara-Horvat, Weininger and Lareau (2003) interviewed parents to investigate parental networks and social class differences in family-school relationships. When considering how problems at school were dealt with, they found a difference between the resources available to middle class families through their social networks were greater than those available to the working class families. For this reason they argue that social capital can act as an inter-generational vehicle of advantage. McNamara-Horvat et al's research is significant for this study as parents from lower socio-economic areas were an integral part of a community of learners at both centres. Second, Farrell, Tayler, Tennent and Gahan (2002) interviewed 76 children aged 3 to 8 years in informal conversations with their caregivers. They sought to listen to the children's 'voices' and to investigate their perception about their early childhood education service. They also elicited their views on what they would tell prospective children who might attend. Children's participation in research and their voices are of particular interest in this study (Christensen & James, 2000; Graue & Walsh, 1998). The children's answers were analysed from the theoretical perspective of social capital identified as community capacity building and social capital. The use of social capital has a parallel to this study where a similar method was used to analyse parent responses.

Funds of knowledge

"The concept of *funds of knowledge* … is based on a simple premise: People are competent, they have knowledge, and their life experiences have given them that knowledge"(Gonzales, Moll, & Amanti, 2005a, p. ix-x). These authors, in their research on the funds of knowledge in minority households, aimed to alter public perceptions of working class communities and to emphasise the strengths and resources these families had to offer in enhancing their children's school learning. Fleer and Williams-Kennedy (2001), in their research with indigenous families, took a similar view. They positioned the families as knowledgeable about their children and valued their cultural context. Both of these research studies worked on the premise that learning is a social process. Moreover, learning must be connected to the children's lives, local history and the community contexts in which they live. The lower socio-economic centres in this research offered the opportunity to examine this

thesis as it applied to the creation of a community of learners to promote environmental education in the early childhood curriculum.

A child's home offers a wealth of knowledge that can be harnessed to enhance the child's educational learning in the early childhood setting. To illustrate this point Moll (2000) uses the term funds of knowledge as the knowledge families, as well as communities, contribute to a child's socio-cultural learning. An example of community learning would be that of religion. Sunday School, Bible Studies, the Catechism and the Liturgy constitute religious funds of knowledge. The latter can also be related to the household's labour and social history which allows for the socio-cultural distribution of material and intellectual resources through strategic social ties and networks (Gonzales et al., 1995; Greenburg, 1989; Velez-Ibanez, 1988, , 1993). Funds of knowledge can be described as the historically developed and accumulated strategies utilised by the family, such as skills, ideas and bodies of knowledge that maintain a household's functioning and wellbeing. An example would be painting a young couple's house when family and friends from the community combine their skills to assist in the completion of the task.

Gonzales et al. (2005b) in their book *Funds of knowledge* argue that; "learning does not take place 'just between the ears' but is eminently a social process" (p. ix). Through their research over many years they have been able to contemplate the lives of the students who have taken part in the research in the context of their homes and families. This has made them acutely aware of the societal ideologies, politics and historical context of the students' lives and how these impact on their educational opportunities.

Research on funds of knowledge in early childhood was conducted by Riojas-Cortez (2001). She investigated 4 and 5 year old children's funds of knowledge during socio-dramatic play. Twelve funds of knowledge categories were used to identify socio-dramatic play episodes, including childcare, family values and traditions, friendships, economics and education. From these categories 41 socio-dramatic play themes emerged. The research sought to identify the cultural traits of Mexican American children. The funds of knowledge identified included values and beliefs, language, forms of discipline and the value of education. The information gained

offers teachers a way to provide a culturally reflective curriculum. Although the current study did not directly investigate children's funds of knowledge the teachers at both centres valued children's cultural background as well as parental funds of knowledge.

Although Moll, Amanti, Neff and Gonzales (1992) are best known for their ethnographic research studies it is their theoretical underpinnings that are of interest in this study. The wealth of knowledge in the form of funds of knowledge that families can contribute to children's environmental learning is the notion under investigation. Emphasis, therefore, is placed on the theoretical notion of funds of knowledge rather than the research methodology per se. The collaborative research approach used in the studies however, has definite links with the participatory action research approach used in this study.

Metaphors of Learning

An academic debate on what constitutes learning emerged in the closing years of the 20th century. The question posed by the academic community was: Was learning and knowledge acquisition the possession of the individual, or did learning and 'knowing' happen through participation in a group in a learning situation? The latter epitomises the socio-cultural/social constructivist approach to learning. Proponents of either one of these views held very strong views to the exclusion of the other. Sfard (1998) added to this educational debate by offering a metaphorical explanation of these two opposing views. She identified two metaphors of learning: the *acquisition metaphor* and the *participation metaphor.* The *acquisition metaphor* views learning as a personal possession. The notion of a person gaining knowledge either individually or in a socio-cultural context is taken for granted. On the other hand the *participation metaphor* of learning differs markedly from the *acquisition metaphor* on what constitutes learning. The *acquisition metaphor* views learning as the gaining of personal knowledge while the *participation metaphor* views learning as happening in the socio-cultural context of groups. It is seen as an apprenticeship, (Rogoff, 1990), peripheral participation (Lave & Wenger, 1991), the social construction of knowledge (Greeno, 1998; Vygotsky, 1978), or "enculturation" (Brown, Collins, & Duguid, 1989). What is absent from the conversation on learning in the *participation metaphor* are the words 'concept' or 'knowledge'. These entities are replaced by the word

'knowing' with an emphasis on group action and activities. Sfard (1998) makes the comparison between the two metaphors of learning and suggests that in the *participation metaphor* "the permanence of *having* gives way to the constant flux of *doing*". She also suggests: The vocabulary that accompanies this discourse refers to "situatedness, contextuality, cultural embeddedness, and social mediation" (p. 6). Furthermore Sfard (1998) suggests: "Thus quite unlike the *acquisition metaphor*, the *participation metaphor* seems to bring a message of everlasting hope: Today you act one way; tomorrow you may act differently" (p. 8). After discussing both metaphors she cautioned about the danger of adhering to one and dismissing the other out of hand. The debate continued into the new millennium with Paavola, Lipponen and Hakkarainen (2002) arguing that there was a third metaphor of learning, the *knowledge creation metaphor.* An argument will be posited here that the *knowledge creation metaphor* is an extension of the *participation metaphor* and explains how environmental knowledge is created in a community of learners.

The Knowledge Creation Metaphor

> *The knowledge creation metaphor* of learning means that learning is seen as analogous to processes of inquiry, especially to *innovative* processes of inquiry where something new is created and the initial knowledge is substantially enriched or significantly transformed during the process (Paavola, Lipponen, & Hakkarainen, 2002, p. 24).

Why was it necessary to go beyond the two learning metaphors identified by Sfard (1998)? Essentially, a clearer definition of 'knowledge' was required. Knowledge is the key word in the political rhetoric and ideology of the 21st century and especially in the growth of a 'knowledge economy'. The growth in knowledge communities is a response to that worldview.

In the *participation metaphor* one way to view learning is the passing on of valuable cultural knowledge from one generation to another. This can be described as the 'transformation of participation' in ongoing activities (Lave & Wenger, 1991; Rogoff, Paradise, Mejia Arauz, Correa-Chavez, & Angelillo, 2003). This process is achieved by the passing on of knowledge to the younger generation by the more knowledgeable older members of a given culture. This occurs through a type of apprenticeship system

where the older generation are seen to have the accumulated knowledge. Through a process of enculturation the younger generation learn the necessary valued skills of the culture (Rogoff, 1990, 1998). In the *knowledge creation metaphor* this process is questioned. Bereiter (2002) suggests that in the 'cut and thrust' of the knowledge economy everyone is a 'newcomer' and the 'old timers' must succeed in a climate where you are only as good as your last achievement. Bereiter and Scardamalia (1993) argue that the notion of the older generation having all the knowledge can be debunked. Their reasoning is that often the younger generation develop skills and competencies that the older generation would find difficult to accomplish. Technology is a case in point. The younger generation have been brought up with it and it is an integral, and taken for granted, part of their every day life. On the other hand, technologies such as computers and cell phones can be difficult for the older generation to grasp and can remain a persistent conundrum.

Paavola et al. (2002) argue that in order to understand the innovative knowledge communities that are emerging as a response to the knowledge society there needs to be a move away from the dichotomy of the *acquisition* and *participation* metaphors. They argue for a *knowledge creation metaphor* that can bridge the gap between the cognitive (*acquisition metaphor)* and the situative (*participation metaphor)* perspectives of learning. Knowledge is pivotal to the cognitive perspective whereas the situative perspective highlights participation in socio-cultural practices and actions (Anderson, Reder, & Simon, 1996). In the *knowledge creation metaphor* knowledge is highlighted but not in the way it is in the *acquisition metaphor*. The emphasis is on processes, especially the inquiry or the innovative processes that lead to the creation and advancement of knowledge. If Sfard's (1998) notion that the *acquisition metaphor* involves *having* knowledge and the *participation metaphor* is about *doing* and *knowing* then the *knowledge creation metaphor* is about the *process* of creating knowledge.

The *knowledge creation metaphor* has links with the *participation metaphor* of learning. The *knowledge creation metaphor* of learning supports the notion of situatedness of cognition through social interaction and collaborative participation inherent in the *participation metaphor.* However, an emphasis on the *process* by which knowledge is developed and created is the distinguishing difference. Through

the creation of a community of learners in this study an 'epistemological infrastructure' was used to also create a community of knowledge. "Epistemological infrastructure refers to individual and collaborative practices of working with knowledge and engaging in inquiries for advancing knowledge that are important in knowledge work" (Paavola, Lipponen, & Hakkarainen, 2002, pp. 25-26).

A model that exemplifies the knowledge creation metaphor is proposed by Bereiter (2002). He criticises the *acquisition metaphor* of learning because knowledge is seen to reside in the individual's mind. His model suggests knowledge is 'in the world' as conceptual artefacts that are theories, models and ideas. He believes that the knowledge society has caused knowledge to be viewed as something that can be produced and shared through collaborative interaction and knowledge building within a community. His idea that knowledge is in the world as opposed to a person's head is based on the theories of Popper (1972) where he suggests three worlds are evident. World one encompasses physical and material reality. World two encapsulates the realities of mental states. World three is the world of cultural knowledge. World three is very important as individuals do not only function in the first two worlds, but are able to develop cultural artefacts that link with Popper's third world. Although the latter world can operate autonomously it is still dependent on worlds one and two.

Bereiter (2002) is critical of learning theories that view the mind as a container where accumulated knowledge can be stored. Instead he advocates for a learning theory that recognises the pivotal role that world three makes to the advancement of knowledge through the conceptual artefacts of theories, models and ideas. The creation of a community of learners is theoretical in nature and the innovative process of building this conceptual artefact creates something new. The teachers at the two centres in this study became 'creative experts' who led the early childhood education field by creating an innovative conceptual artefact in the form of a community of learners. Furthermore, creating and advancing knowledge (in the case of this study, environmental education) was consistent with the *knowledge creation metaphor* of learning.

What makes Bereiter's (2002) theory of the knowledge creation metaphor different from both the acquisition and the participation metaphors of learning? Paavola et al.

(2002) suggest it is because: "… he emphasises more strongly a conscious effort to advance knowledge and a commitment to go beyond existing knowledge and understanding, an effort to solve knowledge problems through collaboration in innovative communities within a knowledge society" (p. 27). This explanation is significant for this study that investigated parents' funds of knowledge. It suggests that parental funds of knowledge complement the understanding of environmental education through the knowledge creation process. This explication suggests Bereiter (2002) is not viewing knowledge as a personal possession, rather as a collaborative effort by people in a knowledge community to create and advance knowledge in a knowledge society in the 21st century. The conceptual artefact of a community of learners to create environmental knowledge in this study encapsulates this notion. As previously discussed, the *knowledge creation metaphor* supports socio-cultural learning through the situatedness of cognition, social interaction, and collaborative participation. Although these two concepts are complementary, it is the knowledge creation approach to environmental education that will be emphasised in this study.

Conceptions of Children's Knowledge Construction

Co-construction of knowledge

Malaguzzi (1993) (the founder of the Reggio Emilia approach to early childhood education) constructed the concept of the 'rich' child. The multiple perspectives and interests of this competent child contribute to an early childhood curriculum rich in learning experiences. The principle of empowerment as espoused by *Te Whāriki* (Ministry of Education, 1996) encapsulates this construction of the child (Cullen, 2003). This is as opposed to the 'poor' child who is separated into areas of development, cognitive, socio-emotional and physical development. In Malaguzzi's view the latter does not allow for the complex processes that produce a rich and unique individual, a child who is, in his words, "rich in potential, strong, competent" (Malaguzzi, 1993, p.10).

Learning for this rich child is not individual, rather it is a co-operative and community activity in which the child co-constructs meaning (Palinscar, 1998) with adults and other children. In co-construction, the transmission of knowledge, and desired outcomes, is not the purpose of learning, nor is the child a passive receiver or

reproducer of knowledge generated by the adult. Instead, as Rinaldi (1993) argues, all their knowledge is produced by self and social construction. They, therefore, are active agents in the construction of their knowledge in socialisation with peers and adults (Newman, Griffin, & Cole, 1989; Wertsch, 1995). The rich child engages in activity with the world, has ideas and theories that deserve merit, and if appropriate, the questions and challenges of adults.

Finally, the rich child must be viewed in the socio-cultural sense as a member of society. This child exists in the family home, but more importantly in the wider world. The child has rights as a citizen and this brings with it accompanying responsibilities. For this reason, he or she should be included in, and have an active relationship with society (Dahlberg, Moss, & Pence, 1999). The rich child emerges as a co-constructor of knowledge engaged in a wide range of relationships with diverse adults and peers in the home and beyond. In the co-construction process the child is not a passive receiver or reproducer of knowledge, (Bereiter, 1990; Valsiner, 1998). For that reason they are, in a socio-cultural sense, also a member of society and therefore a community of learners (McCaleb, 1997; Rogoff, Goodman Turkanis, & Bartlett, 2001b). Furthermore, they are co-constructors of knowledge, identity and culture (Dahlberg, Moss, & Pence, 1999; Ministry of Education, 1996). The above construction of the child as a socio-cultural being who is a valued member of their community and society was integral to this study and to the creation of a community of learners at both centres.

Inter-subjectivity

"Underlying interaction within the zone of proximal development is inter-subjectivity, the process of constructing and reconstructing joint purposes between the child and his/her interacting partner" (Rogoff, 1998, p. 429). In an early childhood education sense, inter-subjectivity is viewed as the interaction between children and caregivers/educators and the shared meanings that result. Children are able to experience the world through their main caregivers/educators who involve them in the socio-cultural life of the centre and highlight shared meanings and behaviours. Anning and Edwards (1999) suggest that an important behavioural indicator of inter-subjectivity is turn taking. This, in their view, is pivotal to language development. Turn taking is co-regulation. This happens when mothers adapt their behaviours to

the rhythms of their children. This allows the latter to be taking the lead that mirrors conventional conversation. The inter-subjective nature of the relationships between parent and child was acknowledged in this study.

The zone of proximal development and cultural tools

Vygotsky (1978) introduced two key socio-cultural concepts, the Zone of Proximal Development (ZPD) and cultural tools. The ZPD is the range of potential learning that occurs within a given social and cultural environment. Vygotsky defines the ZPD as the distance between a child's actual developmental level of independent problem solving and their potential level of development where problem solving is guided by an adult, or more capable peers. This individual 'tutorial' approach between the expert adult and the novice child is a limitation when considering the group learning context of the centre. In this setting a more equal co-construction of knowledge is an appropriate approach (Jordan, 2004b).

Cultural tools, on the other hand, include a comprehensive range of ideas and objects children can use to achieve their goal. Rogoff (1990) identifies some of these tools as calculators, computers, books, numbers, letters, and ideas such as gravity. A child can utilise these socio-cultural tools, or artefacts (Cole, 1996), to understand the world and to solve problems. A good example of the use of cultural tools involved the research of Rogoff (1995) when she investigated the sale of Girl Guide cookies. Learning occurred through interactions with parents, customers, troop leaders and children. The use of cultural tools such as colour coded forms to ascertain money owed, routes to deliver cookies, and various sales strategies were also features of socio-cultural learning. Environmental learning within a child's ZPD and the use of cultural tools such as books and the computer can contribute to the co-construction of environmental knowledge.

Research on the co-construction of knowledge began with Vygotsky's ideas about socially constructed learning and continued in many socio-cultural studies of mind (Wertsch, Del Rio, & Alvarez, 1995). The use of co-construction of knowledge and inter-subjectivity to enhance the shared meanings about the environment, contributed by the child, teacher and home, was a focus in this study. It also proved instrumental in the creation of a community of learners.

Domain Knowledge

The concept of domain knowledge which has its origins in cognitive constructivism refers to a network of information about a specific area. It refers to a co-ordinated whole rather than discrete "pieces" of information. More recently research on domain specific knowledge has merged with research on socio-cultural learning. In their review of domain specific knowledge acquisition Wellman and Gelman (1998) concede that studies now concentrate on knowledge as content (Inagaki, 1992), and they outline what knowledge children have and the mechanisms of how this knowledge is formed in a socio-cultural context. Wellman and Gelman (1992) have posited the idea that children can possess domain specific knowledge that suggests children can have their own naïve theories about areas such as physics and biology. A similar notion to that of domain knowledge has been espoused by Vygotsky (1978), in what he called informal concepts.

Foundational domain knowledge has been defined by Wellman and Gelman (1998, p. 523) as "those concepts or bodies of knowledge that engender, shape, and constrain other conceptual understandings". They argue that unlike Piaget's concepts of children's knowledge as domain general structures and processes, foundational domain knowledge views knowledge as complete bodies of knowledge that are domain specific.

Inagaki and Hatano (2002, p. 141) outline the socio-cultural aspect of naïve biology. They assert that: "naïve biology is acquired through exposure to a culturally arranged biological environment and discourse about it, and enriched further through participation in cultural practices" (p. 141). They outline a taxonomy of three practices that are vital to a child acquiring naïve biology as a core domain. First, growing plants and owning and caring for animals. Second, through excursions to zoological gardens or botanical gardens, and finally through reading picture books and watching television with others. Although they concede that in today's industrial society not all children will have the opportunity to take part in these experiences they espouse the benefits of participation in these socio-cultural activities. This explanation of how children acquire naïve biology is particularly relevant to this study as all of the activities outlined can be part of an early childhood programme.

Through the activities outlined children can make predictions and think about the causality of their biological predictions. Inagaki and Hatano (2002) believe naïve biology in children has three characteristics: a) an interest in bodily processes especially illness and nutrition, b) the use of personification to make predictions based on their own human experience, c) their explanation of biological causality is vitalistic. In other words living organisms gain power from ingesting food and water. Therefore, according to Inagaki and Hatano, naïve biology develops through children's interactions, hypotheses and socio-cultural activities. Moreover, direct contact with nature, excursions and the world of books and television are examples of naïve biology acquisition. Through such processes children possess domain specific knowledge that is characterised as "a core of systematic beliefs and distinctions" (Wellman & Gelman, 1998, p. 554). Knowledge as content in the knowledge creation process and a socio-cultural approach were pivotal in this study.

An example of early childhood research which investigated children's domain knowledge was reported by Cullen and Allsop (1999). The aims of the research were: to ascertain first, the knowledge base children brought to outdoor play, second, whether children shared their knowledge with peers in order to extend play sequences, and finally, the effects of informal adult interactions on the complexity of child's play.

Observations were conducted over two terms. In phase one, adults were requested to offer minimal interactions with children, while in the second phase adult interactions were encouraged as part of children's play. In phase one, interests were short lived. This was in contrast to the second phase, where resources were added to the sandpit to promote construction and teachers interacted with the children over extended periods of time. During this time the teacher participated by helping to resolve construction difficulties and by sharing and recalling knowledge and extending their construction play. The addition of resources highlighted the fact that construction is a collaborative enterprise. The most significant finding, however, was that the participation of the teacher added to the complexity of play. Cullen and Allsop's (1999) research highlighted the benefit of a socio-cultural approach and suggested that teachers can enrich children's play, while at the same time become co-learners

with children. The present study was enhanced by using a similar approach to promote environmental education through a community of learners.

Domain knowledge was investigated in early childhood research conducted by Prince (1994). One four year old child in the study possessed her own domain knowledge of the circulatory system of a tree. She explained: *trees can put water in them but you can't see*. When asked *why*? She replied *because it is mixed in with the branches.* This is a sophisticated concept and is also an example of naïve biology (Inagaki & Hatano, 2002).

More recently in research conducted by Hedges (2004), an excursion to an Antarctic Encounter and Underwater World played a major role in children's socially constructed learning in a socio-cultural context, and their domain knowledge. Hedges found that first hand experience and experiential learning in an authentic context enhanced children's knowledge of sea creatures and penguins. Children were also able to apply the knowledge gained to new learning situations (Wellman & Gelman, 1992, , 1998). After the excursion they socially constructed their own learning with peers and asked more questions of adults about new learning situations (Hedges & Cullen, 2003). Enquiries about the Underwater World glass viewing tunnel and the travelator were also discussed. Excursions as outlined here were an integral part of promoting environmental education and children's domain knowledge in this study.

For an excursion to be meaningful for all those involved (teachers, children and parents) excursions need prior planning and follow up experiences. Hedges explains it thus:

> Teachers' careful planning of meaningful excursions includes ascertaining children's prior knowledge and experiences, providing preparatory and follow up experiences and meaningful discussion opportunities, involving parents in the knowledge construction process, accessing subject knowledge to support children's learning and documenting children's learning (Hedges, 2004, p. 14).

This explanation of planning for excursions was significant for the design of this study. Teachers were encouraged through the project approach to gain subject knowledge and to work with children's environmental interests. They prepared the

children for excursions and offered meaningful experiences afterwards. Valuing the parents' knowledge and documenting the whole experience was also a strategy.

Home-centre links are vital for content knowledge and children's domain knowledge. Bowman et al. (2001, p. 18) express this succinctly: " Early childhood programmes and centres should build alliances with parents to cultivate complementary and mutually reinforcing environments for young children at home and at the centre".

Research on Children's Environmental Learning

Teachers are the key to successful environmental education implementation using a socio-cultural/knowledge creation approach. The teachers' creation of a conceptual artefact in the form of a community of learners will allow them and the children to create their own environmental knowledge. This, however, cannot happen in vacuum; teachers need appropriate resources (Prince, 2000) and advice on introducing environmental education into the early childhood curriculum. To assist teachers to analyse their practice, Wilson (1993a) developed a Fostering a Care of Nature Index. The latter was further refined in a publication by Prince (2004) aimed at giving early years teachers guidance about the introduction of environmental education in the early childhood curriculum. The issue of environmental education resources and in-service training was raised in Greek research that examined kindergarten teachers' practice in environmental education. An exploratory study investigated what existing environmental education was happening in kindergartens in the Athens area (Florgaitis, Daskolia, & Liarakou, 2005).

The latter study endeavoured to understand the status quo and whether or not kindergarten teachers were involved in environmental education. Several issues were investigated: a) the extent to which environmental education was applied in kindergartens, b) teacher professional development and self-learning, c) teacher motives for involvement or non involvement, d) types of environmental education learning experiences offered, e) types of collaboration teachers developed, and finally f) from whom they received environmental education assistance. The need for systematic in-service training was uncovered. It was suggested that this training should encompass self-learning practices and that a distance education approach was a way to remedy the current environmental education provision. The study

demonstrated the need for environmental education in the early childhood years. For Florgaitis et al. (2005) their research was only a tentative first step in ensuring that environmental education becomes an integral part of the early childhood education curriculum.

Environmental interviews

Interviewing children is an important tool in environmental education research with young children. Wilson (1994) examined children's knowledge about the natural environment. In her research study she interviewed children between the ages of two and a half years to five years about the natural environment to investigate children's knowledge and awareness of the natural environment and their affective attitudes to it. The answers showed prevalent attitudes of fear and violence and a lack of understanding about the natural environment. To a lesser extent, appreciation, respect and familiarity were exhibited. A study by Prince (1994) followed, using a similar methodology adapted for the New Zealand context. The first part of Prince's research yielded similar findings to Wilson. In the second part of the research, a teaching intervention was implemented to enhance children's knowledge and attitudes towards the natural environment, using meta-cognitive dialogues. This comparative study interviewed the children before the teaching intervention, immediately after, and three months later. After three months the children in the meta-cognitive group displayed an holistic approach to environmental learning not apparent in the comparison group.

How children think about the environment was investigated by Palmer (1995). She interviewed four and six year old children and examined their conceptions and misconceptions about waste management. She found examples of both understandings and misunderstandings about waste management. Palmer subsequently undertook further longitudinal research in conjunction with Polish researchers (Palmer, Grodsinski-Jurczak, & Suggate, 2003) to compare English and Polish children's understandings of waste management.

The authors make it clear that comparative studies between countries have methodological drawbacks. Collection of data occurred at different times by different researchers. The Polish researchers however were given comprehensive training in how to conduct the interviews. Even so, this does bring into question the validity of

the comparisons as contextual issues could impact on the findings. This research study elaborates on Palmer's (1995) research as the interviews continued in the period 1994-2000. The study found that children aged between the ages of four to six years were capable of developing thoughtful understandings of waste issues. Availability of teaching resources to support the children's developing understandings was deemed important. Furthermore, appropriate teacher education to introduce an holistic approach to waste management was pivotal to the children's knowledge acquisition. The four studies outlined above highlight the efficacy of the interviewing process to gain a greater understanding of what children really know about the natural environment.

Context

Context is important for early learning about the environment. Paprotna (1998) investigated children's understandings of ecological concepts. She used an ecological vocabulary with five and six year old children. She concluded that ecological concepts were influenced by the length of time at kindergarten and an ecological process that developed favourable attitudes towards ecology. Phenice and Griffore (2003) investigated pre-school children's innate relatedness with nature. They utilised the eco-psychology concept "that children are born with a sense of relatedness to their environments, and through the processes of socialisation they acquire a sense of separateness from environments including the natural environment" (p. 167). Children were interviewed and asked what they thought about nature and their place in nature. The data demonstrated the children's construction of their relationship with nature. The authors suggest that everyday experiences such as eating an apple at snack time can provide opportunities to discuss ecological facts with children. This gives them a sense of the concept of their connectedness with the world.

Palmer et al. (1999) undertook a major European study of environmental education. The project aimed to investigate the nature and origins of early ideas about the environment, by interviewing four and six year old children from three countries (England, Slovenia and Greece). Each child was interviewed, and shown three photographs of the tropical rain forest and three of the Polar Regions. Key questions were asked to ascertain their knowledge of these regions and to promote discussion. Again this demonstrates the potential of interviews to ascertain children's

environmental knowledge and as a technique was used in the current study. Data collected and the findings on the children's knowledge of these two regions help to explain aspects of the knowledge these children have when they enter school and how it develops into an understanding of aspects of environmental change. These three studies provide an insight into the importance of the context of the early childhood centre as well as the child's life experiences in developing environmental concepts.

Children's drawings

Other studies have employed a drawing technique to elicit children's perspectives of the environment. Alerby (2000) examined how children and young people (7 to 16 years) think about the environment. Her aim was to interpret the meaning of their thoughts about the environment. This study took a phenomenographical approach, "a theoretical framework for research that focuses on the phenomena of study" (Mutch, 2005, p. 222). It was based on empirical material, consisting of drawings produced by 109 participants and their oral commentary. Mortari (1997) employed a similar approach. The participants were primary school children six to ten years and their drawings were analysed and discussed. Both studies demonstrated that drawings are a powerful way of getting children to express their knowledge about the environment. Prince (1994) used four year old children's drawings as an analytical technique in her research. At the conclusion of the teaching intervention, the children were asked to draw pictures to illustrate their accumulated knowledge of what had been learned about the environmental content offered. This proved a workable technique with this age group.

The sonic environment

Deans, Brown and Dilkes (2005) conducted an experiential research project that investigated sound in the local environment. It involved 20 x four and five year old children and their teachers in an eight week teaching and learning programme where children experienced the sounds in their environment many times. These included the sounds of birds, water, city sounds and leaves. Data were collected through digital audio records, interviews, 'listening lists', a project booklet, children's artwork and documentation. The study suggests a way teachers can include experiences to heighten children's awareness of sounds in their local environment and to promote the tenets of environmental education. Of relevance to this study is that only Prince

(1994) and Deans et al. (2005) used a teaching intervention focussed on implementing environmental education within the early childhood curriculum and to date evidence to the contrary has not been accessed.

In summation, all of the studies discussed illustrate the diversity of environmental education research studies that have investigated the topic of environmental education from both the perspective of the teachers as well as the children. The research studies with children have investigated attitudes and understandings about the natural environment. Drawing pictures to illustrate their knowledge of the natural environment has allowed children to express their environmental understandings artistically. Although these studies examined teachers' involvement in environmental education and children's environmental knowledge, none examined how teachers integrate environmental education into the early childhood curriculum. In particular there is no mention of the teaching strategies teachers could employ to teach children about the environment or for the successful implementation of environmental education within the early childhood curriculum. Furthermore, no mention was made in any of the studies about parental involvement in environmental education. Parents' personal perspectives on environmental education, and how this related to their children's learning, and creation of environmental knowledge, were not addressed. This represents a significant gap in the literature that this study aimed to remedy through the creation of a community of learners.

Conclusion: Rationale for the Study

Fien (1993) identifies four management positions (outlined earlier) that support the environmental approaches of Fien, and Fleer (1998). They envisage environmental education as education *about* (knowledge and care of the environment), education *in* (hands-on experience), and *for* the environment (informed action). Fein (1993) and Fleer's (1998) approaches provide a model and rationale of how environmental education can be translated into the early childhood curriculum through the use of *Te Whāriki* (Ministry of Education, 1996). These approaches form the basis of research questions one and two (see page 7 in the introduction) and focussed on the baseline environmental knowledge of the focus children and the parents.

For teachers to be fully involved in research in early childhood education they need to have an understanding of both pedagogy and curriculum (Bowman, Donavan, & Burns, 2001). In New Zealand, pedagogy and curriculum are associated with *Te Whāriki* (Ministry of Education, 1996) that recognises socio-cultural learning is embedded in cultural and community contexts. Therefore, home-centre links (Hedges, 2002; Jordan, 2003) were an integral part of this study. Teachers also need to have an understanding of the theoretical underpinnings of an integrated curriculum, especially as it relates to *Te Whāriki* (Ministry of Education, 1996).

Two ways that teachers display curriculum and planning knowledge are the project approach (supported by the emergent curriculum), and documentation. The former allows children to engage in topics of environmental interest while the latter records the learning that has taken place. The project approach has the potential to include parents in a community of learners and for that reason was integral to both the design and methodology of this study.

Three early childhood studies with socio-cultural theoretical underpinnings examined current perspectives on children's learning. Brennan (2005) and Gibbons' (2004) studies examined centre mealtime routines through enculturation and participation respectively. Jordan's (2004b) study used the socio-cultural concept of co-construction of knowledge to examine teacher-child interactions. Methodological limitations were evident in Brennan's (2005) and Jordan's (2004b) studies where the absence of a parental perspective was apparent. This was integral to Gibbons' (2004) study as philosophically parental involvement is important in playcentre, as it was for this study. Socio-cultural ways of learning (enculturation, participation and co-construction) were emphasised in all of the studies and are acknowledged in this study also. However, knowledge creation as a *process* and how it relates to environmental education forms a gap in the literature in all three studies. How teachers perceive their role in the implementation of environmental education within the early childhood curriculum in the first phase of the research was the focus of question three.

A community of learners (Konzal, 2001; McCaleb, 1997; Ramsey, Breen, Sturm, Lee, & Carr, 2005; Rogoff, Goodman Turkanis, & Bartlett, 2001a) composed of teachers, children and parents was central to this study. All of the above studies (with

the exception of Ramsey et al. (2005)) were in primary schools. As part of the COIs in the early childhood sector Ramsey et al. (2005) reported on their community of learners. A perceptible point of difference is that unlike the COIs this study reports on the *process* involved in creating a community of learners. The creation of a community of learners was the emphasis of phase two of the research, and was the focus of question four.

Parental and home-centre input into children's learning, the sociological concepts of social capital (Field, 2003; Fukuyama, 1995; Halpern, 2005; Lin, Cook, & Burt, 2001; Putnam, 2000) funds of knowledge (Gonzales, Moll, & Amanti, 2005b) and the teachers' valuing of these were central to this study. They were a vehicle to encourage parental participation in the community of learners. The literature reveals interviewing is a way social capital can be gauged. Five studies (Farrell, Tayler, Tennent, & Gahan, 2002; Fritch, 1999a, 1999b; Kahne & Bailey, 1999; Lareau & Horvat, 1999) included this research method. Adults (particularly parents) were interviewed in four of the studies. Similarly, this study used parental social capital for analysis. However, only three studies included children: (Farrell, Tayler, Tennent, & Gahan, 2002) from a social capital perspective, and Gonzales et al. (2005b) and Riojas-Cortez (2001) from a funds of knowledge perspective. This present study did not examine children's funds of knowledge, instead it concentrated on parental funds of knowledge. Question five focussed on the ways a community of learners evolved to promote environmental education in the early childhood setting.

Sfard (1998) identified two metaphors of learning, the *acquisition metaphor* (a personal possession) and the *participation metaphor* (socio-cultural learning in groups). Paavola et al. (2002) identified yet another metaphor, the *knowledge creation metaphor.* This study had the opportunity to outline the *process* of knowledge creation. Although acknowledging the socio-cultural aspects of the *participation metaphor,* Bereiter (2002) questions such things as enculturation. He believes that people in a knowledge community can move beyond existing knowledge to solve knowledge problems. This study examined creating a community of learners (a conceptual artefact) to promote environmental education in early childhood. It is argued here that through a community of learners all the participants (teachers, children and parents) created their own knowledge about environmental education.

Children construct knowledge in a socio-cultural way through inter-subjectivity (Rogoff, 1998), and the zone of proximal development (Vygotsky, 1978). This study drew on the shared meanings contributed by the child, the teacher and the home context. It had the opportunity to examine children's domain knowledge and naïve theories about biology (Inagaki & Hatano, 2002; Wellman & Gelman, 1992, , 1998). A similar approach was used in this study. Research into domain knowledge was undertaken by Cullen and Allsop (1999) and Hedges (2004). Excursions were central to Hedges' research, providing evidence of socially constructed learning (Hedges & Cullen, 2003) and were utilised in this study also.

It is argued that environmental education should not be seen as a separate subject but rather an integral part of the early childhood curriculum (Florgaitis, Daskolia, & Liarakou, 2005; Prince, 1994; Wilson, 1993b). Interviewing preschool children is advocated by many environmental education researchers (Palmer, 1995; Palmer & Neal, 1994; Palmer, Grodsinski-Jurczak, & Suggate, 2003; Prince, 1994; Wilson, 1994). This study highlighted how interviews can examine children's environmental understandings. The context of the early childhood centre was important in three environmental studies (Palmer et al., 1999; Paprotna, 1998; Phenice & Griffore, 2003). Two studies (Deans, Brown, & Dilkes, 2005; Prince, 1994) used a teaching intervention. This was particularly relevant to this study as the implementation of environmental education into early childhood curriculum was a principal aim. A significant gap in the literature was revealed in all of the studies when considering how teachers implement environmental education, and the teaching strategies necessary to achieve this. A lack of a parental perspective and their contribution and participation was also noted. This study has the opportunity to remedy this through the creation of a community of learners where parental contribution to children's environmental knowledge creation is valued. Questions three, four and five are applicable to the above concepts and research and were integral to the design and methodology of the present study.

In the next chapter the methodological underpinnings of the research (participatory action research) will be discussed. The research design, ethical considerations, participants, data collection methods, analysis and interpretation will be outlined.

Chapter Three: Methodology

Introduction

This chapter outlines participatory action research, a derivative of action research, as the methodological underpinning of this research. A description of the research design and ethical considerations provide information about the two centres (Ocean Kindergarten, Sanctuary childcare centre), and the participants involved (children, parents and teachers at both centres). The methods used, data analysis and interpretation are also outlined.

The research was conducted in two early childhood centres (Ocean Kindergarten and Sanctuary Childcare) in two phases over the duration of one year. Initially the study began as a case study approach but evolved into participatory action research as participants developed skills, interest and involvement in the research. This allowed the researcher to initially act as expert and to lead the research process. A responsive, collaborative and empowering process allowed the teachers at both centres to gain confidence in the research process and to implement the EEIC in their respective centres.

At the end of phase one and before the commencement of phase two, when a decision (by the teachers) needed to be made to lead the research, a transition period occurred. At this time discussions about the success of the EEIC at both centres and the possibility of leading the research took place. The research questions for phase two were discussed and the teachers decided to work with the existing questions with the guidance of the researcher. The teachers' strengths and abilities as nascent researchers were reinforced by the researcher and the teachers were empowered to lead the research in phase two. This resulted in a joint sharing of the research during the transition period. The researcher then took a step back and encouraged the teachers at both centres to transition into phase two of the research and lead the process using a participatory action research approach.

In the second phase the teachers at both centres became fully involved in the research process after choosing to follow a participatory action research methodology. They were empowered to lead the research themselves using a project approach and the emergent curriculum. Both groups created a conceptual artefact in the form of a

community of learners that allowed all those involved (teachers, parents and children) to create their own environmental knowledge.

Research Questions

The main questions and rationale for their selection was outlined earlier. Here the main questions and the sub-questions that were investigated are as follows:

Phase one

Main Question

What constitutes the environmental education knowledge base of preschool children?

Sub questions:

What baseline environmental education knowledge do preschool children possess?

What are the family influences on preschool children's environmental education and knowledge base?

Main Question

What knowledge does the family contribute to children's environmental education, learning and knowledge base?

Main Question

How do teachers perceive their role in the implementation of environmental education into the early childhood curriculum?

Sub questions:

What baseline education knowledge do teachers possess?

What pedagogical strategies do teachers use to implement environmental education into the early childhood curriculum?

Phase two

Main Question

What contribution do early childhood teachers make to children's environmental learning and knowledge base?

Sub questions:

How does the creation of a community of learners, focussing on the introduction of environmental education into the early childhood curriculum, enhance children's learning and knowledge base?

How can early childhood teachers involve families in the creation of a community of learners to introduce environmental education into the early childhood curriculum?
What strategies can early childhood teachers employ to create a community of learners knowledgeable about environmental education?

Main Question
In what ways does participatory action research methodology, and the creation of a community of learners concept, evolve to promote environmental education within the early childhood education setting?

Methodology
The Research Process
The study began as a case study. The rationale for this decision was to allow the staff at both centres to feel supported by me (expertise/resources) in their planning and implementation of the two week EEIC. Building a sense of trust and rapport with the staff, focus children, the other children at the centre, and the parents, was a very important goal in phase one of the research. This foundation allowed the teachers to gain confidence in the provision of environmental education learning experiences and in the research process.

Case study
According to Stake (2000) a case study is rooted in qualitative research inquiry. It is not a methodological choice, instead it is a choice of what is to be studied, that is 'the case' (Yin, 1989). Bassey (1999) extends on this notion as it applies to research in educational settings. He concedes that a unified definition is elusive. Yin (1989), however, believes a case study happens in a real life setting and relies on triangulation of evidence from multiple sources for validation. Moreover, data collection and analysis is aided by theoretical propositions developed earlier. Flood (as reported in Fals Borda, 1998) considers a case study to be a 'bounded system' that is also an integrated system.

Case studies according to Babbie (2001), allow a researcher to focus attention on a selected social phenomena. Stake (2000) elaborates further on this notion and suggests that themes and issues serve to emphasise the social phenomena under investigation.

Three types of case study are identified by Stake (2000), intrinsic, instrumental and collective. An intrinsic case study is conducted to gain a better understanding of the case; the instrumental to gain an insight into an issue; and the collective is a case study investigated at several sites. Taking into consideration these characteristics the design of the research is crucial to successful implementation. The two-phase design of this research anticipated the need for the teachers at both centres to become familiar with the research process before launching into the participatory action research phase of the research. This could not be predicted at the outset of the research, as the choice to use participatory action research was ultimately the teachers' decision. The first phase of the research acted as a 'practice ground' for the teachers to gain confidence in the research process, with the guidance and support of myself as the researcher. The teachers then entered the second phase equipped to lead the research. It is the instrumental case study that was most relevant to the research study undertaken. Because the two centres, a kindergarten and childcare centre, focussed attention on a selected social phenomena, the creation of a community of learners, the instrumental case study was the appropriate design. Stake (2000) argues that this type of case study will provide insight into a particular issue, (environmental education hereafter referred to as EE) and this eventuated.

Instrumental research plays a secondary role in facilitating a comprehensive understanding of a complex context (Mertens, 1998). The context in this case, was the creation of a community of learners, to promote environmental education. The research questions and sub questions of phase one, outlined earlier, fitted well with the conceptual structure of a case study. The approach involved spending an extended time in the centres, having contact with the activities and operations of the case. Reflection on and revision of the meaning making process of the research was essential, particularly as the study evolved into a participatory action research design.

For the teachers to gain content knowledge of EE, I provided them with readings about EE and books that offered learning experiences for the children. However, this was more in the spirit of action research than the initial case study approach. Both centres used the internet to support planned learning experiences. In the case of the childcare centre I made resources that could be used as part of the EEIC. I also

visited the Department of Fisheries and the Department of Conservation, from whom I was given posters on the children's interests (fish, birds). Postcards were laminated and cut into pieces and could be used as a puzzle, or as a group matching game. Each postcard had facts about the species and could be read to the children. Appropriate questions were asked by the teacher to assist the children to create their own knowledge.

Library books to support the children's interests were also used. Excursions were a major part of both phase one and phase two of the research. The teachers' efforts in phase one of the research became the 'practice run' that led into them driving the research in phase two and creating a community of learners. Teachers also used my book *Environmental education in the early years* as a resource to plan their programmes (Prince, 2004). In summary, staff began with the children's environmental interests and followed the emergent curriculum and supplemented it with additional resources to further enhance the children's learning.

Investing the time in forming a relationship with the participants (especially the teachers) paid off when both centres chose to lead the research in phase two. The staff at the childcare centre needed very little encouragement as I assured them that *you're doing it already*. Originally the kindergarten was reluctant to lead the research because of staff changes. I had fully intended to support them in another two week EEIC when the project approach and the community of learners evolved and the kindergarten teachers took charge.

In summation, in phase one (case study) my role as researcher was one of outsider and observer with the teachers in control of the EEIC. A transition period between phase one and two occurred where the teachers and myself jointly shared the research process. In phase two my role became one of insider and participant in the participatory action research led by the teachers.

Action research

There are two essential aims of action research: to improve and to involve. Action research aims at improvement in three areas: firstly, understanding of the practice; secondly, the improvement of understanding of the practice by its

> practitioners; and thirdly, improvement of the situation and practice. The aim of involvement stands shoulder to shoulder with the aim of improvement. Those involved in the practice being considered are to be involved in all its phases of planning, acting, observing and reflecting (Carr & Kemmis, 1986, p. 165).

According to Zuber-Skerritt (1993) when educational practitioners engage in action research they work collaboratively and systematically to reflect on their practice and make changes and improvements to the way they are currently working. For action research to be successful the participants in the research (in my case teachers in early childhood centres) were involved and took ownership from the beginning. The teachers became researchers and what they learnt was willingly applied because they had been stakeholders in the action research from the outset.

Action research is a process. Feldman (1995) argues it is a specialist approach to research inquiry. Poskitt (1995) maintains there is a cyclical basis to action research commencing with observing, followed by collecting data, data analysis, reflection on the data, and finally compiling action plans. There are many debates about action research and therefore agreement and disagreements about its principles, features and characteristics as an educational research method. Costello identifies several qualities of action research (2003, pp. 5-6):

- Action research is referred to variously as a term, process, enquiry, approach, flexible spiral process and as cyclic.
- It has a practical problem solving emphasis.
- It is carried out by individuals, professionals and educators.
- It involves research, systematic, critical reflection and action.
- It aims to improve educational practice.
- Action is undertaken to understand, evaluate and change.
- Research involves gathering and interpreting data, often on an aspect of teaching and learning.
- Critical reflection involves reviewing actions undertaken and planning future actions.

When taking into consideration these qualities it was the emphasis on participation and collaboration in a community of learners that prompted the choice of participatory action research methodology for this study.

Participatory Action Research

> Theorizing participatory action research requires articulating and - to an extent - formalizing what is implied when participants in a social setting decide to take the construction and reconstruction of their social reality into their own hands, knowing that they are not alone in constructing or reconstructing it, but nevertheless taking an active agential role in changing the processes of construction of social realities (Kemmis & McTaggart, 2000, p. 573).

This quote epitomises the second phase of the research process undertaken by the teachers at both centres. They constructed and reconstructed their social reality. A community of learners (a conceptual artefact) was the vehicle for all proponents of the community of learners to create their own environmental knowledge.

Participatory action research evolved from participatory inquiry (Reason, 1994), and participatory research (Fals Borda, 2001; Fals Borda & Rahman, 1991; Park, Brydon-Miller, Hall, & Jackson, 1993; Rahman, 1993). Its roots lie in liberation theology and the collective action of oppressed peoples. Predominately conducted in third world countries, participatory action research has had its greatest impact there, but not exclusively (see McDonald, 1982). Mertens (1998, p. 72) offers a succinct summation: "… the focus is on people's participation in setting the agenda, participating in the data collection and analysis, and controlling the use of results". It is this participation in the research of practice that forms the uniqueness of participatory action research (Whyte, 1991). Participatory action research was the chosen methodology by both centres for phase two of the research. As such it is a form of action research (Kemmis & McTaggart, 2000; Lewin, 1946) and aims to help people change their educational realities by changing practice and their lived realities.

In explaining the roots of participatory action research Kemmis and McTaggart (2000) offer five epistemological perspectives in the study of social practice (pp. 575-579).

First: *Practice as an individual behaviour, to be studied objectively.*
Second: *Practice as group behaviour or ritual, to be studied objectively.*
Third: *Practice as individual action, to be studied from the perspective of the subjective.*
Fourth: *Practice as social action or tradition, to be understood from the perspective of the subjective* and finally: *Practice as reflexive, to be studied dialectically.* This perspective understands practice as political, therefore, to study it is to change it through action. It takes into consideration the standpoint from which a researcher researches practice in its own right. This perspective combines all four previous perspectives and examines the individual, the social group, the objective and the subjective as they relate to practice. Participants collaborate in the process of transforming their own practice and the setting in which that practice takes place.

This final perspective fits well with the concept of participatory action research because the participants themselves seek to change their practice by working collaboratively. The researcher when studying practice from this perspective also takes a dialectical position. S/he will consider the objective and the subjective aspects as well as the individual and the social setting. This will mean affording the participants respect as co-researchers, remembering that the participants are impacted on by discourses, social relationships and the history of the institution in which they work.

As a research method participatory action research, within the action research paradigm, has as its paramount purpose the improvement of practice (Fals Borda, 2001, , 1998; Greenwood & Levin, 1998; Kemmis & McTaggart, 2000; McTaggart, 1998b). According to McTaggart (1998b), quality participatory action research will involve three aspects of the nomenclature. Firstly: participation. Practitioners enhance a social practice by engaging in both action and research. Secondly: action. Research that is judiciously planned, purposefully implemented and thoughtfully studied ultimately leads to change in practice and is ultimately validated in practice. Finally: research that is based on observation and a range of data collecting techniques, supported by informed theory that culminates in both participation and action. This results in a transformation from existing practice to one where a complete change in practice is evident (Fullan, 2003). Therefore, for these reasons,

participatory action research was the logical choice for use in improving practice in early childhood education. Early childhood education is, by its very structure, team orientated and therefore participatory. *Te Whāriki* the early childhood curriculum (Ministry of Education, 1996) has as its framework a participatory approach to education and uses reflective questions to encourage this to happen in practice. Further, staff ratios of one staff member to 10 children over two, for example in childcare, means staff members work in groups.

Kemmis and McTaggart (2000) outline a commonly held criticism that participatory action research is 'low tech' research. However, in their view, methodological rigor is secondary to the process of transformation of practice and practitioners. This challenge highlights a gap in the literature, and as McTaggart (1998a) asserts, the documentation of enlightened cases of participatory action research would help counteract opposition to this methodology. The current study has the opportunity to achieve this. This view is highlighted in the research question that aimed to examine the ways participatory action research methodology evolved to create a community of learners to promote environmental education in the early childhood centre. Documentation of the participatory action research process and the creation of a community of learners offers insight into the ways this methodology evolves within the two early childhood education settings in this study.

The study of practice is central to participatory action research and to the research undertaken. Kemmis and Wilkinson (1998) suggest it is gained through observing the individual performance, the social and material condition and interactions, taking into account intentions, meanings and values, and accepting the subjective language discourses and traditions of the research setting. This is evident in the detailed documentation kept by both centres. All of these aspects worked together and culminated in the change and evolution of practice epitomised in participatory action research methodology.

All research is action. Moreover, research is an action *in* and *on* the status quo in any given situation and inevitably it has consequences. Things will change as a result of research. The very act of asking questions and trying to make sense of them is an intervention in itself for those involved in the research process. Depending on whether

those involved choose to implement the change and want to change their situation (or not) has different consequences. Staying the same is an action in itself even if it is technically "inaction" (Wadsworth, 1998).

Participatory action research occurs in a social situation, in the case of this research, two early childhood education centres. The purpose is to study a social situation to bring about change and improvement. This movement is to a new and improved social situation and in Wadsworth's view results in creative transformation from "a world 'as it is' to a world 'as it could be'" (Wadsworth, 1998, p. 6). This is qualitative *possibility* research rather than positivist *predictive* research and is therefore the essence of participatory action research. This can be a 'messy' process as there is no predictable outcome to the research and no one will know exactly what the new social situation will look like.

Participatory action research seeks multiple truths and guides participants to discover their own truth and to acknowledge the truth of others. The researcher in this qualitative perspective becomes a co-researcher, and empowers the participants to uncover their own truth or truths within the reality of their lived lives. During the participatory action research phase of the research (phase two) I adopted this stance with the teachers (Kemmis & McTaggart, 2000). I empowered them to discover their own truths about the shape of the environmental education programme they would implement to create a community of learners to promote environmental education within their respective centres (Wadsworth, 1998).

In phase two of the research, when the teachers at both centres chose to use participatory action research, the emphasis at both centres was on the creation of a community of learners to promote environmental education in early childhood curriculum. Figure 2 illustrates the process.

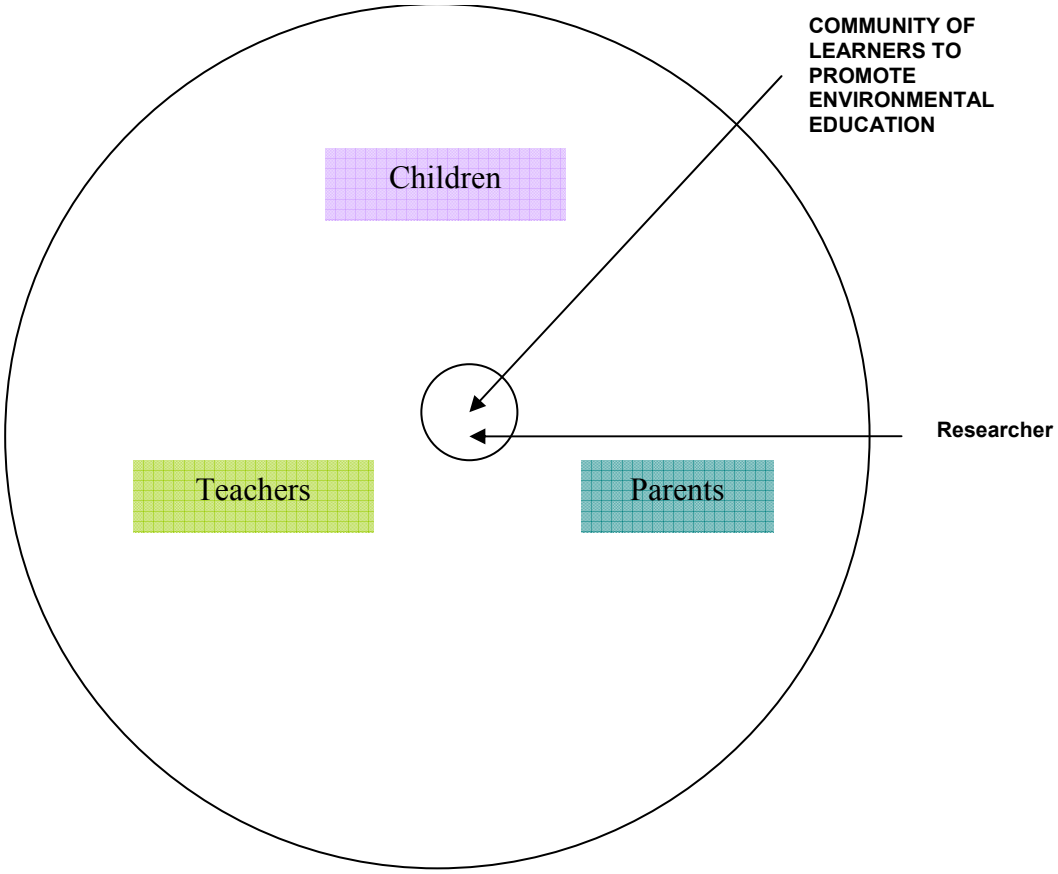

Figure 2: Phase Two: Participatory Action Research - Both Centres

Wadsworth (1998) argues that although the concepts of participation, action and research are separate entities they are not discrete stages, rather they merge in practice. She asserts: "instead there are countless tiny cycles of participatory reflection on action, learning about action and then the new informed action which in itself is the subject of further reflection" (p.7). Therefore the change does not occur only at the conclusion of the research, it happens throughout the research process.

Participation

Participation is integral to the research process, without participants there is no participatory action research. Wadsworth (1998, p. 8) identifies four conceptual parties to research.

1) The researcher/s
2) The researched
3) The researched *for* (in the sense of having the problem the research is to resolve)
4) The researched *for* (in the sense that they may benefit from better information about the situation)

The reasons the participants participate in the research will be their degree of interest in the topic or question. A researcher taking a participatory approach to research will be transparent from the very beginning about the reasons for engaging in the research. In this research I was clear from the outset that environmental education in early childhood education and curriculum was my passion. Furthermore, it was hoped the participation of all the proponents of the community of learners would lead to the promotion of environmental education in the early childhood curriculum.

In collaborative research it is imperative that the participants have a sense of shared purpose about the efficacy of the research. They also require an understanding of the value of the research and comprehend that the research should be a positive experience to all those involved in a community of learners that will enhance environmental learning within the centre setting. This type of research collaboration means that the difference between the researcher, the researched and the researched *for* will not be distinct categories. Rather they will merge into a successful participatory action research process where the researcher and the researched are co-researchers with a common purpose about what the research is *for*.

Research Design

The research design for this research included a two phase approach (one year duration) involving two (cases) early childhood centres (Ocean Kindergarten, Sanctuary childcare). Data collection occurred at both centres where there were three participant groups: teachers, parents and focus children. A case study approach occurred in phase one. During this phase, a two week EEIC was implemented, first by Ocean Kindergarten, followed by Sanctuary childcare.

Two interviews were conducted in phase one, before and after the EEIC, at both centres. The research instruments were semi-structured, audio-taped interviews. The

children's interviews were individual while the teacher and parent interviews were focus groups. Narrative observations of focus children and teachers were recorded.

In phase two of the research, teachers chose to lead the research and to follow a participatory action research approach during term three and term four. They documented their project approach to environmental education and the emergent curriculum. As the researcher, I observed the focus children and had conversations with teachers, children and parents. This was to ascertain the evolution of a community of learners. These conversations were recorded as field notes. Document analysis for themes such as child profiles, occurred at the centres and continuing data analysis took place. At the conclusion of the second phase of the research the children were interviewed for a third time using audio-taped semi-structured interviews. Combined focus group interviews (audio-taped) were held with the teachers and parents from both centres.

Justification of Research Design

The use of a case study and participatory action research design in this research had both strengths and weaknesses. The principal reason for choosing a case study design for phase one of the research was for the teachers to gain confidence in the research process, and the opportunity to practise it. Although they were responsible for the EEIC, and empowered to do so, I provided resources and other expertise. However, as novice researchers a power deficit was apparent as they looked to me as the expert researcher.

The transition period allowed for discussion about the progress of the research process in phase one. This in turn allowed the teachers to reflect on their ability to lead the research in phase two. Once the decision to lead the research was made, the locus of control shifted from me as 'outsider' in phase one, where I observed their actions and gained information through research instruments, to one of 'insider', co-researcher and participant in the collaborative, participatory action research process. The use of the project approach in phase two parallelled the participatory action research process and allowed the teachers to transform both their practice and themselves as practitioners and researchers.

Table 1 provides a project outline of the research design.

Table 1: Project outline

<table>
<tr><td>Time line of phases and terms</td><td>Methodology</td><td>Tasks: Both Centres</td><td>Centre</td><td>Outcome</td></tr>
<tr><td>Phase 1
February 2004 – March 2004, Term 1</td><td>Case Study</td><td rowspan="2">Researcher: Information provided and informed consent gained.
First interview with focus children. Focus group interview with teachers and parents. Teachers implement two week EEIC. Observations of teachers and focus children. Second interview with focus children. Focus group interview with parents and teachers.</td><td>Kindergarten</td><td rowspan="2">Teachers at both centres gain confidence in conducting research in order to transition to participatory action research.</td></tr>
<tr><td>April 2004 – May 2004, Term 2</td><td>Case Study</td><td>Childcare Centre</td></tr>
<tr><td>June 2004</td><td colspan="4">Decision: Transition to Participatory Action Research to create a community of learners</td></tr>
<tr><td>Phase 2
July 2004 – September 2004, Term 3

October 2004 – December 2004, Term 4</td><td>Participatory Action Research used at both centres</td><td>Teachers leading the research using the project approach based on children’s environmental interests and the emergent curriculum.
Researcher: Observations of teachers and focus children. Conversations with teachers and parents. Third interview with children. Third combined focus group interview with teachers and parents</td><td>Kindergarten and Childcare Centre</td><td>Teachers conduct and lead research process using PAR to create a community of learners to promote EE in ECE</td></tr>
</table>

Ethical Considerations

Ethical paradigms

King, Henderson and Stein (1999) discuss a principilist approach to ethics. They assert this is not the only approach to ethics and argue for a relationships paradigm. They contrast the principles, truth and small frame focus of the principilist paradigm with one based on relationships. They offer a broader view of ethics which is especially relevant to participatory action research and the creation of a community of learners. It considers individuals and groups as context based and has a wide frame of reference using a narrative focus. Continuity and change are addressed, as issues arise after a project is finished, and relationships change over time. Cognisance was taken of both paradigms in this research study with relationships forming an integral part.

Codes of ethical research

Research ethics are outlined in the codes of ethical conduct for research (Massey University Human Ethics Committee, 2002). Adhering to these codes of ethical conduct ensured this study was planned in a sensitive manner (Aubrey, David, Godfrey, & Thompson, 2000). Ethical approval for the research was necessary because of the participation of young children. Approval was given on 19 December 2003 under number 03-129. It was also necessary because of the utilisation of participatory action research methodology.

Children are particularly vulnerable. Hedges (2001) highlights this with preschool children. She stresses the importance of the preparation and competence of the researcher. Disruption to the normal teaching and relationships within the research context is to be avoided. In her view, the potential for harm is minimised if the normal play context of the early childhood centre becomes integral to the research process. This view of the research context occurred in both centres.

The flipside to minimising harm is the maximising of benefits. As Wilkinson (2001) so cogently argues, the benefits to some do not justify the burdens placed on those involved in the research. Benefits need to be positive for those involved in research. Therefore, I offered advice and support to the teachers with environmental resources to implement environmental education into the early childhood curriculum as outlined

earlier. In my previous research I highlighted the need for this practical assistance (Prince, 2000) and this research study reinforced this notion.

Informed consent

Informed consent shows respect for the person's right to make an informed decision (Wilkinson, 2001). Moreover, the design of this study powerfully demonstrated informed consent. For those who chose to withdraw I respected their decision. If consent is given it must be voluntary and informed. Furthermore, it must be gained without coercion, and the participant must be able to understand the information. This can be problematic when considering the involvement of young children, as was the case with this study. However, it was not insurmountable. The focus children gave consent because the consent form offered to them was written in language they could understand. It was read to them and then they were able to sign it independently. This was respectful of their rights and enhanced a sense of autonomy and control (Hedges, 2001). The same can be argued for children's voluntary participation (Gallop, 2000). The child's assent must be complementary to parental consent. Both are necessary (Snook, 1997,1999).

Confidentiality

Because of the provincial location a promise of anonymity was problematic, while confidentiality was assured. Maintaining confidentiality was a very important aspect. In the first instance it meant not discussing the confidential aspects of the research outside of the centres involved. It also included not making obvious the focus children, or their parents. On other occasions, focus parents would confide in me about matters unrelated to the research process. This occurred at times other than the interview situation. In this instance I offered a 'listening ear' without offering advice. Instead I suggested where the most appropriate avenues of assistance might be.

Privacy

Snook (1997) argues that privacy involves a child's undisputed right to privacy. In the study every effort was made to respect the children's privacy. This was achieved by reducing the adult-child power relationship (Hedges, 2001) through my presence as a participant observer in the centre setting. As a participant researcher I was an integral part of the research events that took place at both centres (Mutch, 2005).

Allowing the child the opportunity to opt in and out of the research on the grounds of privacy was respected (Alton Lee & Nuthall, 1992).

Researcher's role

Because of the initial case study approach, I was present at the centres for considerable periods of time. To reduce tensions surrounding my presence in the centre, and in order to avoid 'distorting' the case, I needed to firstly acknowledge (by my very presence) that I would 'disrupt' the case (Edwards, 2001).

It was, therefore necessary, from the outset to put strategies in place to alleviate this tension. First, I needed to acknowledge my role as 'expert' in the field of early childhood education due to my previous research experience. Second, once I had established this, my presence in the centre needed to be recognisable, for teachers, parents and children alike. This was achieved by wearing a 'pin on' flower with my name on it. This symbol assisted those involved in the research to identify me, and my role as the researcher. These strategies were designed to be transparent. Combined, the strategies modelled a collaborative, responsive, and empowering research process for all those involved in the research.

In phase one of the research I reassured the teachers that my expertise would be used to assist them with resources and advice in order to plan and implement the two-week EEIC. I also pointed out to them that once they had successfully completed the EEIC they might like to lead phase two of the research using a participatory action research approach. During the EEIC the teachers at both centres became aware of the importance of working with children's interests, the project approach and the emergent curriculum. I suggested that this approach could work well if they chose to lead the research in phase two.

As this was collaborative research it was essential I was aware of what Goldstein (2000) describes as aspects of power, privilege and relationship. She argues that there is a potential for exploitation in any research endeavour and this will separate the researcher from the researched. This was particularly relevant for the two student teachers involved in the research who attended the same institution where I am employed. To resolve this ethical dilemma a meeting was held with the students and

it was agreed that in my role as researcher I would not visit them on practicum or mark their work for the duration of the research study. I also assured them that no aspect of the research would be discussed at the tertiary institution. Furthermore, I assured them that if concerns arose, regarding my role, or any aspect of the study, they could confidentially approach my research supervisor for advice or assistance. My role also involved privilege. Goldstein goes on to say, "Any collaboration can be difficult. And when university researchers enter classrooms [centres], some problems are bound to arise because of issues of power and status inherent in these relations" (p. 6).

An example of this arose where my role as researcher was in conflict with my role as tertiary lecturer. A practice-based incident was related to me while at the early childhood centre. Mindful of my role of researcher, I stated unequivocally that I was not at the centre in that role and suggested contacting the co-ordinator of the programme. Conflict of role also occurred where teachers would introduce me in my lecturing role using the institution's name. I would respond by saying, "I am not here in that role, (pointing to my flower name tag) I am here as a researcher". As a researcher I needed to be aware of the relationships of the ethical paradigm in all my interactions with participants in both centres. Cognisance was taken that relationships are context bound and will change as the research process unfolds.

In conclusion, my role was one of 'outsider' in phase one and 'insider' in phase two. This meant I was fully involved in the research process both at the site, as well as involved in the community of learners that was created at both centres. This is opposed to the extreme view of the 'outsider' role, where the researcher collects data from the site, is not involved with those participants being researched, and leaves (Harris, Lowenstein, & Scott, 2001). Therefore my researcher role as 'insider', with knowledge of early childhood education, means that the nature of the research was one of a collaborative sharing of knowledge. In this study I was aware of how all these ethical issues previously discussed would impact on the research process and made allowance for them in all my relationships with participants.

Selection of Centres

In New Zealand there are many different provisions of early childhood education with differing philosophies (Farquhar, 2005). For instance, six different provisions were chosen in research conducted by Prince (2000). The rationale for choosing one kindergarten and one full day childcare for this research was that childcare and kindergarten are statistically the most preferred parental choice for early childhood education and represent two different philosophical provisions.

Kindergartens in New Zealand are administered by non-profit Kindergarten Associations located in regional areas and are responsible for managing the kindergartens in their designated area. "A key philosophy of the kindergarten service is to maintain an accessible, high quality, early childhood care and education service" (Duncan, 2001, p. 11). This is achieved through minimal fees supported by extensive fund raising, the employment of qualified teachers and finally, parent committees who are involved in the management of the local kindergarten. Enrolments start from 2 ½ to 3 years of age and once the child is enrolled they can attend until 5 years of age. As a general rule, five mornings and three afternoon sessions are offered, although some kindergartens will have only morning sessions, as was the case with the kindergarten in this research

Childcare in New Zealand has traditionally been considered as the out-of-home care of young children. This early childhood education provision is governed by the Early Childhood Regulations that require a centre to have a licence to operate. A significant change to childcare provision in New Zealand occurred in 1986 when childcare (the responsibility of the Department of Social Welfare) came under the auspices of the Ministry of Education. This transition integrated the care aspect of childcare with that of education. This decision was further reinforced when a three year Diploma of Teaching (Early Childhood Education) was introduced in 1988. The care of infants and toddlers was to be an essential component (May, 2003). Childcare focuses on care and education. Children generally start anytime from 3 months to 5 years of age and can attend for a range of time. Some children attend for only a few hours a week, others for school hours, while some children attend full time for approximately 45 hours.

The introduction of a common curriculum (*Te Whāriki)* for all early childhood education provision within New Zealand (including kindergarten and childcare) further highlighted the importance of care and education for young children. Childcare is inclusive of children 0-5 years of age and is most often offered as full day care with parents choosing the hours their child will attend. On the other hand, kindergarten offers sessional provision (mornings/afternoons) and caters for children 3-5 years.

Farquhar (2005) urges parents to match the provision with their child. Childcare meets the needs of working parents and those needing time out from their children. Kindergarten has traditionally been a choice for sessional early childhood education, with kindergartens conveniently located in suburban areas. Historically, kindergartens foster children's educational independence while childcare emphasise care and education. However, with the advent of *Te Whāriki* (Ministry of Education, 1996) this is less pronounced.

Description of centres

The two research centres are located in a provincial city in the North Island of New Zealand. Both centres are located in lower socio-economic areas. This was a deliberate choice. The Strategic Plan for early childhood (Ministry of Education, 2002) has, as one of its goals, increased participation in early childhood education. Targeted areas include high Māori and Pasifica populations, and children from lower socio-economic backgrounds. Both centres meet these criteria. Nuttall (2005), however, critiques this assumption and suggests that the Strategic Plan "fails to acknowledge and celebrate the diverse knowledges and contributions that Māori and Pasifica children, families, and communities make to early childhood education in New Zealand" (p. 8). With this in mind an investigation of parental environmental funds of knowledge, and social capital, was pivotal to this study. By comparison, centres located in higher socio-economic areas, have less of this cultural mix, and have obvious advantages in terms of environmental funds of knowledge and social capital. They have visibly stronger social networks associated with occupational and educational status. Conversely, centres located in lower socio-economic areas have a different kind of environmental funds of knowledge and social capital that stems from

their parental occupations and educational attainment. This contribution was pivotal to this study, and to the creation of a community of learners.

The description of the centres is supported by quotes from the centre philosophy and introductory information. The physical setting, culture of the centre, curriculum (*Te Whāriki*) and the participation of the parents and community of each centre are outlined. Both centres conform to the Early Childhood Regulations both indoors and outdoors.

Ocean Kindergarten is a purpose built centre in a suburban location. It has an indoor play area, bathroom, kitchen and office. A large outdoor area is a feature. It is a sessional centre, open five days from 8.30-12.30. It is licensed for 30 children 3-5 years. They aim "to encourage, extend and empower individual learning through a strong resource base". Furthermore, "children are encouraged to learn holistically…extending children's individual interests". Ocean believes "parents and whānau are valued as equal partners in their children's learning".

Sanctuary childcare has a central city location and is a converted house with an indoor play area, sleep room, bathroom, kitchen office and outdoor area. It is a full day childcare, open every day from 7.45 am-5.15 pm. The childcare centre is part of a wider provision of a governing body that caters for the needs of families. The childcare centre started as a small play group and from their present location they are soon to move into a purpose-built centre in a nearby suburb. "We offer low cost education and care for children 2-5 years". Furthermore, "We provide programmes which allow children to learn through play…taking into account the strengths and interests of each child." Sanctuary "believe that the centre has to be inviting of parent involvement and inclusive of Māori and different cultures".

Selection of Participants: Kindergarten/Childcare

Participants: teachers/caregivers

At the kindergarten, four teachers took part over the one-year duration of the research. Although the kindergarten was a two-teacher kindergarten, there was a need for sick leave for both permanent staff at different times during the research process. This meant that two relieving teachers also took part in the research. All of the teachers

held a Diploma of Teaching (ECE). This is a requirement of the Kindergarten Association.

Eight childcare staff took part over the one-year duration of the research. Two of the teachers had a Diploma of Teaching (ECE). Two were current student teachers at the tertiary institution where I am employed, while another was a student teacher involved in teacher education with another field-based provider. The remaining three were caregivers who were not actively involved in attaining a Diploma of Teaching (ECE). A decision was made by centre staff to involve all staff regardless of qualifications, as the aim of the research was to create a community of learners to promote environmental education in early childhood curriculum. This is in keeping with the Reggio Emilia approach where everyone interacting with the children is considered to be part of the children's learning environment.

A letter was sent to the Kindergarten Association and the governing body of the childcare centre and written consent and confirmation for both centres to take part in the research was received (see Appendix 1). An initial approach was made to both centres to introduce myself and gauge their interest to take part in the research. At this time, consent forms and information sheets explaining the research were left for their perusal (see Appendix 2). Further meetings were conducted at both centres to answer questions regarding my role, the research and to receive written consent.

I explained to both centres that I would be identified within the centre as a researcher by wearing a flower with my name on it.

Participants: parents

In order for all parents to have the opportunity to take part in the research, an invitation and an expression of interest reply form was issued to all parents by the teachers. A sealed box to receive replies was left in a prominent position (the foyer of the kindergarten and beside the sign in area at Sanctuary childcare). Parents were encouraged to take part with their children although accommodation was made for parents to take part without their children. A meeting was held to explain the research (information sheets/consent forms) for themselves and their children. This included explaining to them I would also get the children to give their assent. This would take

the form of a user-friendly consent form (an example was shown to the parents). Seven parents at both centres indicated interest in the research. A time was set to conduct the first focus group interview at Sanctuary childcare. Because of the difficulty of transport and getting the parents to the centre, this meeting was held during session time. The focus group interview that occurred the following week was also during session time, for the reasons outlined.

Participants: focus children

Six focus children (all girls) took part in the research at Ocean Kindergarten. This occurred because of parental response to taking part in the research. Six children (four boys/two girls) took part in the research at Sanctuary childcare. The function of the focus children was to act as an impetus for the teachers to recognise and plan for children's environmental interests. The children at both centres were chosen from the same invitation and expression of interest to take part reply form, sent out to parents. Before the first interview the focus children had the consent form read to them and then they signed it with their name or a nature related picture (Hedges, 2001).

Table 2 on the following page outlines the details of the participants in the study. It states teacher qualifications, children's ages and the pseudonyms of the teachers, focus children and parents.

Table 2: Details of participants

	Teacher (T) pseudonym	Teacher/caregiver Qualifications	Child (C) pseudonym	Child age and gender	Parent (P) pseudonym
Ocean Kindergarten	Henrietta	Diploma of Teaching (ECE)	Charlotte	4 years female	Carol
	Megan	Diploma of Teaching (ECE)	Greta	3 years female	Angela
	Mary Lou	Diploma of Teaching (ECE)	Georgia	4 years female	Kathryn*
	Sophie	Diploma of Teaching (ECE)	Louisa	3 years female	Christine
			Kimberley	4 years female	Janet
			Brooke	3 years female	Marilyn
Sanctuary childcare	Diana	Diploma of Teaching (ECE)	Bethany	3 years female	Eve
	Jill	Diploma of Teaching (ECE)	Ashleigh	4 years female	Alice
	Pania	In teacher education	Jacob	4 years male	Marie
	Jenny	In teacher education	Jordan	3 years male	Grace
	Elizabeth	In teacher education	Aaron	4 years male	Denise
	Kate	Not involved in teacher education	Nicholas	4 years male	Jane
	Kylie	Not involved in teacher education	Benjamin*	4 years male	Nicola*
	Sally	Not involved in teacher education			

*Withdrew from research process.

Methods

Observations

This method was employed to gain insights into environmental knowledge creation and the creation of the community of learners. It also recorded the implementation of EE into the early childhood curriculum. The recording of the meaningful interactions of participants involved in the community of learners was the primary purpose (Mertens, 1998). A field notes/coversheet was used for each observation. This allowed recording the context of the situation whether the observation was recorded at the centre or on an excursion (Mutch, 2005) (see Appendix 3).

According to Edwards (2001), there are three main observational methods to choose from. These are anecdotal observations, time sampling and event recording. Each

has advantages and limitations. Running records were not considered because of the time consuming nature of this method where every aspect is recorded. Anecdotal observations on the other hand record significant incidental events and provide in-depth information. The major criticism of this method is that they can be overly subjective as they record a mixture of facts and impressions (Penrose, 1998).

Time sampling as an observational method is used to observe a child or a learning experience. The observation notes what is happening at regular intervals and are evenly distributed over a session. A pencil, paper and timer are required. This method does provide information over a prolonged time span and is manageable for busy practitioners. Over time it will provide valuable information about what a child is doing at different times and the learning experiences involved. However, it only records what happens at certain times of the day and therefore several observations are needed to provide a clear picture of the child's learning (Penrose, 1998).

Event recording focuses on the event about which information is required. For instance, how often are girls playing in the carpentry area? It will record how many times this behaviour occurs. A careful definition of the observable behaviour is essential. A mark is made to record when the behaviour occurred. The limitations of this observational method are that the child has to be observed for an entire session and only 'snapshots' of the behaviour are recorded. For instance, it does not indicate how long the girls stayed at the carpentry area or what they were doing.

Target observations

After considering the three major forms of observation above a fourth method, the target child-adult method, was chosen as there were focus children and teachers at each centre. This was the preferred method as it allowed observations of behaviour in the centre environment. In this way the focus children's interest in the EE learning experiences offered became part of the 'bigger picture' of the EEIC implementation. The format of the observation schedule allowed for recording the observation and the linking it with theory and concepts. Relevant concepts and theories included knowledge creation, the community of learners, co-construction, co-learning, domain knowledge, scaffolding and socio-cultural aspects. The children's context was also noted. The target children (those present) were observed on each visit I made to the

centre. They were observed as part of the environmental learning experiences offered and at mat time. This information was recorded in the reflective comments column as it is important to separate observations from interpretative comment. This approach went beyond the purely interpretation style of many observation schedules. The observations were narrative in style so did not identify individual children at the centre (apart from focus children), rather they offered examples of the theories and concepts outlined (Edwards, 2001) (see appendix 4). This notion is consistent with the creation of a community of learners as a conceptual artefact, because all proponents of a community of learners learn as a cohesive group. The target observations provided rich information about the focus children and teacher's knowledge creation and environmental learning. However, to ensure triangulation of data sources, interviews, document analysis and teachers' contribution to data collection provided a broader picture.

Teacher contribution to data collection: documentation

"In everyday language, to document a process or event is to gather and organise information about it. Documenting something provides a written pictorial record of what has occurred" (MacNaughton & Williams, 2004, p. 257).

This explanation of documenting in the early childhood centre has been used in some centres for a very long time. However, it is the recent availability of digital cameras and computer programmes to record events and children's topics of interest, which has revolutionised the documentation process. Both centres in this research had digital cameras at their disposal. However, photos of children were not included in this research for ethical reasons. Dixon (2001) points to advantages of photographing children's drawings, paintings block creations and constructions. Children can also assist with taking photos or alerting their teachers to creations worthy of documentation. Digital photos of children's learning enhance observational techniques especially narratives and learning stories. These photos can be loaded onto the computer and the learning story or narrative attached. This is a more time efficient method compared to conventional photography. Documentation makes learning visible to all the groups within a community of learners and offers a record of the learning that has occurred throughout the duration of a project (Meade, 2001). Photographic documentation affords an opportunity for the teachers, children and parents to reflect on the teaching and learning that has occurred during a topic of

interest and was used extensively by both centres in phase two of the research. For instance, the photos of the aquarium excursions provoked discussion among parents, teachers and children and contributed to the knowledge creation process.

Teacher contribution to data collection: learning stories

Learning stories are: "… observations in everyday settings, designed to provide a cumulative series of qualitative 'snapshots' or written vignettes of individual children…" (Carr, 2001, p. 96). As a form of documentation, learning stories are part of the visible aspect of the overall documentation process. In a display of children's learning on a topic of environmental interest, learning stories will be an integral part. They record children's every day learning especially as a project enters the second phase when learning and research on the topic of interest is at its acme. The four principles of *Te Whāriki* form the basis of the learning stories method (Carr, 2001) and the strands of well-being, belonging, contribution, communication and exploration are used for analysing the learning that has taken place. Hatherley and Sands (2002) highlight five premises that make learning stories unique and are the point of difference from other forms of assessment. They are as follows:

- A narrative style of writing
- The recording of multiple voices: an individual child, groups of children, teachers and parents
- The acknowledgement of children's learning dispositions
- The positive highlighting of children's strengths and interests
- A perceptible display of the teacher role in the early childhood education teaching and learning setting.

A limitation of this method is that the bias of the observer can lead to inferences being made about a child's behaviour and incorrect assumptions being made about what is observed (Martin, 1994).

Learning stories as described were used in both centres by the teachers to portray the learning that occurred as a result of the environment topic of interest. They enhanced the documentation of the projects undertaken during the participatory action research phase of the research at both centres. The learning stories recorded, especially of excursions, added validity to the children's learning and accurately reflected this.

They also provided a talking point for the community of learners to extend on, or revisit the topic of interest.

Document and records review

Mutch (2005, p. 218) refers to document analysis as: "where documents are analysed either quantitatively or qualitatively". Interpretation of text, according to Babbie (2004) allows for inferences to be made and a critical analysis of the document to occur. A limitation of this method is to solely rely on it without triangulation of evidence. This could lead to an unopposed critical analysis.

In the study, reviewing relevant documents and records was used to gain relevant information on curriculum planning, and curriculum materials, such as *Te Whāriki* (Ministry of Education, 1996). Records such as child profiles were also reviewed. These documents provided a background to the topic under investigation, the creation of a community of learners to promote environmental education in early childhood education. It also provided insights into the dynamics and everyday functioning of the centres involved. In phase two of the research (participatory action research) the teachers photocopied education related documents, lesson plans and learning stories (Mutch, 2005).

Semi structured-interviews

In the semi-structured interview: "…the purpose is primarily to discover the espoused theory, the theory in use, or both, of the interviewee" (Robinson & Lai, 2006, p. 108). This explanation means the interviewer has the flexibility and freedom to pick up on interesting responses and follow up with further questions. A limitation of this flexibility is that more explanatory questions (open ended questions) than checking questions (closed questions) will need to be asked.

In this study this interview method allowed the researcher to set up a general structure in advance by deciding what main questions would be asked (see Appendix 5). The detailed structure however occurred during the interview. The interviewees answered in their own words and the interviewer offered prompts, probes and follow up questions to gain clarity and expansion on answers. This form of interviewing was used when interviewing children as it fitted well with participatory action research

methodology and the case study approach used in phase one. Furthermore, it was a flexible technique for data gathering that yielded rich information on the topic of environmental education (Drever, 1997).

Interviews need preparation and this includes when and where they will take place. In this study a quiet place in a familiar setting proved ideal. The interviews occurred in a separate papatuanuku (nature) area that was part of the kindergarten. In the case of the childcare centre, two rooms were used. The first was a sleep room/playroom and the second a small room that was used for one to one or small group learning and contained resources relevant to this purpose. In both cases being part of the centre and in full view of staff and children proved problematic. This posed difficulties with background noise and inquisitive enquiries from other children. However, this arrangement was necessary for ethical reasons and to ensure the children felt at ease with the process. When they decided to go back to join their peers this could take place with minimal disruption to their play.

Empowerment of the children was paramount throughout the three interviews conducted with the focus children at both centres. The children needed to feel at ease when interviewed and it was important to build rapport and trust. Once rapport and trust were established, the focus child/children greeted me with happy recognition whenever I visited the centre. This also allowed them to share their anecdotes about their environmental learning. It was also important that I was aware of the power relations my researcher role could impose. Children's perspectives need to be respected and, as Lewis and Lindsay (2000, p. 197) so poignantly state, "…listened to and – heard".

The interviews with the focus children for the research included both audio-taped semi-structured as well as incidental interviews. The interactions of focus children engaged in natural conversation offered valuable insights into their environmental knowledge. Three interviews were conducted with the children: at the beginning, to establish current knowledge, after the EEIC, and at the end of phase two to make comparisons to tease out environmental and conceptual themes. The final interview provided an overview of the whole research process and the opportunity to document the children's environmental knowledge creation process.

Focus groups

"Focus group interviewing is about listening. It is about paying attention. It is about being open to what people say. It is about being non-judgemental" (Kreuger & Casey, 2000, p. xi). For this reason, it was the most appropriate method to use with the adults (parents and teachers) who were involved in the study. The focus group interview had many advantages. Firstly, its purpose was to gain information about a topic of which little is known. Secondly, focus group research allows for the collection of rich qualitative data. Thirdly, these rich qualitative data were in the respondent's own words and in their context. Finally, their own context provided a comfortable, permissive environment in which to share ideas and views (Stewart & Shamdasani, 1998). Focus groups comprise groups of people who share something in common. Furthermore, they are consistent with the notion of a community of learners. In this study the common focus was participation in the creation of the community of learners to promote environmental education.

Two focus group interviews occurred separately for both teachers and parents at both centres, while the third was combined. The first two took place at each centre a fortnight apart. Therefore, both the teachers and the parents had the first separate focus group interview before the commencement of the EEIC and the second immediately after. As the two phases of the research took a full calendar year to complete the final combined focus group interviews took place at the end of the year. This meant that the combined focus group interview for the teachers (from both centres) took place in late November and for the parents (from both centres) early December. Both meetings were held in a room at the tertiary institution where I am employed. This choice of venue eliminated the need to choose either one or other of the centres in preference to the other. From that point of view it allowed the interview to take place on neutral ground at a halfway point between the two centres. As I had been working extensively in both early childhood centres, this afforded me the opportunity to experience a centre-tertiary institution exchange. This allowed for the concept of "inhabiting each other's castles" (J. Robertson, personal communication NZARE conference 24-26 November 2004).

The teacher combined focus group interview occurred on the night the childcare centre normally had their regular staff meeting. This ensured all staff including part

time staff could attend. The kindergarten was then approached about the proposed date and it was jointly agreed that the meeting would take place on a weekday night over a shared pizza meal provided by me. One teacher from each centre was unable to attend due to prior commitments.

The final parent combined focus group interview proved more problematic and added weight to the notion that the research process is messy and does not always proceed according to plan. Of the ten parents (in total, after withdrawals) involved from both centres only three attended (1 from kindergarten, 2 from childcare). This lack of attendance occurred for three reasons: timing of meeting, transportation and parent-child commitments. Firstly, although parents were consulted about a suitable day, date, time and place for the interview it was difficult to achieve a consensus. After trying to co-ordinate a suitable weekday, a Saturday morning with a 10.00am start was agreed upon. Despite this consultation, parental 'day to day' commitments impacted on attendance (Kreuger & Casey, 2000). Secondly, transportation proved to be a problem. Transport needs to be available and in working condition. It is one thing to get to your local childcare centre or kindergarten (where the two previous interviews were held) but quite another to get to a location further away from home. Finally, parent-child commitments took precedence. The weeks leading up to Christmas are a particularly busy time for parents. Many organizations (both sporting and social) are having their 'break-ups' and there are only so many Saturdays before Christmas. One parent had her daughter's ballet recital that naturally took precedence. Work commitments also impacted. Many parents work Saturdays if the opportunity arises, as partners are able to baby-sit the children. Unexpected events also impacted such as a funeral of a close friend for another parent.

In the focus group interviews, my role was one of a skilled moderator and facilitator as well as to keep the discussion on the topic, while allowing the group to discuss freely. Although the combined focus group interview (for those who attended) yielded lively discussion, in order to canvas the views of all of the parents it was necessary to conduct individual interviews. This process occurred in two ways. Firstly, individual audio taped interviews occurred at the centres. Secondly, individual telephone interviews were arranged to take place at a negotiated pre-arranged time.

Focus groups and individual interviews do elicit different information, even from the same interview questions. This does not mean they cannot be used together. Litosseliti (2003) for instance, finds one-to-one interviews valuable, especially post-focus group discussion. The parents at both centres had been involved in two previous focus groups and had knowledge of what was discussed on the topic. This made the individual interviews more meaningful. Merton, Fiske and Kendall (1990) advocate the use of the focussed interview as an adjunct to the focus group interview. Using an individual interview meant that valuable information was gained from individual parents. They were able to express themselves without the input of a group of people, some of whom were more articulate than others. Although this can be a strength it can equally be a weakness. The major advantages of focus groups are their diversity of opinions expressed, the brain-storming of ideas, the exploration of issues and topics, and this is absent from individual interviews. However, in this research, the use of individual interviews overcame this tension.

The focus group interviews with parents were analysed using the theories about funds of knowledge, social capital and a community of learners outlined earlier. This conceptual framework offered insights into parental environmental attitudes, values and practices and how these influenced their children's knowledge base.

Data Analysis

Coding and analysis

Coding according to Babbie (2004, p. 318) is: "the process whereby raw data are transformed into standardised form suitable for machine processing and analysis." This process involves analytic induction using both deductive reasoning (hypothesis testing methods) and inductive reasoning (theory generated methods) to produce valid data. Triangulation is central to this validity. "This technique involves the use of multiple sources of information, methods, theories and observers to generate data about a research topic…" (Davidson & Tolich, 1999, p. 248). Triangulation in this study involved all of the multiple sources outlined above. The following table outlines the codes used to identify the examples used in the text.

Table 3: Coding for Research Methods

Research Instruments	**Coding**
Conversation	(C)
Document and Records Review	(DRR)
Field Notes	(FN)
Observation	(O)
Interview	(I)
One	I 1
Two	I 2
Three	I 3
Focus Group Interview	(FGI)
One	FGI 1
Two	FGI 2
Combined Focus Group Interview	(CFGI)
Three	CFGR 3

For presentation analysis and to differentiate between data, different fonts are used for field notes interpretation and research analysis.

Organisation of data

Observation notes and transcripts were photocopied. Responses were categorised and organised into a matrix of themes. A computerised data analysis programme was not used because pre-conceived categories would limit analysis. Account was taken of the convergence and divergence of significant answers. Each theme was based on an interview question and in turn was linked to the relevant research question (see appendix 6). A brief introduction was offered and quotes from transcripts were used to support analysis, categories and themes (Bogdan & Biklen, 2003).

Content analysis

Edwards (2001, p. 132) states that content analysis is the mainstay of qualitative research. She likens it to "combing the evidence". Accordingly, the data were analysed and selected segments used to illustrate the themes and data generated categories. Analysis was also theory led, for instance the sociological concepts of

social capital and funds of knowledge. The theoretical underpinnings of a community of learners were also used as an interpretative tool.

Thematic analysis and data generated categories

This research used a number of theoretically based themes to create further data generated categories (Mutch, 2005). Four theoretical themes were applied: knowledge creation (Bereiter, 2002), empowerment (MacNaughton & Williams, 2004), collaboration (Head, 2003), and transformation (Fullan, 2003). Examples to illustrate these themes and data generated categories are outlined in Table 4 below.

Table 4: Additional categories to main themes

Main theme: Knowledge creation	Empowerment	Collaboration	Transformation
Additional categories	Additional categories	Additional categories	Additional categories
Children's environmental knowledge Hands on experience Emergent curriculum Environmental education • *in* • *about* • *for*	Implementing environmental education Integrated curriculum (EEIC) Leading participatory action research (PAR) Project approach	Home-Centre link Excursions Valuing parents' • involvement • contribution Learning together	Team approach Greater awareness • environmental education • issues Growth in children's knowledge

A further four theoretical themes are illustrated below: social capital (Coleman, 1994), funds of knowledge (Moll, 2000), community of learners (Head, 2003), and relationships (Ministry of Education, 1996). Table 5 outlines the analysis of these further four themes across three interviews with teachers, parents and children over two phases. The table analyses themes by using actual words from interviews while the words in bold highlight the theme.

Table 5: Analysis of further themes across three interviews and two phases

Phase	One	Transition	Two
Interview:	Interview one	Interview two	Interview three
Theme:			Social capital
Teachers			**Parents** bring books from home [**resources]**
Parents			I'll go to the library and get books [**resources]** We've got a friend on a farm [**excursions]**
Theme			Funds of knowledge
Teachers			**Parent** was an important part **Parents** look in child's profile
Parents			We look up birds on the computer [**interests]** At home spiders/beetles [**interests]**
Theme			Community of learners
Teachers			We purchased a **wormery** Parents have **wormeries** at home Involved mums in [**excursions]**
Parents			We got together on the wormery I'm doing a **worm** farm I've been on **excursions**
Children			I've got a square one [**wormery]** We went to the farm [**excursions]** To visit the aquarium [**excursion**]

Table continued over the page

Continuation of Table 5

Phase	One	Transition	Two
Interview	Interview one	Interview two	Interview three
Theme:		Relationships	Relationships
		Getting to know you and shared understanding	Shared commitment
Teachers		Coming on all our **excursions**	**Talking** to parents Verbal communication with parents
Parents		We **talked** about the starfish	The teachers **talked** to me They **talked** about rare birds We had a **discussion**
Children		**We** got on the bus to go on our trip	**We** saw the diver **We** played **We** had lunch **We** climbed rocks

Below is an overview of the major theme of knowledge creation through the three interviews and two phases.

Table 6: Overall major theme across three interviews and two phases

Phase	One	Transition	Two
Interview	Interview one	Interview two	Interview three
Major theme: Knowledge creation	Knowledge creation	Knowledge creation	Knowledge creation
Teachers	Using **excursions** Their **interests** Natural **resources**	**Excursion** to aquarium **Interested** in possums Get your **resources** ready	Wonderful outings **excursions** An overriding **interest** We had parents who **resourced** books
Parents	If they show an **interest** Ask lots of questions **interest**	It came down to interaction **interest** Just talk to your kids **interest**	We talked about the starfish **interest** She talked about the budgie **interest**
Children	Photos/natural environment The **trees**, there's **sand**, the **grass**, the sun, this **butterfly**, the beach, **flowers**	Bird A **kiwi** bird Find starfish Pick up **shells** Catch **butterflies** **Morepork** **Crocodile** A little shark Some fishes	Lots of clown **fish** Different **fish** A **seahorse** **Worms** are what **kiwis** eat Big sharks A spider The **chicken** **Ducks**, **donkeys**, the **pig**, **turkeys**, goats, a **pony**

A theme of relationships is used as a summation at the conclusion of chapters five, six and seven to illustrate the emerging community of learners. Relationships are one of the principles of *Te Whāriki* (Ministry of Education, 1996); they are also central to social capital. With any relationship such as one that evolves in a group of friends, it begins with introductions and a period of getting to know one another. It proceeds through a time of consolidating the relationship and culminates in a steadfast relationship that is built on the combined values of all those involved. Therefore, the theme of relationships is further described as getting to know you (chapter five), shared understandings (chapter six) and combined commitment (chapter seven). This allows for triangulation of evidence of the emerging community of learners by using examples from the teachers, children and parents to illustrate the theme.

Triangulation of data

Triangulation was used in this study for validity and reliability reasons. Triangulation means viewing the field of study from different vantage points. Two types of triangulation were employed in this research study, data triangulation and methodological triangulation (Denzin, 1978). Data triangulation was assured by collecting data from multiple sources including personnel groups (children, teachers, parents, researcher), while methodological triangulation was assured by the use of multiple methods (a case study approach, participatory action research and multiple data collecting tools). These two types of triangulation were used to reinforce the interpretations. If contradictions arose in the interpretation of data, the participants' 'voices' took precedence (Mertens, 1998). As my 'voice' would be evident in the text, issues of reliability were likely to be raised. To counteract this Bogdan and Biklen (2003) suggest the researcher reduces subjectivity and increases objectivity in the writing up process by the use of triangulation. Edwards (2001) argues that researchers using qualitative designs (as in this study) need to consider how their discussions will affect the research process (Mutch, 2005). The reflexive writing up process involved a balance of authentic fieldwork and a meaningful interpretative account of events (Edwards, 2001). Denzin and Lincoln (2000, p. 47) summarise the reflexive nature of triangulation thus: "There is, in the final analysis no difference between writing and fieldwork. These two perspectives inform each other."

A community of learners in early childhood education consists of children, parents and teachers. An analysis of the participatory action research process and the creation of a community of learners as a conceptual artefact (Bereiter, 2002) by the teachers at both centres, took place. This was to ascertain if the necessary collaboration and participation had occurred at each centre and supported the concurrent validity and reliability (Davidson & Tolich, 1999) inherent in the research design. These two aspects are integral to the creation of a community of learners to promote environmental education in early childhood curriculum.

Cultural bias

It is important when considering cultural bias, to always begin by describing the researcher's values and cultural framework, in this instance, pakeha [New Zealander of European descent], middle class, middle aged female. Therefore, I had to realise that I was part of the field of study and would influence it. This meant being self-reflexive and taking responsibility for how my beliefs could interfere with the fairness and justice of the research process. As the research was conducted in lower socio-economic areas, with Polynesian ethnic groups, it was an important consideration. At the outset of the research process I fore-grounded my own investments (interest in environmental education and early childhood curriculum) standpoints and assumptions. Self-reflexivity also requires deconstructing the gender, class, power and race perspectives that have been instrumental in the research design. It is an assumption to believe that I share the same world experiences as those involved in the research. For this reason, during the data analysis stage, participants were asked for clarification of their contribution. They were also given transcripts to comment on and had the chance to respond to the interpretation and analysis, as an ongoing part of the research (Grieshaber, 2001). To ensure that cultural bias was addressed I kept a research journal and sought advice from cultural advisors at the tertiary institution where I work. The research journal highlighted my personal perspectives over the course of the research and this was useful in detecting cultural bias (Mertens, 1998).

Generalisabilty

Lincoln and Guba (1985) offer the concept of transferability as a way to apply generalisation in qualitative research. With this approach the reader can make generalisations from the 'thick description' of the researcher. This leaves the decision

of generalisability to a different setting, with the reader (Mertens, 1998). Generalisation from a case to the wider population involves generalising the particular to the general. The participatory action research, as used in this study, is about 'particularisation' and therefore strengthens Lincoln and Guba's (1985) concept of transferability.

Summary

This chapter has outlined the methodology and research methods used in this research. The research was conducted in two phases over one year in two early childhood centres. In the first phase a case study approach was taken to allow the teachers at both centres to gain confidence in the research process. A transition stage then occurred where the research was shared. In the second phase the teachers chose to lead the research themselves using participatory action research. The research design, participants (teachers, parents and focus children at both centres) and the research instruments were outlined. Ethical considerations, data analysis and interpretation using the sociological theories of social capital, funds of knowledge, as well as a community of learners, was explored. Knowledge creation as an overall analytic strategy was also emphasised. My role as researcher in the research process was examined. The following chapter will discuss the baseline environmental knowledge of the teachers, children and parents at both centres involved in the research. Data presentation using knowledge creation as the overall analytic strategy will be outlined across the next three chapters.

Chapter Four: Environmental Education: The Way We Were

Introduction

In this chapter I report on the results from the first of three interviews with the three teachers, six focus children and six parents of the Kindergarten, as well as the eight teachers, six focus children and seven parents of the childcare centre. The chapter examines the baseline knowledge and attitudes of the participants towards the environment and environmental education. Interviews are the only data collection method reported on in this chapter. As the planned EEIC (at both centres) had not yet taken place, observations and document analyses were not used. Quotations from the interviews allow the participants' voices to come through; their words are in italics to differentiate their voices from any literature quotes.

Kindergarten Children's First Interview

The focus children's initial interview consisted of showing them a series of 12 photographs taken of the outside area of the kindergarten, and two local parks with which they were likely to be familiar. This exercise was to gauge their awareness of natural environment features in the vicinity of their centre. The 12 photos were of the oak tree, stage area, outdoor climbing area, general outdoor area with park in the background, local park play area, playground area with a landmark in the background, park scene with netball courts, hollow tree at the local park, ducks at the park, lions statue, play equipment, and the Chinese garden at the park.

Children's baseline knowledge of the natural environment

The children were asked "Can you tell me about this picture?" A verbal prompt, "What else can you see in the picture?" was also offered to ensure the children had ample opportunity to talk about all they could see in the photo. Table 7 below summarises the results from the 12 photos. The results are categorised under four environments, namely the natural environment, the play environment, the human made environment and the social environment (Florgaitis et al., 2005).

Table 7: Kindergarten focus children's identification of different environments

Environmental category (derived from Florgaitis et al., 2005)	Items identified	Number of photos in which category identified from a total of 12
Natural environment		
Nature (trees and grass)	69	12
Environment of imagination (playing in hollow tree)	3	1
Living creatures (feeding ducks)	13	1
Play environment		
Equipment (toys and play items)	108	9
Lions (statue at the park)	4	1
Playground (recognition of playground)	7	1
Identified park (recognition of local park)	12	5
Human made environment		
Fixed structures (fences, buildings, road)	41	7
Social environment		
Outdoor eating	10	4
Kindergarten happenings (photos, being picked up)	2	2
Family outings (visits to park)	8	2

An important finding in Table 7 above is that the focus children identified aspects of the natural environment in all 12 photos. This indicates an awareness of the natural world around them. The play environment, although identified in only nine photos, has the largest total of 131 items identified. This result mirrors the findings of Prince (1994) in which children consistently identified play items first. However, in the current research children demonstrated a greater awareness of the natural environment, despite the fact that they predominantly identified play equipment and related categories. The finding is consistent with the theories of Piaget (1952) who identified pre-school children's inherent egocentricism. If play equipment is present, be it at kindergarten or the local park, it is there for their personal enjoyment and amusement. Children go outside to play, therefore play equipment and the use of it is uppermost in their minds.

The identification of aspects of the human made environment was an interesting finding. While consistently identifying aspects of the natural environment, the focus children were only half as likely to recognise aspects of the human made environment in the photos. The social environment included park visits as well as outdoor eating, involving picnics at the park or having morning tea at kindergarten. Two children mentioned kindergarten happenings. They spoke about being picked up from kindergarten or recalled having a group photo taken at the entrance to the kindergarten.

Kindergarten Parents' First Interview

Parents' knowledge and awareness of environmental education

To investigate the parents' baseline knowledge and awareness about environmental education they were asked, "What does environmental education mean to you?" Out of the six parents interviewed, half had tentative thoughts and half had definite thoughts on what environmental education meant to them. A tentative awareness was expressed by Carol as: *if I was to think about it… experiencing the outdoors.* Conversely, Kathryn had definite thoughts which she expressed succinctly as *just looking after the environment.*

When I asked the parents if they considered it important to have knowledge about the natural environment they agreed unanimously. This finding could indicate that these parents' participation in the study was because of their interest in and their commitment to the natural environment. All offered different explanations and examples for the importance of having environmental knowledge. Christine, for instance, saw it as a personal choice: *so it's personal choice for both children and parents. I mean if you would rather your kids sit inside and watch videos or … you know, boot them outside. That's what I got, go outside and play.* Role modelling a sense of wonder about nature was paramount for Janet who preferred nature to technology. For Marilyn, it was essential for children to have knowledge of the eco system and the interdependence of all living things. She explained, *children need to know how things happen and why. I think they definitely need to have a broad understanding of how the eco system works.*

On the other hand, Angela raised environmental issues such as the consumer society and pollution. She blamed rampant consumerism for the degradation of the planet and highlighted the issue of disposable nappies *because they* [manufacturers] *are making new things easier. For example Treasures isn't good for the environment and yet they make them. What happened to good old cloth nappies?* This idea has been reinforced in a recent newspaper article reporting that British parents are being offered subsidies to switch to cloth nappies (Beston, 2006, February 18). Modern transportation and the subsequent pollution made her reflect *what happened to horses instead of cars?* Carol summed up the feelings of the whole group regarding the importance of having knowledge of the natural environment. She mused, *if you haven't got knowledge you are just drifting through.*

The knowledge that parents believed they possessed about the natural environment was based on their perceptions of what having this knowledge meant to them. Christine saw the knowledge she possessed as coming from outside sources, such as books. Marilyn, on the other hand, based her knowledge on one of environmental responsibility, *I try to do the right thing I guess.* This answer reflects the success of the 'do the right thing' environmental campaign. Along with the 'tidy kiwi', these media campaigns have been used to instil values of caring for the environment by keeping it tidy and litter free.

Rachel Carson (1956), the veteran environmental campaigner, talked about instilling a sense of wonder in children about the beauty of nature. Janet's answer reflected this. *I was brought up to appreciate nature but in a different way than we do now.* Angela's answer was firmly based on an earlier time, before the impact of land settlement and industrialisation. It can best be described as 'earlier times'. She acknowledged the environmental degradation of pollution on the land and a sense of loss permeated her answer. She yearned for a less sophisticated, more environmentally friendly, lifestyle when she said:

> *Nothing's natural these days. Nowhere like back before houses and that you know. You had lots of trees, a lot of bush land, a lot of things that gave oxygen … now it's sort of more or less polluted by fires from houses and big companies … it's not natural any more. I don't know, just take it back to how*

it used to be. I guess by recycling and not having diesel engines and things like that.

Parents' attitudes towards the environment

A variety of attitudes were illustrated in their answers. Affective attitudes of care for the environment prompted Carol's answer *knowing how to care for it* [the environment] *and that sort of thing.* New Zealand's clean green image and the success of the 'tidy kiwi' campaign was reflected in Angela's answer *keeping our country clean I guess … rubbish up after you.* This answer does not address the issue of 'the three Rs', reduce, reuse and recycle, as it only refers to keeping the country clean. Unfortunately and inevitably this rubbish that could be recycled ends up in landfills. This is contrary to protection of the environment principles where reducing the amount of rubbish deposited in landfills is an ultimate goal.

Some answers reflected an active involvement with the natural environment and the sharing of environmental knowledge (refer to Palmer and Neal (1994) in Chapter 2). Marilyn felt it was important for children to know *about* seasonal cycles and the physical elements necessary for growth. She summarised this in her answer *teaching them plants need sun and water to grow and all that.* Interaction with children *in* the great outdoors was important to Carol and is epitomised in her answer when she said *experiencing the outdoors and the environment.* On the other hand, Janet's notion of action showed an understanding of education *for* the environment. Although she identified recycling as a positive action, she also believed environmental education was a package deal. She explained this by saying *recycling and all that, but for me it's into it … rather than just one aspect.*

Parents' action: recycling

When considering parental influences on children's environmental knowledge base, a good place to start is with environmentally friendly household practices. If parents, for instance, recycle it indicates a commitment to a sustainable lifestyle and offers a positive role model to their children. It can also indicate an interest in environmental issues. Of the six parents interviewed, four recycled household waste. The parents were very clear about their motivation for either recycling or not recycling. For those who did recycle, this was reflected in their emphatic yes answers. The two who did

not recycle offered a 'mother knows best' motivation, but shared that their own mothers recycled.

Both of the parents who did not recycle were very clear about the downsides of recycling. This was evident in the following exchange:

Carol: *It's too much hassle with all the different bags and you've got to rinse things out.*
Angela: *That's exactly how I feel … I've got five kids.*
Carol: *... hassle really. I know it's not good, but you know it all goes to the Dump.*
Although both parents acknowledged maternal role modelling of the practice and that they should be recycling, the 'hassle' and time commitment deterred them. In both instances these parents offered excuses for their reluctance to recycle. Angela said, *I've got five kids,* while Carol took an 'out of sight out of mind' approach, because in her mind *it goes to the Dump.* These views are representative of some of those in the community who choose not to recycle. This was highlighted in a recent newspaper article where residents were encouraged to recycle in greater numbers (Pinder, 2006).

Recycling does take commitment and the kerbside recycling service in the area requires recyclable items to be put in plastic supermarket bags. This stimulated discussion on the subject of windy collection days. The following exchange highlights the debate:

Angela: *Throw them in plastic bags and heaps of them on the street and it's a windy day …*
Cynthia: *I do think they recycle the supermarket bags, don't they?*
Angela: *Oh, do they?*
Cynthia: *Yes, I think so.*
Angela: *People who collect them are not going to run down the road.*
General agreement: *That's right.*

City Council recycling initiatives, as well as saving money, were the primary motive for Marilyn and Janet. Both had lived in Auckland where money saving recycling initiatives had been introduced.

Children's understanding of the practice of recycling was discussed. Both Kathryn and Marilyn were unsure as to whether children fully understood the broader issues of 'saving the planet' or sustainability. Marilyn stated, *I don't think they are aware of it because they are too young.* Kathryn's answer was more tentative, *I don't know if they realise why they are doing it, but it's just part of the way they are being brought up with recycling.* These answers are contrary to the findings of Prince (1994). She found that when children were made aware of why it is necessary to recycle, through meta-cognitive dialogues, children were able to articulate in their own way the importance of recycling.

Parents' influence on children's knowledge

Gaining an understanding of the knowledge the focus group parents had about the natural environment was pivotal to realising fully the influence they have on their children's environmental knowledge base. As a parent, one of their roles is to support their children's knowledge and learning about the natural environment. Parental attitudes towards the natural environment play a very important part as parents are powerful role models for their children (MacNaughton & Williams, 2004). Attitudes are caught, not taught, and parents who role model caring and respectful attitudes towards the natural environment invite an imitative response from their children.

For the parents in the research, funds of knowledge (Gonzales et al., 2005b; Moll, 2000) especially the environmental funds of knowledge that had an impact on the functioning of the household, such as recycling, were evident in their interactions with their children. Their social capital, that reflected their social networks, relationships and values (Field, 2003; Halpern, 2005), was also evident when they talked to their children about the natural environment. 'Walking the talk' would best describe Carol's interactions with Charlotte, her daughter. She did not see sharing environmental knowledge with Charlotte as a formal environmental lecture, like *the clouds are made of blah, blah, blah,* but rather a spontaneous interaction – *just brought up outside … living it.*

Marilyn's answer illustrated the impact of social capital on her family home. Rather than the parents providing the social capital, the role was reversed when Marilyn, as

an adult, contributed to the family's social capital talking to her mother about her science learning at university.

> *I did a science degree … and I remember boring my mother to tears … just because you were so excited about all this stuff you had learned. Because I was really interested in science and nature and how things work. She probably hasn't a clue what I'm on about but she actually enjoyed it. And even now she says 'I know those things because you told me'.*

Marilyn was able to co-construct scientific knowledge (Palinscar, 1998) with her mother. Likewise her mother was able to acknowledge Marilyn's social capital by stating, *I know those things because you told me.* Sharing information in a focus group interview prompted Carol to recall an interaction she had with Charlotte:

> *Actually talking about that, Charlotte came up with a question while we were driving along and she said to me 'Mum, the sun burns you, ah?' and I said 'yep' and she said 'how, when it doesn't touch you?', and I had to think … well and I had to tell her about the UV rays. 'But what's a ray, Mum?'. And it's like, okay* [group laughter] *and it really made me stop to think, you know. I had to think, how am I going to explain this because I wasn't sure myself. You know, you get told about UV rays and blah, blah, blah, but you know, a ray. I sort of said 'Oh, a ray is like a blind, a streak you can't see. And you have a sort of vision in your mind of what these UV rays look like. But how do you explain to a four year old?*

This interaction highlights children's theories of the world (Bereiter, 2002). It also demonstrates domain knowledge. Wellman and Gelman (1992) have posited the idea that children can possess domain specific knowledge, suggesting children can have their own naïve theories about physics and biology. Charlotte's response to her mother's explanation of the fact the sun can burn you, *how, when it doesn't touch you?* indicates she has thought about the implication of UV rays even if she does not fully understand the concept. This interaction highlighted how children learn through questioning and the co-construction of knowledge (Jordan, 2003; Palinscar, 1998).

Marilyn spoke for the group when she summarised the process of how environmental interactions occur with her child. She believed in elaborating on the children's enquiries *because if they show an interest you just keep going with it.* Here Marilyn

emphasised child-initiated interaction that can be supported and extended by the co-construction of knowledge based on the child's environmental interest.

Talking with children about the natural environment was one way the parents imparted knowledge to their children. They believed you should offer simple basic answers to their questions, and as Janet explained *yes, you do need to keep it simple.* Marilyn added that parents needed to avoid confusion or the problem of 'too much information'. She asserted: *you've got to think, how do I explain it … that you are actually clearing up problems for them and not making them more confused.* Janet agreed with Marilyn and offered a scenario: *they may ask a question like 'Where does the recycling go?' and you start this long explanation and two hours later all they wanted to know was where the bin was* [group laughter]. For Christine showing them the real thing was how she shared her environmental knowledge.

Carol offered a summation for the whole group about how best to share knowledge of the natural environment with children. In her view *it just comes down to interaction between you and your child and the environment and bringing it all together.* Her answer represented this network of parents' views of the importance of relationships in social capital as well as the norm of appreciation of the natural environment.

Kindergarten Teachers' First Interview

To ascertain the teachers' baseline knowledge about environmental education I asked the three kindergarten teachers a similar introductory question to the parents 'What do you know about environmental education?' When expressing what they considered to be their knowledge of environmental education, their answers reflected education *about, in* and *for* the environment (Fleer, 1998; Palmer & Neal, 1994). Predictably all three teachers offered information based examples of education *about* the environment. Two of the three teachers spoke about education *in* the environment. The examples given included relevant teaching strategies and the use of environmental resources. Only one of the three teachers discussed environmental issues and was aware of the significance of environmental education in the early years.

As an explanation of their knowledge of environmental education, the teachers predominantly offered curriculum based examples. The focus group interview took place in the first term of the kindergarten year. This was the summer term so the safety aspects of being 'sunsmart' were uppermost in their minds. Henrietta's answer was predictable: *keeping children safe with sunhats and sunscreen.* The recycling and reuse of materials for use in collage and other curriculum areas were raised. It is interesting to note both recycling and the ozone layer are topics that could be discussed and investigated in environmental education. If through this investigation, informed action took place, it could be considered education *for* the environment. It does, however, indicate the beginnings of teaching children about environmental education and caring for the environment.

Henrietta also raised the issue of composting. It was not her most favourite learning experience for the children. This was because of the perceived side effects of the worms and the smell integral to the process. In all three of the above examples, no rationale was offered as to why these learning experiences would be included in the early childhood curriculum. The environmental issues of the ozone layer (sunsmart), recycling (landfills) and composting (sustainable living) were not offered as a reason for inclusion in the early childhood curriculum.

When considering the use of the kindergarten outside environment to promote environmental education, Sophie and Henrietta both offered examples of education *in* the environment. Utilising the outdoor area at the kindergarten prompted Sophie to explain it as *here – in this situation – with the leaves falling down in autumn…* This supports the notion of children being inherently interested in their own backyard (Prince, 1994). Henrietta agreed and offered her own examples of *our ponds and streams.* This was seen as a way for children to gain environmental knowledge *in* the community. Sophie saw the 'teachable moment' as an opportunity for ongoing learning and offered teaching strategies for supporting education *in* the environment. She also saw the opportunity to *learn with books and songs as a general opener to questioning* as a pivotal way for children to gain knowledge about the natural environment.

Megan's answer illustrated a deeper understanding of education *for* the environment. She took personal responsibility for her own environmental knowledge. This was evident in her answer *protecting the environment through education … that I was aware of environmental issues. Environmental education like the ray of light, the pollution, the over fishing, possums, under-sized paua. 'Cause things on TV make you aware.* Her response clearly showed she has an awareness and understanding of global environmental issues in some part gained from the media. She demonstrated knowledge of the environmental crisis facing the world and the consequences, if urgent action to address the issues she raised does not occur.

Inclusion of environmental education in the early childhood curriculum relies on teachers' perception of its importance within the early childhood curriculum (Florgaitis et al., 2005). All three teachers believed it was important to include environmental education in the early childhood curriculum. Several themes emerged in their answers. For instance, Sophie talked about conserving water by turning the taps off. Again this deeper issue of the conservation of water was translated at the centre programme level. She valued the whole idea of picking up rubbish to maintain the aesthetic environment at the kindergarten, and the children's safety. She asserted children need an awareness of the world around them and for that reason she considered it important for environmental education to be included in the early childhood curriculum.

Megan identified caring attitudes as an important aspect to be promoted through environmental education within the early childhood curriculum. This was reflected in her answer: *Yeah, I think it's important because if they learn to care for the* [environment] *like animals and insects, and see what food they eat and that – to nurture things and then it will eventually, hopefully, lead to caring for people …* This answer showed an understanding of the concept of environmental education and added weight to her explanation of what she knew about environmental education offered earlier. For her the role-modelling of caring attitudes towards the environment was an integral part of the early childhood curriculum and children's learning.

The teachers were aware of the fact that they would be imminently implementing an environmental education integrated curriculum (EEIC) with the children at their

kindergarten. The programme was to be planned to benefit all the children attending, but to be of particular interest to the six focus children. They considered whether or not *Te Whāriki* (Ministry of Education, 1996) linked with environmental education. They then outlined teacher-initiated as well as child-initiated learning experiences and teaching strategies to support their choice. Table 8 outlines their anticipated role in the implementation of the EEIC at the kindergarten.

Table 8: Kindergarten teachers' anticipated role – curriculum

Categories	Kindergarten
Environmental education links with *Te Whāriki*	Teachers believed *Te Whāriki* did link with environmental educationΔ. Teachers believed *Te Whāriki* was holistic (the woven mat). Henrietta: *It's woven into it* Sophie: *everything we do is Te Whāriki* (taken for granted viewΔ) Megan: *Well being goal 2, emotional well being Contribution goal 3 +, learning with and alongside others and linking into the child's community and family. And exploration goal 3 and 4.*
Child-initiated learning experiences	Megan: *by bringing animals to kindergarten and giving them the opportunity to experience*
Teacher-initiated learning experiences (teacher role)	Teachers planned trip to rocky shore Henrietta: *setting the scene. Children need to learn through interaction and extension of thought* (teacher role). Megan: *kids backyards are smaller* (concern for the lack of connection) *A sense of wonder. Adults need to open the child's sense of wonder of nature and I thought that's it in a nutshell.*
Suggested learning experiences for EEIC	Sophie: *Natural curiosity in our science and nature area* Henrietta: *talk about animals and watching insects, growing plants, tactile items, use of recycled materials, making paper We've had flooding lately and that could come into the programme* (current issues).
Suggested teaching strategies for the EEIC	Empowering, co-constructing, positioning, modelling, telling and instructing, recalling, questioning, teaching in and about the environment, correct terminology◊. Megan: *We use metamorphosis for change ...we use pollution.* Henrietta: *I'm putting in place a programme called Explorer* (computer).

Key

Δ Similar to research conducted by Prince (2000)

+ Illustrates deeper understanding of question

◊ Based on MacNaughton and Williams (2004) *Techniques for teaching young children.* (28 teaching techniques).

Childcare Children's First interview

As with the kindergarten children, the childcare children were shown a series of 12 photos. Six of the photos were taken of the outdoor area of the childcare centre and six photos were of a local park. The 12 photos were of the garden wall, the garden with tree, the sandpit, a butterfly and toys, Norfolk pines and playground, trees with garden in the distance, the park entrance with trees, sand and water at the park, swings, plants at the park, trees at the park, and a general view of the park. The same verbal prompts offered to the kindergarten children were offered to the childcare children. Responses by the childcare children have been placed into the same categories as those of the kindergarten children (see Table 9).

Children's baseline knowledge of the natural environment

Table 9: Childcare focus children's identification of different environments

Environmental category	Items identified	Number of photos in which category identified
Natural environment		
Nature	70	12
Play environment		
Equipment	139	11
Play experience	13	6
Identified park	26	4
Human made environment		
Fixed structures	10	5
Transport	11	5
Social environment		
Outdoor eating	3	2
Family outings	8	4
Recognises centre	6	4
Safety on park apparatus	1	1
Community experience	2	1

An important finding from Table 9 was that the childcare centre focus children identified the natural environment in all 12 photos. The children recognised the

largest total of items from the play environment. This is a predictable finding and parallels the research of Prince (1994) when children consistently identified play items first. On the other hand, children in this research are displaying a greater awareness of the natural environment. A notable contrast occurred between the focus children's identification of the natural environment and the human made environment. Features of the human made environment, such as fixed structures, were not identified in significant numbers. However, the recognition of vans and cars in the photos is significant. The childcare centre has its own van and the children are also transported to their centre by car so both of these forms of transportation were familiar to the children. The focus children identified many aspects of the social environment. They gave details of family outings to the park, outdoor eating, the centre, the safety of park play equipment, as well as the community experience of visiting friends.

Childcare Parents' First Interview

Parents' knowledge and awareness of environmental education

As with the kindergarten parents, the childcare parents were asked "What does environmental education mean to you?" All the parents had definite thoughts about this. Their answers reflected an awareness of the environment and environmental issues. Eve stated, *what it means is learning and playing with your children in natural surroundings.* Grace asserted, *I think it is telling people about like what's going on around us with the environment.* Alice went further to state, *just knowledge of being informed about the environment.* These opinions reflected the parents' social capital about the environment. For this network of like-minded parents, relationships were valued and norms about interaction with the natural environment were considered paramount.

When asked about the importance of having environmental knowledge the childcare parents all agreed on its importance, displaying insightful social capital (values). Furthermore, they were aware of the interdependence of all living things. They felt a need to have respect for the land and a sense of responsibility for its care and protection. Jane highlighted the interrelationship of all living things when she explained, *it doesn't matter what you choose, 'cause animals make the plants grow.* Both Alice and Nicola felt a strong connection with the land of Aotearoa New

Zealand. Nicola said, *what you live with … what you get from the land because you need to know, because you need to respect it.*

Fleer (1998) and Palmer and Neal (1994) have identified three levels of involvement with the environment, *about, in* and *for* the environment. Predominantly, the parents at the childcare centre were aware of education *for* the environment. Eve raised the issue of interdependence when she said, *there are the animals … we affect each other.* Grace agreed by adding *and great big baboons.* This indicates a concern for endangered species that has been widely publicised on the Television news and nature channels. Grace also outlined a sense of responsibility for saving the planet and the importance of *teaching our kids. Hey, 'cause our kids are the next generation.*

Knowledge of the three "Rs" of reduce, reuse and recycle was evident in their answers. Jane asserted, *yes, but it's more important to keep it clean and keep your waste separate from your environment because it will contaminate it then you'll have no environment.* Grace agreed, *because some things aren't biodegradable they hang around for years and years.* These examples of social capital about protection of the environment will most likely ensure their children share their views.

Parents' attitudes to the environment

Parental attitudes towards the environment were reflected in the answers proffered. Affective attitudes of care and respect were present. Grace, for instance, said *yes, caring about it and keeping it clean … 'cause you are always going to see it.* Jane agreed, *same thing, teaching our children to respect it.* For Eve *just being able to learn with your children … the education* was paramount. She emphasised the importance of education as pivotal to having environmental knowledge.

Alice highlighted issues surrounding green ecology and social justice (Stanley & Nelson, 1986) and the need for political action. This was evident when she stated, *the ozone layer, the ocean, oil, water, and who's getting oil. Yes, Greenpeace and green fingered people.* Conservation was on Nicola's mind when she highlighted the exploitation of nature's precious resources. She said *cutting down on power. The way we use nature too much sometimes.* This cornucopian approach to nature (Fien, 1993) sees nature as existing for the benefit of humans.

Eve took up on the theme of exploitation and elaborated further. She highlighted how nature can be exploited for the burgeoning beauty industry: *I think we really exploit whales. For instance, there's not many left and they are huge animals, but they just get slaughtered all the time for perfumes, soap, for man things. Things we don't really need.* This is a very insightful answer and again illustrates the environmental ideologies of Fien (1993) and the relationship between humans and nature. Eve also longs for economic production that is based on a harmony between people and nature.

Nicola raised cultural environmental issues with the picking of flax. She said, … *respect that you give, like when you are picking flax.*

Parents' action – recycling

All of the parents in the childcare focus group recycled their household waste. However, there was the exception of food cans that for most was a distasteful task, particularly pet food cans. The answers varied from Nicola's *I don't do tins* to Jane's *I throw them in the bin, they're a pain in the bum.* This led to a lively discussion on how best to clean cans before disposing of them in the recycling. Grace and Alice had visited the local recycling depot with their children, who with parental role modelling, learned where to put the various recyclable items.

Parents' influence on children's knowledge

The garden featured strongly in the answers of the focus group parents at the childcare centre when asked about their knowledge of the natural environment. Gardening is featured here as a social capital norm that is valued. It also illustrates these parents' funds of knowledge. They are not only growing plants for their aesthetic beauty, but also as food for their households. Their social capital and gardening funds of knowledge based on their experience was illustrated in their acceptance of learning through their mistakes. First attempts were not always successful. However, as they gained knowledge about what plants need for survival they shared it with their children. Grace, who loves gardening, stated: *my first year the plants just died, I never used to water them.* Alice identified with this dilemma …*trying to keep my plants alive and in doing that I teach my children, don't touch my plants, don't over water my plants.* Eve's self-sufficiency and the food chain was the basis of her household

funds of knowledge. She shared, *I raised pigs. We had veggie gardens. And you eat them, throw your scraps out and the pigs eat them … to me it's a bit like a cycle.*

The parents at the childcare centre offered practical examples of how they talked to their children about the natural environment. Some gave examples of care of the environment. Jane spoke of her daughter throwing plastic out of the car. She felt *if I tell her not to, well that's encouraging her not to,* while Eve role modelled putting out the recycling to Bethany. Grace talked with Jordan about the bug catcher they have at home. Some parents were unsure as to whether they actually did talk to their children about the natural environment. This led Alice to reflect *…we do it without knowing.* Jane pointed out, *we just do it from the time they are born.*

This everyday approach to sharing their social capital with their children about the natural environment was reflected in their answers. The latter also illustrated the pivotal role relationships and parental expectations play in this process. Answering children's questions and co-constructing knowledge was important to Jane and Eve. Jane stated, *kids want to know about everything so they ask about everything.* Eve agreed, *they will say 'what are you doing?' so you explain to them.* Grace displayed social capital when she talked about what praying mantis ate: *And then I found out, well, they eat bugs, so he used to come in with all sorts of bugs. I remember having one* [a bug catcher] *when I was younger. I used to catch other praying mantis to feed it.*
Cynthia: *So they eat each other?* [general agreement] *Oh, that's something I've learned today.*

Alice outlined how she gained her social capital from both her extended family and the wider community. *We're like kids, we ask our Mothers, our Aunties, our Uncles, our friends, and they tell you, and then your kids ask you, and well … I'll tell you because I know now.*

Childcare Teachers' First Interview

Eight teachers from the childcare centre were asked "What do you know about environmental education?" The categories outlined by Fleer (1998) and Palmer and Neal (1994) of education *about, in* and *for* the environment dominated their answers.

Half the respondents offered examples of *about* and *in* the environment while three teachers offered examples of *for* the environment.

When discussing education *about* the environment, the use of the immediate environment was favoured. Elizabeth summarised this by saying, *it's just teaching them about their surroundings … trees and seasons.* However, this time it concentrated on working with children's environmental interests and including them in the curriculum. Jill believed in using excursions to extend the children's interests. This would, in her view, encourage children to *talk to their parents about it*. Kylie encapsulated the discussion by saying, *anything happening around us, in our area and in their particular background.* These answers indicate the creation of an incipient community of learners.

Respect *for* the environment and *adults and children learning together* was important to Pania. Sally saw it as *unity of us and the world, how we treat the world and how the world treats us.* This respect for the environment, in Kate's view, meant *bring home their knowledge and share it with their family,* thus supporting an emerging community of learners.

When asking about the importance of including environmental education in the early childhood curriculum, all agreed it was important. Several themes emerged. The use of the immediate environment was reiterated. This was extended into an awareness of the wider world. Diana summarised the group's rationale: *it makes children aware of what's happening around them. And we bring what's happening out there into the centre.* This answer boded well for the implementation of the EEIC. Caring attitudes and respect for the environment were seen as central to the inclusion of environmental education into the early childhood curriculum. Sally expressed it this way: *I think it is important because attitudes are forming young, and their sense of wonder is very strong at this age.* The use of books and working with children's interests were considered important.

As with the kindergarten, the childcare centre teachers were aware of the fact that they would soon be introducing an EEIC to the children, including the six focus children. They examined the notion of whether *Te Whāriki* (Ministry of Education,

1996) linked with environmental education. The childcare centre teachers envisaged their role in implementing environmental education as a mixture of child-initiated and teacher-initiated approaches to curriculum provision. They offered suggestions about what learning experiences they would include in the EEIC and the teaching strategies to support their choice. This is an example of socially constructed learning. The teachers considered working collaboratively as a team to be a teacher-initiated approach. This meant working with other teachers as well as parents and therefore displayed the rudiments of a community of learners. The following table illustrates their role in the implementation of the EEIC at their centre.

Table 10: Childcare teachers' anticipated role – curriculum

Categories	Childcare
Environmental education links with *Te Whāriki*	Teachers believed environmental education lined with *Te Whāriki.* Six teachers offered specific examples from their practice. For example: Sally: *It's to do with belonging in the world. But also exploration…and working theories, making sense of things.* Pania: *Te Whāriki has a socio-cultural approach which included the environment.* Kylie: *The focus on learning from the family and the whānau, this whole environmental thing. It's about protecting it and fostering a knowledge and love so future generations will care for it*Δ.
Child-initiated learning experiences	Listening to children and picking up on children's interests. Being adaptable if interests waned.
Teacher-initiated learning experiences (teacher role)	Teachers believed working collaboratively as a team to be a teacher-initiated approach. Working with parents. Use of teaching strategies, especially role modelling (caring attitudes). Excursions. Working with teacher strengths (music). Kate: *We've been talking about the seasons so I did write a song.*
Suggested learning experiences for EEIC	Drew on past experiences of children's interests: garden and insects, recent excursions, recycling, worm farm. Use of natural resources. Names of animals. Preparation of natural food.
Suggested teaching strategies for the EEIC	Facilitating, feedback, problem solving, suggesting, encouraging, praising and helping, scaffolding, telling and instructing, reading, listening, singing, demonstrating, describing, recalling, modelling, co-constructing, questioning, empowering, positioning equipment and materials, collecting◊.

Key

Δ Similar answers to research conducted by Prince (2000).

◊ Based on MacNaughton and Williams (2004) *Techniques for teaching young children.* (28 teaching techniques).

Summary of First Kindergarten and Childcare Interviews

In the photos all children identified the natural environment with play equipment accounting for the total number of items. Recognition of the human made environment differed while equal numbers identified the social environment.

The parents demonstrated 'tidy kiwi' care for the environment while respect was displayed by others. Both groups identified education *for* the environment by teaching children, offering information and considering interdependence issues. Most

recycled though some thought children were too young to understand. For others it was an expectation. Social capital was displayed in family relationships and values concerning protection of the environment. Household funds of knowledge included recycling and gardening. The latter also contributed to children's knowledge creation.

All of the teachers acknowledged the environmental three As of awareness, attitude and action. When comparing the articulation of teaching strategies at both centres cognisance must be taken that there were three teachers at the kindergarten compared to eight at the childcare centre many of whom were in teacher education or were recent graduates.

With this in mind, in the next chapter the implementation of the two week EEIC programmes at Ocean kindergarten and Sanctuary childcare will be outlined. The responses by the teachers, focus children and the parents to the second interview conducted at the conclusion of the programmes are presented.

The findings on the baseline knowledge of the teachers, children and parents presented here can be described as the way we were. It offers a starting point to gauge the participants' progress through the impending EEIC and beyond. The findings also suggest the teachers at both centres are very clear about their anticipated role in implementing the EEIC. Furthermore, the participants all have a base of environmental knowledge on which they can create their own knowledge about the natural environment. This boded well for the success of the forthcoming EEIC.

Chapter Five: Knowledge Creation: First Steps in Environmental Education

Introduction

In the previous chapter the baseline environmental knowledge of the children, teachers and parents from the kindergarten and childcare centre was discussed. This chapter will discuss the implementation of the EEIC at both the kindergarten and the childcare centre. Results from the second interview, post EEIC, with the children and the focus group interviews with the teachers and parents will be explained. Examples from the EEIC and interview responses will be used to highlight the success of the EEIC and children's knowledge creation. This will illustrate the potential for the kindergarten and the childcare centre to create a community of learners to promote environmental education, and for the teachers at both centres to take charge in phase two of the research.

"A Sailor Went To Sea, Sea, Sea"

Environmental topic of interest at the kindergarten: the rocky shore

Henrietta and Megan planned their two week EEIC around the topic of the rocky shore. A visit to the rocky shore is an annual event for the kindergarten and is combined with the new entrant class at a local primary school. A visit to the Department of Conservation (DOC) was also planned. Along with the rocky shore topic of interest, they planned many daily learning experiences. A folder of environmental education learning experiences and information on environmental education assisted them in their task. They were careful to have a balance of learning experiences that offered the children knowledge *about* the environment. Opportunities to experience environmental learning *in* the environment and through the emergent curriculum encouraged the children to be aware of environmental issues *for* the environment. The learning experiences occurred in large groups, small groups and individually and included mat time, table top learning experiences, excursions, singing, books and puzzles, and interactions both group and individual. This planning catered for a creation of knowledge approach to children's learning. It supports the view that through an integrated curriculum, children can create knowledge on an environmental topic of interest in different ways, regardless of individual learning styles. Henrietta and Megan had planned the EEIC across all curriculum areas thus ensuring that the children would experience the topic in many forms.

They were mindful to take into consideration other aspects of pedagogy that considered their teaching, the learning environment, routines as well as the knowledge, skills and values they wanted the children to achieve. Their careful planning epitomised the notion that an integrated curriculum is not "what happens" rather it was a meticulously planned curriculum to promote environmental education in their kindergarten. The EEIC was based on the socio-cultural approach to learning outlined in *Te Whāriki* (Ministry of Education, 1996) and the learning experiences were underpinned by strong links to the principles and strands of the document.

The EEIC: An Integrated Curriculum

The analysis of the qualities of an integrated curriculum posited by New (2000) will be used to illustrate how the teachers from both centres implemented their EEIC in their respective centres. The EEIC was to be planned with the kindergarten focus children in mind but was also to be inclusive of all the children and connected to their lives (New, 2000). The teachers planned from the focus children's environmental interests while including all the children in the learning experiences. The teachers realised at the beginning of their planning that being well resourced to support an EEIC focussed on environmental education was imperative. The kindergarten was eligible for special funding because of its lower socio economic location. The teachers decided taking part in the research warranted getting new resources for the kindergarten. These would support the learning of environmental education and included puzzles, books and games.

Knowledge Creation: Children's Theories

In the following example, Henrietta gets all of the children to recall what they have seen on the excursion especially the visit to the DOC centre. It included the children's learning *about* birds as well as Kimberley's theory of the world concerning the physical capabilities of cats.

Henrietta: *Who saw the feral cat at DOC?* (Some children say they did).
Henrietta: *Who stroked the feral cat? You did didn't you Georgia?*
Children: *Cats eat birds. Dogs eat birds.*
Kimberley: *When birds are flying cats can't get them. Cats and dogs are on the footpath.*

Henrietta: *Cats can get birds in the trees. The cat can climb the trees and get their nests.*
(T O 23. 3.04).

In this response rather than correcting Kimberley's theory of the world Henrietta offered more information for Kimberley to consider in order for her to create her own knowledge about cats. Central to Kimberley's theory was the conviction birds can fly but cats and dogs cannot. However, what she needed to consider was that cats can climb and kill birds that cannot yet fly.

Knowledge Creation: Butterflies

To ensure that the EEIC was challenging for children and adults alike (New, 2000), it needed to be based on the children's interests. Sometimes this required the teachers to research the topic in order to support the children's thinking on the environmental topic of interest. In the following examples the topic of interest is butterflies. Charlotte was particularly interested in butterflies. She was often seen wearing butterfly wings and was in Carol's words *butterfly mad*. Both the teachers and Charlotte illustrate their knowledge of butterflies and in Charlotte's case transfers that knowledge to the life cycle of the frog, thus creating her own environmental knowledge about life cycles.

Henrietta used a magnetic story *The very hungry caterpillar* by Eric Carle to teach the children about caterpillars and butterflies.

Henrietta: *What shape shall I make the moon?* (Some children say a circle others an oval).
Henrietta: *In the light of the moon a little egg lay on a leaf.*
Henrietta continued with the story and concluded with: *He built a cocoon for two weeks and then he came out as a beautiful butterfly*.
Henrietta: *To begin with it needs to dry its wings. Then it finds a green leaf and lays more eggs. What is it called?*
Children: *Metamorphosi*s.
Henrietta: *What does metamorphosis mean?* [Pause] *It means change from an egg to a cocoon or chrysalis into a butterfly*.

Charlotte: *Frog is an egg tadpole and frog.* (T O 22.3.04)

Continuing with the topic of interest of butterflies, Megan reinforced the children's knowledge by discussing the prior experiences at Kindergarten of the metamorphosis of an Emperor Gum Moth and a butterfly.

Megan: *Now can you think back to a few weeks ago when we had an Emperor Gum Moth? What happened to the moth?*
Children: *Cocoon.*
Megan: *Yes moths make cocoons and butterflies chrysalis*.
Brooke: *I saw a caterpillar making a chrysalis. It makes a butterfly and it flewed*.
Kimberley: *It died because it didn't dry its wings.* [remembering the butterfly at kindergarten that had died despite Megan making up a sugar solution for food].
(T O 23.3.04)
Both Brooke and Kimberley illustrate here their deepening understanding of the life cycle of butterflies and their creation of knowledge about the topic of interest.

In both these examples the teachers and the children are challenged to learn more about butterflies, both in the moment with a familiar story and by recalling the past. This illustrates a knowledge creation approach to learning. The children and the teachers socially constructed their own knowledge about butterflies.

Knowledge Creation: The Rocky Shore

When considering the integrated curriculum, New (2000) placed importance on the quality of a communal and collaborative approach. This was evident in the implementation of the kindergarten's rocky shore excursion and could act as a precursor to the pivotal role collaboration plays in the creation of a community of learners. In the days leading up to the excursion and for several days after, the rocky shore topic was evident in and across the curriculum. This occurred in discussions and a variety of learning experiences. Megan used a book, *By the seashore: A touch and feel adventure* by Maurice Pledger to familiarise the children with sea life and the tactile experience they would encounter on their excursion.

Megan: *Just use our eyes at the rocky shore. Don't touch the coral, sea eggs, sea urchins, or a clown fish- Nemo*.

Henrietta supported the children's learning by reading a book on whales and reading two poems on the sea. She talked to the children about safety issues (sun block and runners) and what they would need to bring. This included morning tea and lunch, a drink bottle *and a change of clothes in case you get wet*. She built anticipation in the children by reminding them *only one more sleep*. The big day arrived! The children, teachers and parents got on the bus and went to the rocky shore. The quality of communal and collaborative learning (New, 2000), is illustrated in the interactions of the parents, focus children and the researcher, based on field notes (in a different font) of the excursion.

Carol: *Charlotte where is your bucket?* They both start to collect sea life and put it in the bucket. Carol role-models enthusiasm and a sense of wonder and humour about the sea shore environment to Charlotte.
Cynthia: *What's in your bucket Charlotte?*
Carol: *A squid ring!* [an orange hair tie].
Cynthia: *Oh yes it is a very interesting specimen*.
Carol and Charlotte, Janet and Kimberley look in Charlotte's bucket.
Carol: *Three crabs, one snail, and a squid ring!* [laughter].

Greta's carer took her shoes off so she could feel the water. She found a crustacean. Several children felt it on their skin. She then put it in her bucket.
Marilyn and Brooke shared the experience together. Brooke found a crab under a rock. She picked up a slater and it uncurled in her hand, much to her delight. She continued to lift rocks to find sea life. Georgia shared with me she had found a crab in the water. She did this by pointing.

Kimberley and Carol enjoyed the experience of lifting up rocks and finding sea life and particularly seaweed. All of the children enjoyed the experience and then all too soon it was time for morning tea. Henrietta reminded the children to put back the sea life and Greta did this by allowing the tide to take the creatures back to their natural habitat (FN 17.3.04).

The children's learning about the rocky shore continued as Henrietta and Megan revisited the experience and encouraged the children to reflect meta-cognitively on the what, how and why of their thinking about the rocky shore excursion.

Henrietta read a poem about life in the sea and the following discussion occurred. Both Charlotte and Kimberley offered their own theories of the world about life at the bottom of the ocean.

Knowledge Creation: Habitats

Henrietta: *I wonder why it is so quiet under the sea?*
Child: *Because they are fish they can't make a sound.*
Charlotte: *Because they don't. They make bubbles out of their mouth.*
Kimberley: *They live underwater…because they need to eat and drink.*
Henrietta: *They are very quiet because the big fish eat them. They need to be quick. They are what the big fish eat…Sharks, Whales and Dolphins.* (T O 18.3.04)

Both Charlotte and Kimberley were creating their own knowledge about why it is quiet under the sea. Charlotte was aware that fish have gills and that breathing underwater causes bubbles that do not make a sound. Kimberley realised fish need to be in the sea in order to survive.

Both Henrietta and Megan illustrated the final concept of courageous (New, 2000) when planning the EEIC. Henrietta not only had to take on the role of head teacher in the absence of Sophie, but also had to form a team with Megan to implement the programme. This meant taking on board New's (2000) argument that curriculum is "how things ought to be" to benefit not only the focus children but all the children attending the kindergarten.

Kindergarten Children's Second Interview

The rocky shore excursion consisted of two separate events on the same day, a visit to the DOC centre and the experience at the rocky shore.

Children's environmental learning occurred in a variety of ways. First, the rocky shore environment supported children's environmental learning. Second, knowledge gained from the EEIC was applied at the rocky shore. Third, having a parent there was important and finally children identified process and resources for knowledge creation.

Prior to the children going to the rocky shore, they visited the DOC centre. The purpose of the visit was to give the children the opportunity to visit an environmental education information centre. Learning occurred here, but to a lesser extent than the rocky shore. Children needed a great deal of prompting to elicit answers. Answers were brief and ranged from Georgia's *a kiwi bird* to Brooke's *I saw some fantails.* There were examples of what they saw in their answers, especially the Kiwi. Kimberley was able to remember it was a *real kiwi* but *people got it and put stuff inside.* Megan was at the DOC centre and explained to the children about taxidermy. From this explanation Kimberley was able to create her own knowledge. Megan's use of correct terminology illustrated her belief in this teaching strategy.

It was interesting to note that although this was the first place visited, it had less impact. A possible explanation was the building was small and the group visiting was large. Moreover, it *wasn't real.* It was more like a museum. The obligatory 'Do not touch the displays' sign was prominent. This made the comparison with the experiential learning experience at the rocky shore even more cogent.

To ascertain the environmental learning at both locations the children were asked, "Do you remember something special last week?" The children were also asked three questions to ascertain the learning that had occurred on the excursion. They were asked firstly, what they had learned about at the rocky shore; secondly, why had they gone there, and finally, how did we get our knowledge about the rocky shore.

The rocky shore environment supported most children's environmental learning. They displayed a sense of wonder (Carson, 1956) as they deposited the sea life in their buckets. For instance Kimberley said, *I got seaweed that was green. And some stones that were different colours.* The children collected starfish, crabs, sea slugs and seaweed (live), as well as inanimate sea life, such as rocks and shells.

Kimberley made links between the knowledge gained through the EEIC and how it was applicable to the excursion. Henrietta had told the children they were not to bring anything live back to the kindergarten. Kimberley remembered this and said, *some, but not crabs or live things.* This not only demonstrates her recall but her awareness of the conservation issues previously discussed.

Having a parent there was important to the children. Kimberley referred to learning together with her mother and the co-construction of the knowledge she gained. This also showed the beginnings of the concept of a community of learners. Although environmental learning occurred on the rocky shore trip, children were also able to build on their previous learning to create their own knowledge about the environment. For instance, Greta possessed more in-depth knowledge about crayfish. She regularly goes fishing with her grandfather who dives for crayfish. His household funds of knowledge have deepened Greta's knowledge about crayfish. For instance, when talking about the sea life at the rocky shore, she discussed crayfish and the fact *they walk.* Children learned through their senses, for instance Charlotte said that she *paddled in the water.*

However, more importantly children identified the learning process and the resources needed to support and acknowledge the knowledge creation process. Kimberley noted they had brought buckets and spades to the rocky shore, while Brooke alluded to Henrietta taking digital photos for display back at the kindergarten.

When asked what they had learned at the rocky shore imagination and knowledge creation were evident in Brooke's answer, *I saw some water, some fishies – loads. They were not died. I saw a crocodile eat all the fishes and all the live fishes left.* In this explanation Brooke used the excursion to the rocky shore as a platform to make links with other aquatic life. Moreover, she was aware of the fact that crocodiles are predators.

Georgia was very clear about what she had *learned* on the rocky shore excursion and how this tactile learning had taken place. This was revealed in her answer, *I went there to touch other things. I learned to pick up shells.* She was made aware this was a

special experience that required leaving the kindergarten to explore a real life experience in her community. This occurred 'in the world' and was pivotal to her knowledge creation process.

The new learning experience of travelling on the bus to the rocky shore, as well as the opportunity to get hands on experience with sea life, were the reasons given by the children as to why they had gone on the rocky shore excursion. Kimberley offered an insightful analysis of the rationale for the excursion. She suggested it was teacher-initiated, *because my teacher wanted to go there… because they took us to the rocky shore and we had lunch and they gave us a play on the merry go round.* Alternatively, the excursion could be viewed as the beginnings of a community of learners where all the participants collaborated in the experiences of the rocky shore, lunch and a visit to the park.

Finally, the children were asked how we got our knowledge about the rocky shore. Kimberley elaborated further on her previous answer where she said that the teachers were instrumental in the knowledge creation process. [They] *took every single child there. And some of us didn't need our mums and dad.* Brooke suggested that her knowledge was gained from the excursion as well as the learning experiences offered afterwards. She stated, *we standed in the water and Henrietta took some pictures. Back at the kindergarten we did some pictures.* On the other hand, Charlotte and Grace's responses reflected their personal experiences especially that of the bus travel to the rocky shore.

Integrated Curriculum Environmental Concepts

Through the integrated curriculum the children at both centres were able to grasp the environmental concepts of pollution and conservation. Examples are offered here from the kindergarten.

Pollution

Throughout the EEIC the children were reminded of putting their rubbish in the bins provided. Many anecdotal examples of rubbish in streams, and the need not to pollute our precious waterways were given. The following example sees Megan using a scientific experiment to illustrate how water gets polluted. She has a glass jar full of

water with a fish sellotaped to the outside. She shows the children the fish is swimming in clean water.

Megan: *And then along came people and they had a picnic. They forgot to take their rubbish home and it blew in the water.*

A chippy packet.

A bit of banana skin.

Plastic gladwrap.

A teabag.

Lettuce.

She asked a child to stir the water around.

Megan: *See how it has gone brown. Is it a nice place for fish to live?*

Children: *No.*

Megan: *It is important for us to take our rubbish home at the beach, river, lake or pond. Because, if we don't it blows into the water.*

Kimberley: *Fish could jump up for food.* (T O 19.3 04)

Kimberley's response illustrates that she has her own theory about fish and their physical capabilities. She has created her own knowledge and believes that despite all that rubbish the fish could jump up for food. She may have seen this phenomenon on a TV advertisement.

Conservation

The topic of conservation was made very real to the children through the excursion. Megan had told them *just to use our eyes at the rocky shore* before they went. Furthermore, Megan illustrated the concept of conservation when discussing crayfish.

Megan*: There are special rules about taking these* [crayfish] *out of the ocean. If we took all the mummies, daddies and babies would there be any left for us to eat*?

Children: *No*.

Megan: *So we need to take some mummies, some daddies and no babies!* (T O 19.3.04)

From this response it is clear the children are beginning to understand the concept of living in a sustainable way.

Children's Environmental Learning

All the focus children demonstrated socio-cultural learning through the co-construction of knowledge and inter-subjectivity about the topic of environmental interest. In the following examples Kimberly (kindergarten) and Jordan (childcare) demonstrate their environmental learning and knowledge creation. Kiwis had been a topic of interest and the kiwi in the glass case at the DOC centre fascinated Kimberley. As she and Janet (her mother) approached the case Janet knelt down to Kimberley's level and pointed out the features of the bird. They both examined it carefully. Janet pointed out the characteristics of the Kiwi including its shape, beak and feathers. Kimberley's thirst for knowledge saw her later join a group of children at the case with Megan. Kimberley asked: *Is it alive?* Megan replied: *No*. She then explained that a special person called a Taxidermist put special stuff inside *so everyone can see what it looks like*. This discussion concluded with the children singing the Kiwi bird song (FN 17.3.04).

A meaningful interaction took place between myself and Jordan that illustrated the integrated learning that had occurred during the EEIC. I was reading *The nickle nackle tree* by Lynley Dodd. On one of the pages there was a bird's nest. This led to Jordan going over to the ABC frieze on the wall and showing me the nest (N for nest) with the baby birds with their mouths open for food. Grace shared in her interview that Jordan had an intense interest in birds. He then moved to the puzzle table and found a puzzle piece with a nest, this time with eggs in it. I acknowledged both of these aspects of Jordan's creating his own knowledge about birds.

Emergent Curriculum

As the EEIC progressed at both centres examples of emergent curriculum arose. The initial interest in bird's nests at the childcare centre attested to this. The following example was an unexpected event at the childcare centre. I had a discussion with the children as we were waiting to go on our excursion to the park:

Cynthia **:** *Who can tell me about what happened with a big bird on your roof?* A child tells me a bird came and ate the bread that Jill had thrown up on the roof. Jill had taken the bread out of the

bird feeder because no birds were eating it and had thrown it up on the roof. A huge Seagull (very wide wingspan) had swooped down and ate the bread. It did not fly away instead it ate the bread uninterrupted on the roof. It circled around the centre while the children watched outside and then flew away (F.N. 21.5.04).

From this example of emergent curriculum Jill was able to plan further bird learning experiences for the children including an excursion to the DOC centre to see the birds.

Potential Parental Social Capital and Funds of Knowledge

The participation of the focus group parents was predominately their involvement in or knowledge of the excursion. Two interactions with me indicated the potential of the parents to share their environmental social capital and funds of knowledge with their children and the teachers and to become an integral part of the community of learners.

On the excursion to the rocky shore I had a conversation with Marilyn. I spoke first about what Brooke had enjoyed at the DOC centre. She shared that Brooke had enjoyed the pictures of Whales. She said they had taken Brooke to Kelly Tarlton's Undersea World. A friend of the family was involved with the Penguins so this had given the family free admission. Marilyn was able to take advantage of the social network of her friends and in turn share her social capital with Brooke (FN 17.3.04).

The day after the excursion Angela came into the Kindergarten. I was able to connect with her about Greta's visit to the rocky shore and how much she had enjoyed it. To which she replied: *She lives in the water*. I asked: *Does she have a lot to do with the water?* Angela replied: *Yes her grandfather takes his grandchildren out on the water and he did it with us too.* Both Angela's parents came from big families. She shared that her father is a diver and has shared his funds of knowledge (especially about diving) with his grandchildren. As children he had taught his family to live off the land. For all these reasons Greta had had contact with the sea *since she was a baby* (FN 18.3.04).

Teaching Strategies

During the EEIC the teachers employed a variety of teaching strategies (MacNaughton & Williams, 2004). By far the most often used strategy was questioning and was also seen as important in interview one. This supports the research of Wylie (2001). She identified that if early childhood teachers engaged in quality interactions with children such as asking open ended questions, this factor is associated with higher competency scores at age 10. Another aspect of practice that was identified by Wylie (2001) was responsive adults and this supported the teachers' use of describing as a teaching technique. As the examples cited from the EEIC indicate, the teachers used recalling, suggesting and telling and instructing during many of the observations and these were referred to in interview one. The use of grouping, positioning people and facilitating was used at mat times. The kindergarten had two mat times a day so these strategies were associated with this learning experience. Reading as a teaching strategy was evident both at mat times and at other times during the session. Empowering children and giving them feedback on their knowledge creation efforts was also considered important. Other teaching strategies were used but to lesser extent than questioning and describing.

The teachers proved to be courageous (New, 2000), in their ability to work together on the EEIC. They offered an environmental curriculum that illustrated 'how things ought to be' for the benefit of all the children at Ocean kindergarten. Moreover, they proved they would be able to conduct the second phase of the research themselves. They were able to offer learning experiences *about, in* and *for* the environment. The latter occurred when Henrietta with the help of a Maisy mouse puppet was able to reinforce the conservation of water. Maisy told the children she was sad when she heard the taps running and that *wastes our precious water*. This example suggests that the teachers were ready to lead the research in phase two and create a community of learners to promote environmental education.

Kindergarten Parents' Second Interview

Funds of knowledge

At the conclusion of the EEIC the parents were interviewed again to find out if their children had communicated with them about the excursion, as well as any other environmental learning.

All the parents shared that they had discussed with their children the excursion to the rocky shore. Janet elaborated on what Kimberley had said in her interview. She confirmed that Kimberley had brought home a rock and a shell that needed to be washed, as they were *very smelly.* Angela confirmed the conservation message that had been given to Greta at kindergarten about not bringing live things home. Christine and Angela did not attend the excursion. Carol's answer reflected her environmental funds of knowledge, as well as the importance of children and parents, and the researcher, learning together in a community of learners. She related an amusing incident of finding an orange hair tie that she referred to as a *squid ring,* to which I said *that's a great looking specimen,* much to the hilarity of the children.

A very interesting finding was Janet's verification of Kimberley's account of seeing the kiwi at the DOC centre. Kimberley took the lead at home and discussed the day's events with the rest of the family. She was able to clarify with them that it was not a *real live kiwi*, as they had thought, but was stuffed. This illustrates well this family's shared funds of knowledge about things environmental. Kimberley was able to co-construct meaningful environmental knowledge with her family.

Children displayed environmental interests. As Carol shared, *Charlotte is butterfly mad.* I verified this, saying it had also been my observation. Carol then offered an excellent example of co-construction of knowledge with Charlotte. *She'd drawn a picture here* [at the kindergarten] *and it was sort of in three sections. A couple of lines which were the caterpillars and there was this big black spot. Which she explained was the chrysalis, and then she said 'and that's what you call metamorphosis Mum'. Beg your pardon. And I was just freaked out … I mean they had obviously been studying metamorphosis and it had gone in and she had remembered.* Carol was able to acknowledge that Charlotte had created her own knowledge about butterflies. The example also highlighted learning that had occurred during the EEIC as well as the teacher's belief in using the correct terminology.

Children's knowledge creation was displayed in Marilyn's account of Brooke's learning about kiwis at kindergarten. Marilyn spoke of Brooke describing the kiwi's appearance and behaviour, including their long beak, fur [feathers], and their

nocturnal habits. Christine shared how Louisa's environmental knowledge had been enhanced by the environmental funds of knowledge of her extended family. Christine explained how she had been at her grandfather's house when Louisa found a weta. Not knowing what it was, Christine asked her father, who enlightened her. Subsequently Louisa brought it along to kindergarten to share with the children. I was involved in the mat time about the weta and was asked if wetas could camouflage themselves. I admitted I did not know but would get a book out of the library. I believe it was important for children to see adults as learners also. It turned out wetas can camouflage themselves so, as I shared with the group, *we all learned a lot about wetas.* This whole example illustrates the beginnings of a community of learners, where knowledge from home is being shared at the kindergarten.

Social capital

On the excursion Janet had been able to exert her social capital. Although the teachers had categorically stated that the children were not to bring things back from the rocky shore, Janet was able 'to bend the rules' and gain permission for Kimberley to do so. The recent excursion to the rocky shore also prompted Janet to go to the park nearby. She had not been before but had since been back three times with the family for picnics and to the playground. Both Janet and Christine identified fishing as a family weekend pastime. Carol, Angela, Janet and Marilyn cited children's own backyards as sites for weekend activities. Caring for and playing with family pets, gardening and nature activities were things that could be pursued at home.

The parents were asked what activities they do as a family at the weekend. The families' social capital in the form of adult-child relationships, social networks, norms and values was evident in their responses (as outlined in Janet's examples of social capital). Four themes emerged: visits to local parks, activities prompted by the recent excursion, the use of their own backyards, family dynamics and structure. The latter refers to single parent families, blended families, and the extended family. Visits to local parks were verified by the answers given by the children about the photos. All of the children had been to the local park and this was evidenced by their recognition of the playground. In photo 9 Kimberley recognised the ducks, as did Louisa, who also recognised the lion statue in photo 10.

Family dynamics impacted on weekend activities. Carol stated *I don't have Charlotte at the weekend, she's with her father.* This was verified when Charlotte responded to photo 9. She said, *I've been there with daddy.* Janet's blended family means Sunday is the only day all of the family can get together. Having time out at the weekends was reflected in Angela's answer: *they go to their grandparents or their dad's.* She shared that the grandparents take the children to the beach or camping, which illustrates well the social capital of this extended family. Her parents both came from large families and enjoy family activities. This prompted Janet to lament, *I wish I had an extended family, we're here on our own.*

At the conclusion of the interview I shared with the group that I had found out plastic supermarket bags were biodegradable. This prompted Angela to bring up the topic of disposable nappies. She said she was now more aware of the environment. On TV she had seen that a girl had discovered a way to compost disposable nappies. She summed up her growing awareness thus: *yes, I do hear things about the environment ... it's something on my mind at the moment ... talking more too*. This answer shows a significant shift from the first interview with an environmental 'awakening' and a growth in her household funds of knowledge and social capital. (FGI 2)

Kindergarten Teachers' Second Interview

Working as a team

The same questions asked in interview one were asked in the second interview to note the emergence of a community of learners who would promote environmental education. The interviews occurred immediately after the implementation of the two week EEIC. What occurred was a 'transformation' (Fullan, 2003) to a united team approach. This was evidenced by the use of the term 'we'. For instance Henrietta said, *we've become more aware ourselves* and Megan added, *most of us turn up with an* [newspaper] *article.* This awareness had spread to the integrated curriculum which Henrietta said, *we've incorporated into everything.* Megan agreed, *it's just clicked in.* This heightened awareness supports the belief that environmental education should be an integral part of the curriculum (Florgaitis et al., 2005; Palmer & Neal, 1994). Mary

Lou, a reliever who was not part of the EEIC agreed it was the *primary way to teach children.*

Implementing the EEIC prompted Henrietta to purchase more environmental resources. The kindergarten values being well resourced and this is encapsulated in their philosophy that refers to a curriculum supported 'through a strong resource base'. Perhaps the most surprising finding was the perceptible enthusiasm shown by Henrietta, who had initially been reluctant to take part. Her answer of *far more enthusiastic* was a pleasing result for the children and her colleagues who would have benefited from her role-modelled enthusiasm. The implementation of the EEIC and Henrietta's enthusiasm had served to strengthen the establishment of a community of learners including the teachers and the children. However, little attempt had been made to tap into the parental household funds of knowledge, or their social capital.

Being involved in the implementation of the EEIC meant the teachers were better able to articulate the importance of including environmental education in the early childhood curriculum. A transformation had occurred from thinking it to doing it. Henrietta was able to make the taken-for-granted visible by reflecting *we've gone out and integrated it.* She admitted to a greater awareness of taking a more integrated view of the curriculum and the emergent curriculum. The creation of a community of learners was further strengthened by Megan's perception of the success of the EEIC and the children's contribution. She shared, *we share things with the children, they bring things back into the kindergarten, so that spurs us on too*.

Teachers' role – curriculum

When considering their role in the implementation of environmental education, in interview one only one reference was made to child-initiated learning, the remainder being teacher-initiated. In this interview the reverse occurred. The rocky shore excursion was teacher-initiated, but apart from that both teachers were now following children's environmental interests. For Megan, going back and reinforcing concepts was an important aspect. Megan had taken a mat time on pollution and had performed an experiment with a bottle of clean water and pollutants. Megan related that at a later time Brooke and a friend were looking at the bottle: *look at Megan's water, and I thought, how priceless, it's Megan's water now, and I referred to it again today with*

the rubbish. This response illustrates both this teacher's enthusiasm and the children's environmental learning as well as their perception that the teacher owned the experiment.

Following the children's interests and documenting them meant the teachers were able to socially construct knowledge with the children as well as be more involved in discussions about the children's learning. Henrietta shared that the children were now bringing the focus to them. Their environmental interests then led to the emergent curriculum. This finding boded well for phase two of the research, where the teachers would take charge using participatory action research.

Links with environmental education and *Te Whāriki* (Ministry of Education, 1996) were again examined in this interview. Megan as before was able to make specific reference to *Te Whāriki*. She referred again to the weaving metaphor. Henrietta was more able to articulate the links this time with *Te Whāriki.* She offered more focussed answers rather than the taken for granted answers of interview one. A child (not a focus child) had been taken to the honey farm recently and the connection with the principle of family and community was given as an example of this visit. Furthermore the child's mother had extended the learning by bringing in honey for the children to eat. Henrietta's raising of the principle of family, community, and the learning together aspect of a community of learners, indicates the teachers had the potential to 'take charge'.

The learning experiences and knowledge that had been included in the EEIC were excursions, including to the rocky shore, recycling/rubbish, caring attitudes, and kiwis. The most significant finding, however, was the importance the teachers placed on resources. As mentioned earlier, this is highly valued. Examples given were books, posters, newspaper clippings, and seaweed brought back from the rocky shore all of which were discussed with the children and linked to their environmental learning. They also mentioned how they could support the children's interests in the future, indicating their desire to run the programme themselves in phase two.

Although there were many instances of teacher-child and child-teacher interactions, the household funds of knowledge and social capital of the parents remained largely

untapped. This was a limitation to both the creation of a community of learners as well as the benefits that could have accrued for the children and teachers in knowledge creation.

As with the kindergarten, the childcare centre put in place a two week EEIC based on the children's interest in birds.

"Birds: A Real Flyer"

Environmental topic of interest at the childcare centre: birds

The staff at the childcare centre had noticed the children were interested in birds. A week prior to the EEIC (see appendix 7) Jenny recorded a learning story documenting this interest. It began with a nest being brought into the centre. This led to a discussion about what the children would need to make a bird's nest and culminated in a walk to the beach to gather materials to construct their nest. The centre is located near a beach and through the interactions that occurred at the centre and on the co-operative walk to the beach the children were able to socially construct knowledge about what they would need to make a nest. Frequent short walks in the local community are a cultural practice for this centre.

Having established the children's strong interest in birds the teachers created a curriculum web with tentative learning experiences outlined for the children's enjoyment of nature and the emergent curriculum. They took cognisance of the children's ages and were careful to offer balanced learning experiences that would enhance the children's environmental knowledge. They were enthusiastic to offer the children learning opportunities *about* the environment through learning *in* the natural environment and to encourage the children to develop nurturing attitudes that would lead to education *for* the environment.

The integrated curriculum planned encompassed learning in large groups, small groups and individually. Environmental learning happened in many different ways. The pleasure of singing is a very important culture of this centre. Kate's ability to create meaningful songs about the topic was utilised. Tabletop displays of learning experiences such as books and puzzles were an integral part of their planned curriculum. Mat times and the everyday interactions in groups and with individual

children to answer their questions was a meaningful way the children learned about birds. Excursions were integral to the whole process of environmental education learning. These included visits to the park, beach and DOC centre.

Their EEIC catered for individual learning styles and for the children to learn in many different ways across all curriculum areas. Because of the diverse staff at the centre, they demonstrated they were "teachers who are dedicated and work as a team" (Philosophy statement). They took into consideration their teaching and pedagogy. This included the learning environment, the routines of the centre and the knowledge, skills and values of the children. *Te Whāriki* was the curriculum the centre followed and the socio-cultural approach to learning was evident in their planning.

The EEIC: An Integrated Curriculum

The EEIC was to be planned with the focus children in mind. However, it was to be inclusive of all the children at the centre. As with the kindergarten the focus children's environmental interests were the basis of planned learning experiences for all children. The philosophy statement ensured this would happen as planning would occur "around the strengths and interests of each child". The examples that follow illustrate the quality inclusive of all children and connected to their lives (New, 2000).

The children's interest in birds prompted the construction of a bird feeder. This allowed the children to be involved in a 'hands on' experience (building and painting it). Once completed it would be in their outdoor area for observing birds feeding. On the first day of the EEIC, Pania and Jordan took part in assembling a 'connect by numbers' bird feeder. Following the instructions required problem solving skills and was accompanied by singing Hammer, hammer, hammer. However, it did get constructed. The children including Nicholas painted the bird feeder with poster paints. The mixing of colours prompted Kate to say, *blue and yellow make green*. To complete the bird feeder and to strengthen it Jill used screws and attached a rope. A 'ceremony' took place when Jill hung the bird feeder in the tree outside while the children watched. It was obvious that not all children had witnessed the event happening because one child approached Diana later concerned that the bird feeder had gone 'missing'. Diana reassured her by showing her the bird feeder hanging in

the tree. The child then came inside and made her own birdhouse with plastic rods complete with plastic birds to inhabit it.

Knowledge Creation: Birds

The socio-cultural approach to learning involves teachers and children learning together and creating knowledge on a topic of interest (birds). The following example from a teacher observation involved Diana and Ashleigh in a joint enquiry about parrots. A learning experience of pasting feathers on a parrot is at the making table.

Ashleigh: *What's this bird's name?*

Diana: *It's a parrot. Shall we get a book and read about the parrot?*

Ashleigh: *Yes*.

Diana and Ashleigh looked through the book and after looking at very many different parrots they finally found a coloured parrot similar to the one they were making. Diana continued reading to Ashleigh about parrots discussing what they ate and identifying the colour of their feathers. In this example the teacher drew on the child's knowledge creation process to co-construct knowledge about different species of birds. A culture of 'let's find out together' permeates the example (FN 26. 5. 04).

Communal and collaborative

The excursions undertaken by the childcare centre epitomised New's (2000) view that of all the qualities of an integrated curriculum this is the most important. The aspect of collaboration was strongly evident throughout the EEIC and boded well for the teachers taking charge in the second phase of the research. The learning that occurred about birds throughout the duration of the EEIC is encapsulated in the following example of post excursion discussion. The socio-cultural approach to learning and the social construction of knowledge is evident. Kate is using a reference book on birds to deepen the children's knowledge of birds while ensuring it connects with the excursion in a meaningful way. She begins the mat time by asking the children about the excursion to see the seagulls.

Knowledge Creation: Bird Habitats

Kate: *What did you see the seagulls doing?*

Children: *Eating the bread. Flying.*

Jacob: *Plane*.

Kate: *Yes they have wings like a plane*.

Kate: *These are Gannets. Look how the baby is next to the mother. It is up on a cliff. We have gannets here. When we go to the park next I will show you. There is a big bit of land sticking out. It is called Cape Kidnappers. People come from all over New Zealand to see the gannets!*

Cynthia: *People come from all over the world to see our Gannets! It is the only inland colony in the world* (T O 21. 3.04).

This example illustrates aspects of socio-cultural learning that had occurred on the excursion to the park. Specifically the children and the teachers have inter-subjectivity about birds and their habitats.

Stepping outside the square takes courage (New, 2000) and talent and Kate possesses both. She composed songs that complemented the topics of interest. For instance, after the children's excursion to the beachfront to feed the birds she wrote the music and lyrics to the following song:

When Sylvia seagull goes to the park
She doesn't play on the slide or the swings
She waits for the children to throw her some bread
And then she tells all of her friends.
The children make seagull sounds
(Arrgg arrgg arrgg).

Kate is a valued member of the teaching team. Everyone at the centre appreciates her musical talents. Her summation reflects this: *I think creating songs is a lot of fun and can be very topical*. Absolutely!
(FN 28. 5.04).

Childcare Children's Second Interview

The children's environmental learning happened in a variety of ways on their excursions to the park and the DOC centre. The park visit allowed the children to learn through hands on experience.

The walk to the park and being with family featured strongly. Jacob outlined the hands on experience of feeding the seagull; Jordan referred to *a big bird* that was standing on a light stand, while Aaron communicated his knowledge by making seagull sounds. Aaron and Jordan's environmental knowledge was displayed by describing the birds. Jordan and Jacob related the hands on experience at the DOC centre and seeing marine birds. Both demonstrated environmental learning when they talked about the kiwi, lobster and dolphins.

As with the Kindergarten children, the childcare centre children were asked the same three questions to ascertain the learning that had occurred at the park and the DOC centre; what they had learned, why they had gone and how they had got their knowledge.

When the children were asked what they learned about birds on their excursion, their answers reflected learning through the senses. Jacob displayed environmental knowledge as he had budgies at home, *well, we feed them and give them some water*.

Three themes arose when the children were asked why they went to the park and the DOC centre. Aaron thought it was to play, while Jacob saw the excursion as a chance to learn new things. Jordan's answer displayed the relationships and networks of social capital when he mentioned visiting the park with *my dad and my nana*.

The walk to the park afforded the teachers, parents and children the opportunity to learn together in a community of learners. For instance Jordan's mum attended, along with a child she cares for. They all enjoyed feeding the seagulls and playing on the swings at the park. Jacob explained his environmental learning about snails, *and snails crawl on the ground. And sometimes…sometimes snails get frightened. And they hide in their shells. At the park.*

Potential Parental Social Capital and Funds of Knowledge

The focus parents at the childcare centre had contact with the teachers when they dropped off and collected their children and they would often stay. This contact in Eve's case has led to her assisting with the programme. Eve brought in a picture of the Amazon jungle with many exotic birds for the children to look at. This was to support the bird topic of interest. In this example, Eve was able to illustrate her social capital by linking into the social network of the childcare centre. Furthermore she was able to establish the relationships integral to the concept of social capital.

Marie illustrated her funds of knowledge when she shared with me her love of domestic animals and birds. On the last day of the EEIC a Cockatiel was brought in to the centre. This triggered a conversation about her knowledge of birds. She asserted, *I know quite a lot about birds. My father was a security guard and he brought lots of stray animals home*. She shared they had had four dogs and four cats. Each of the children also had their own rabbit outside as well as goldfish. Her father had a perceptible interest in nature and owned cockatoos and budgies. It is obvious from this conversation Marie's funds of knowledge from her family network greatly enhanced Jacob's interest in birds (FN 21.5.04).

Teaching Strategies

Over the duration of the EEIC the teachers used a variety of teaching strategies. The teachers in the kindergarten and at the childcare centre overwhelmingly used questioning as their number one teaching strategy. The age of the children at the childcare centre meant that teachers were often using descriptive language to inform children of concepts or routines. This also included telling and instructing the children and was associated with meaningful feedback on the subject or action under discussion. Facilitating and reading were strategies that required teachers to make time to read to children both individually and in groups. Over the two weeks of the EEIC the teachers employed 27 out of the 28 teaching strategies outlined in MacNaughton and Williams (2004). This is compared to 21 of the strategies identified in interview one. Deconstructing was the only strategy not used.

In summary, the bird EEIC 'was a real flyer'. It proved that the teaching staff were more than ready to lead the research in the second phase. They offered environmental education experiences *in, about* and *for* the environment. Within the centre the conservation message of saving water by turning off taps was spearheaded by Kate and reinforced by all staff. Through this action the children were demonstrating the socially constructed learning they had gained through their familiar centre environment where everyone takes responsibility for the natural environment.

Childcare Centre Parents' Second Interview

Social capital

All the parents reported that the children had spoken to them about the excursions to the park and the DOC centre, illustrating well the relationships component of social capital. This was with the exception of Denise, who was absent, and Nicola and Benjamin who had withdrawn from the research. Grace shared that Jordan had talked about feeding the birds and enjoyed playing at the park. Eve concurred and said Aaron and Bethany had also enjoyed the experience. Alice on the other hand said, *the birds didn't fascinate her* [Ashleigh] *at all … I was trying to force her* [laughter]. Marie shared that feeding the birds was not a novelty for Jacob as they had birds at home and that they often fed the ducks.

The parents offered examples of what the children shared with them about the excursion to the DOC centre. Jordan told Grace he had patted a bird and seen a kiwi. She asked if there was an owl at the centre as he had made a morepork sound. Jordan then showed Grace both the kiwi and morepork on a poster at the centre, telling her they were *the same.* This is an excellent example of the social capital of the home combining with the co-construction of knowledge at the centre. Eve talked about Aaron and Bethany's reaction to the exhibits at the DOC centre. She demonstrated her social capital when she explained how both children had been fascinated by the feral cat with the bird in its mouth. Eve is the grandmother of Aaron and was speaking about his experiences, in the absence of Denise, her daughter. She believed the children could make connections because *they had seen our cats catch birds.* Jill had explained the conservation message to the children. Alice offered a summation of the children's learning during the bird interest and the EEIC. She said, *that was a good*

progression because they saw the pictures, then the stuffed ones and then a real one. Alice is referring here to a live budgie that was donated to the centre.

Both Jane and Marie reported visiting local parks at the weekend, while Alice spoke of parks for sporting events. As the childcare centre is located near the sea, Jane and Marie mentioned respectively visiting the beach or rocky shore. Prompted by the environmental focus at the childcare centre, Eve took Bethany on a *round trip picking up leaves.* They both enjoyed learning together with Eve making Bethany aware of the variety of leaves that can be found. She also took Bethany to a paddock nearby to feed horses and pat farm animals. Others in the group said they did this also. Family weekend activities for the childcare centre parents were discussed to examine their social capital. Four themes emerged: visits to local parks, activities prompted by the EEIC, happenings in their own backyard, and family dynamics and structure.

Jane, Grace and Alice all mentioned family dynamics and structure. Jane works at the weekend so it is her partner who is responsible for family leisure activities. Both Alice and her husband are involved in sporting activities at the weekend. They often travel by bus and the grandparents attend also, illustrating well the social networks and relationships inherent in social capital.

Caring for the environment in their neighbourhood or community provoked considerable discussion. Jane shared a discussion she had had with her neighbours about a derelict car parked in the street. Assuming it was hers, it was the neighbours who rang the Council to have it removed! Social capital can be either positive or negative. Marie, who lives near a supermarket, had difficulties with rubbish ending up on her section. She and two neighbours rang the supermarket suggesting they provide rubbish bins to alleviate the problem. Eve identified a similar problem in her street on recycling day. Grace related examples of both parked cars and rubbish. Grace's car broke down in front of the neighbour's house and as he was about to sell, this necessitated an apology. Jordan's penchant for throwing rubbish over the back fence saw him cleaning it up, and Grace apologising again!

Funds of knowledge

Grace delivers pamphlets in the community and this offers an opportunity for her and Jordan to enjoy the local environment. Grace said she cleans up the backyard at the weekend and this modelling has made Jordan aware of caring for the environment. When they go for walks at the weekend, Jordan takes his scooter and always tells her about glass on the footpath or rubbish in the local stream. Again this demonstrates Grace's funds of knowledge about the importance of keeping the home environment tidy, which in turn has translated into a wider concept of preservation of the environment.

Childcare Teachers' Second Interview

Working as a team

The questions asked in interview one were asked again in interview two which occurred at the conclusion of the EEIC. A transformation (Fullan, 2003) occurred after the implementation of the EEIC. The teachers were more cohesive as a team. Furthermore they shared inter-subjectivity about the concept of environmental education, as well as a vision of environmental education in early childhood curriculum. The diverse answers offered in interview one focussed predominantly on education *about* and *in* the environment. Sally asserted, *we're part of the environment and the environment nurtures us*. As a team they were focussed on the concept of environmental education. Environmental issues were raised in the form of recycling and pollution. The former was mentioned in interview one, but the inclusion of pollution suggests a move along the continuum to education *for* the environment. Jenny compared caring for the environment to how we care for our skin. This was an insightful analogy. The environment is also a living, breathing organism. The most significant finding, however, was that out of the eight teachers, seven spoke of teaching, learning, or co-construction of knowledge.

A transformation again occurred when the teachers articulated the importance of including environmental education into the early childhood curriculum. All agreed it was important and the growth in the children's knowledge and learning about the environment as a result of the EEIC was offered as a reason for this. Kylie explained, *if you saw a seagull… how are you going to look after this bird?…would mean so much more to them.* Jill mentioned adult awareness, while Sally and Kate

highlighted the emergent curriculum. Real life experiences versus TV were raised by Diana and Kylie, while Sally viewed the integrated curriculum as a way of embracing technology for the benefit of children. The success of the EEIC and the emergence of a community of learners are encapsulated in an incident related by Kate. She overheard the children discussing turning the taps off so as not to waste water. She was aware of how it is easier to do this for children, but instead she empowered the children by *making the children aware rather than just turning the taps off ourselves.*

Teacher role- curriculum

When considering their role in the implementation of the EEIC in interview two, the childcare centre teachers took a socio-cultural approach to the teaching and learning of environmental education. This was supported by actual quotes referring to the zone of proximal development (Vygotsky, 1978), co-construction, co-learning and guided participation (Rogoff, 1995). Moreover the socio-cultural approach was described as the balance of teacher-initiated and child-initiated learning. A balance between the two led to an equal partnership of 'learning together' alongside the children. This was seen as being a teacher **for** children, not **of** children. Elizabeth summed this concept up well when she said, *I wasn't just teaching, I was learning as well.*

Being well resourced, planning, picking up on children's interests (and adult support of these) also took on a socio-cultural focus. Observation was mentioned for the first time in interview two, indicating the importance of this technique to pick up children's interests. When comparing the two interviews, a team approach was a major issue in interview one. This was taken for granted in interview two as the teachers had inter-subjectivity about working with the children in a socio-cultural way. This was evidenced by the agreement of others with Jenny's answer: *we were building on what they know, but using it in the integrated curriculum so they get an all round knowledge base* [clapping]. Several said together *zone of proximal development.*

The concept of whether environmental education links with *Te Whāriki* (Ministry of Education, 1996) was examined again. In interview one, six out of the eight teachers gave specific examples from the document, compared to three in interview two. For instance, exploration was mentioned four times in interview one and only once in

interview two. Exploration suggests a Piagetian 'lone scientist' approach. This notion had diminished and been replaced with a socio-cultural approach to children's learning. Furthermore, references to co-construction and co-learning indicated a more equal relationship in the learning process. Three teachers raised family and community (one referred to Māori environmental beliefs) while two mentioned parents and families. This explicit link to community meanings showed the emergence of a community of learners and the teachers' potential ability to lead the research in the second phase.

In interview two, half of the teachers spoke about the holistic nature and the weaving metaphor of *Te Whāriki* (Ministry of Education, 1996), compared to one in interview one. Two teachers made links between environmental education, one believing that *Te Whāriki* was written with the environment in mind. *Te Whāriki* is a bicultural document and this gives cognisance to Māori beliefs about the environment (Reedy, 2003). It is interesting to note there has been a change in the teachers' understanding from quoting book and verse and identifying particular strands, to the notion that environmental education was woven throughout the document. This suggests an understanding that environmental education was not a separate content area but was integrated throughout the curriculum and *Te Whāriki.*

All eight teachers responded to what learning experiences and knowledge should be included in the EEIC. Environmental knowledge was seen as important in interview one and was still seen as important in interview two. Co-construction of knowledge and basic knowledge were still highlighted in interview two. A category raised in interview two was the recognition of specific knowledge of the environment. Resources to support children's interests and knowledge were also outlined and were seen as essential to this process, with a significant number of teachers highlighting this point. Excursions were still seen as valuable, as was the garden. Basing the programme on children's interests was referred to by one teacher in interview two and this shows a distinct change from interview one where half the teachers saw this as important. This notion was taken for granted in interview two as the teachers continued to work within a socio-cultural approach to the implementation of the EEIC. The bird interest that had been the focus of the EEIC formed the basis of many responses. Attitudes of care and respect were raised again in this interview and

continued to be seen as important. Recycling was equally seen as important in both interviews. Although family involvement features minimally, these results overwhelmingly suggested the teachers were ready to take charge of the research in phase two, to create a community of learners to promote environmental education.

Questioning was the most favoured teaching strategy. When discussing teaching, four of the teachers, Diana, Kylie, Jenny and Pania, agreed with previous speakers about teaching strategies used. This suggested inter-subjectivity. The teaching strategies outlined were predominantly socio-cultural. As the first interview was hypothetical, this finding suggests that when thinking about the recent EEIC, what had actually happened in practice came to mind. (T FGI I)

Researcher Role

As a participant observer I was fully involved in the centre programme at both the kindergarten and the childcare centre. From the outset I offered information and practical learning experiences that I felt would be helpful in implementing the EEIC and took on the 'service role' advocated by Kemmis and McTaggart (2000). The staff at both centres realised I was there as an advisor but would not be facilitating the EEIC. To support the childcare centre's interest in birds I made puzzles out of postcards and brought in many books from the local library on birds. As the children's topics of interest 'emerged', I would go back to the library to get supporting literature. I also approached local Government Agencies for posters and suitable material to support the bird topic of interest.

I immersed myself in the programme and as a participant observer took part in the programme and routines, such as 'tidy up time' and assistance with ratios at the Kindergarten. For instance at the childcare centre when a child (not a focus child) requested a book to be read I would oblige, often sitting on the floor. This prompted Jill to remark, *I saw your feet and I thought you were a student*. This assumption that a researcher does not get involved was reinforced when Elizabeth, seeing me sweeping the floor and cleaning table tops said, *Cynthia you shouldn't be doing that!* to which I replied, *I am here to help*. This interaction illustrates the power relationship between the researcher and the participant. Many people have the idea of the detached observer carrying a clipboard. This epitomises the 'hit and run'

researcher who takes all and gives nothing in return. This notion is the antithesis of a participant observer.

At the conclusion of the EEIC I discussed with the teachers at both centres the success of the EEIC that they had recently completed. I emphasised that they had achieved this independently of me, apart from my provision of resources. I shared with them the analysed transcripts from the first two interviews and suggested they may like to lead the research in phase two. The idea that participatory action research could be used to build on the nascent community of learners and to create a collaborative participatory community of learners was also discussed.

Summary of Kindergarten and Childcare Second Interviews

Both groups of children went on an excursion and discussed this with their parents at home who reinforced the children's responses about the excursion and other environmental learning experiences.

The teachers discussed the integrated approach to children's environmental interests and the emergent curriculum. Adult awareness of environmental education, children's learning and role modelling of care were also discussed. Others, however, emphasised a connectedness with nature. Collaborative links with parents necessary for a community of learners were only tentative while capitalising on the parents' funds of knowledge and social capital remained largely untapped. However, stronger links were emerging at the childcare centre.

Questioning as a teaching strategy was favoured by both groups of teachers. Compared to interview one a greater use of teaching strategies was evident in the kindergarten and childcare teachers' responses. The recent EEIC influenced the childcare teachers' choice of teaching strategies and a socio-cultural approach was evident in their choice. These findings add weight to the importance of relationships in the community of learners. The important relationships are child-parent, child-parent-community and child/ren-teacher/s.

Relationships: getting to know you

The following table outlines the relationships theme of 'getting to know you'. This is illustrated with examples from the three proponents of a community of learners, the teachers, children and parents.

Table 11: Relationships: Getting to know you

Phase 1: Case Study		
Environmental education: Excursions		
	Kindergarten excursion: the rocky shore	Childcare excursion: the park/DOC
Teachers	Henrietta *To start off we investigated the rocky shore and we talked to the children about that a lot.*	Diana *I think outings are really family orientated. Just seeing them down at the playground and being a bit more close and I've just seen them. It was wonderful.*
Children	Kimberley *My mum found a crab shell but the crab wasn't there.*	Ashleigh *I went with my mum to the park.*
Parents	Carol *We discussed the whole day. Yeah, she had a good day and enjoyed it. That was the main thing.*	Marie *Mainly the one at DOC… We talked about what was going to be there. While we were at DOC he said about the morepork song.*

In the final summation the EEIC allowed the focus children (and the other children at the centres) to create their own environmental knowledge through the relationships between the teachers, children and parents as indicated in Table 11. Many examples of environmental knowledge creation by the children and teachers were offered from both centres as they related to the rocky shore and bird interests. Collaboration (with teachers, children and parents), the key to the creation of a community of learners, was beginning to emerge. Furthermore, the teachers at both centres had demonstrated they were capable of leading the research in phase two. However, cognisance needed to be taken of the need to fully utilise the parents, especially their environmental social capital and funds of knowledge. A more collaborative approach that would aid children's knowledge creation and create a community of learners to promote

environmental education was the task facing the teachers as they were poised to take charge in phase two.

At the conclusion of the EEIC both centres had to make the decision to lead the research themselves or put in place another EEIC. The following chapter will outline that process. If they decided to lead the research themselves they would begin by following the children's environmental interests. Through the project approach and the emergent curriculum they would document the focus children's (as well as the other children at the centre) knowledge creation. This would happen through photographic displays, learning stories and the children's profiles. Excursions would be a feature. Thought would need to be given to the teaching strategies the teachers would use to support the children's environmental learning. As part of the participatory action research process the teachers would create a conceptual artefact in the form of a community of learners. This would require working collaboratively with the parents and valuing their contribution to the curriculum, by acknowledging their funds of knowledge and social capital. This would ensure that all the participants in a community of learners (teachers, children and parents) would gain meaningful learning and knowledge about environmental education.

Chapter Six: Empowerment: The Teachers Take Charge

Introduction

In the previous chapter the implementation of the EEIC at both centres was discussed. In this chapter an overview of phase two of the research is presented. The decision to lead the research themselves in phase two, using a participatory action research and project approach to environmental education is discussed. Excursions, the emergent curriculum and teacher documentation of this, along with the teaching strategies employed, are outlined.

At the conclusion of their recent EEIC I discussed with both centres the likelihood of them leading the research in the second phase, using participatory action research. I pointed out the fact that apart from me providing useful resources and being a human resource, they had both planned and implemented the entire two-week programme independently. This was verified in the analysed transcripts of the first two interviews I shared with them. As part of this discussion, I emphasised the importance of working collaboratively with parents to create a community of learners. This would mean they would need to be aware of and utilise the parents' social capital and funds of knowledge. A start had been made in phase one and they would need to build on this in phase two. I was also mindful of the experience of Lee (2002) who asserted that her role was to be part of the action research process not to control it. The response to this initial discussion was mixed, with the childcare centre 'rearing to go' and the kindergarten reluctant to 'go it alone'.

Decision Time: Phase Two

The childcare centre was very excited at the prospect of continuing on in the second phase working with children's topics of interest. The resounding success of their bird focus had inspired them and demonstrated the benefit of working with children's interests and following the project approach to promote environmental education in the early childhood curriculum. They worked in a socio-cultural manner allowing the children to socially construct and create their own environmental knowledge in an integrated way through both the planned EEIC and the emergent curriculum. The latter offered the flexibility to pursue other related environmental education topics that arose out of the original bird topic of interest.

In contrast to the response of the childcare centre, the kindergarten staff were reluctant to take on the responsibility of leading the research themselves. This was particularly so for Henrietta who was not only coping with staff changes but the responsibility of the head teacher duties. This is a very normal reaction to the challenges of taking part in early childhood education research. This reticence to take part was echoed by a primary school teacher in Lee's (2002) research.

> I have learnt so much about myself as a teacher, which never would have happened if I hadn't been coaxed and supported into thinking about trying new things. But as to whether it is a realistic option to expect teachers to do on their own probably not
> (p. 16).

I had respected this initial decision and we had planned to put in place another EEIC based on children's environmental interests.

As it transpired this proposal did not take place. Instead, both Henrietta and Mary Lou went with the children's interests and a project approach 'emerged' and the second phase of the research took on a life of its own. This is exactly what should happen when teachers work in a socio-cultural way with children and when they use a project approach based on children's observed interests. Once the teachers were on a roll, I stepped back and encouraged them to go with the children's interests and plan learning experiences accordingly. I became a 'guide on the side' rather than the expert. I constantly empowered both teachers to 'take charge' by offering resources.

More importantly though I encouraged them to go with the children's environmental topics of interest and this is what did occur. Henrietta summed up the project approach and offered this explanation for its success: *because we started where they were at and we worked our interests along with them*. This response not only highlights the interests, passions and preferences of children, but that of the teachers also within the emergent curriculum. Another deciding factor was the fact that Henrietta and Mary Lou had trained together as kindergarten teachers 30 years earlier. Moreover, they had inter-subjectivity (Bruner, 1996) about working together on the

children's interests and researching environmental content knowledge. Henrietta alluded to this on many occasions: *It has taken me back to when we were first teaching when we actually did prepare children for trips. We don't just get on the bus and go*.

Henrietta also needed to work with relievers and she handled this with considerable confidence. The reason for this was that she was committed to using a socio-cultural approach to enhance the children's learning. This was echoed in her response: …*and to have the confidence to actually get into a team* (even the relievers*) and do it. We all knew we were in it together and we all had those aims and objectives*. So despite the initial apprehension and reluctance to take charge the last word goes to Henrietta whose enthusiasm for the research is encapsulated in her summation of the research process: s*o I've just found it fantastic. I've really enjoyed it*.

Participatory Action Research in Practice

Although participatory action research may appear to be a straight forward process, the practical reality can be very different. Time is a major impediment to the successful implementation of participatory action research. In Lee's (2002) study, the teachers emphasised their role as 'doers' not 'thinkers'. This alluded to the time necessary to reflect on their practice in order to make changes. Time was also an issue for the teachers in this research, particularly the teachers at the childcare centre. Diana lamented: *sometimes I wish we'd had more time to put into things, but it just didn't happen*. Jill concurred and explained the centre hours (7.45am-5.15pm) left scant time for the necessary observations. Her sentiments are explicated thus: *so having time to just sit down and write an observation is a kind of luxury. Sometimes it's hard to get it on paper*. This situation was further compounded by the centre ratios: *30 children pretty much the whole time…pretty full on and the children are too*. This is this centre's lived reality as the centre does have children who require assistance from Group Special Education. The above responses therefore illustrate how the demands of a busy centre can impact on the planning necessary to implement a project approach using participatory action research.

Researching Environmental Topics of Interest

Once both centres had opted to lead the research using participatory action research, their decision prompted them to learn more about environmental education and to get answers from the community and resources such as books, TV and the computer internet. For instance, because the children were interested in worms, Henrietta accessed the expertise of the staff at the local environment centre to answer her questions on how to establish a wormery at the kindergarten. Once this initial contact had been made she organised release time for Mary Lou to attend a meeting at the environment centre on how to establish a wormery. A wormery was purchased and the children assisted Mary Lou to get it operational. Henrietta was full of praise for the assistance given. She shared: *it was the first time since I've been teaching we went to the environment centre and actually used the facilities and things. And it was great*. This is an example of both teachers' knowledge creation about wormeries.

Both Diana and Kate mentioned the importance of research to answer their own and the children's questions on a topic of interest. Kate related a personal environmental learning experience. After a weekend fishing trip Kate had seen the men cut open a shark and there were babies inside. This led her to ask: *do sharks give birth to babies?* This prompted her to research the topic by using books, posters and TV to gain information on sharks. Then as a result of the Aquarium excursion she was reading a brochure and saw a shark egg, *and I thought Oh! But I had seen it with my own eyes*. Subsequently she had been watching *Hi-5*, a TV programme, to gain more information on sea life and ideas to support the children's environmental interests.

Kindergarten: Participatory Action Research

Empowerment: the project approach

In the second phase of the research and after recently completing their planned EEIC, the teachers were very aware of working from the children's environmental interests. They had a system for doing this that closely resembled the model posited by Cowie (2000). The noticing, recognising and responding method of assessment was used in her science classrooms during her research. Early childhood teachers have had success using this same method in early childhood education settings and this proved the case in this research also. Teachers notice in their everyday work with children many aspects of children's activities within the early childhood curriculum (Carr, Lee,

& Jones, 2004). This 'noticing' happened for Henrietta and Mary Lou and was followed by observations of the children's environmental interests. These observations took a variety of forms from learning stories to an informal discussion at the end of session about significant questions or comments the children had made about a topic of interest. This would often occur during the responsive and reciprocal interactions that are an integral part of the socio-cultural learning that occurred in the kindergarten or at group mat time. Both teachers recognised that what they had noticed through the children's interactions was authentic learning. They also recognised that these interactions had the potential to lead to a project on the children's emergent environmental interests on a topic. Finally, they would respond to the children's environmental interests by planning learning experiences to support the children's learning. Their response also was mindful of the emergent curriculum and children's emergent interests allied to the topic of interest. Furthermore, their planning was flexible enough to maximise the meaningful socio-cultural learning and knowledge creation that results from curriculum that 'emerges' from both the children's as well as their own environmental interests.

Once they had established the children's environmental interests they would plan to support the interest with learning experiences. They constantly considered the emergent curriculum and the possibility of the unexpected events and discoveries by the children. Due to frequent changes of staff, Henrietta found informal discussion at the end of the session to be the most valuable way to establish what would be offered to the children. More importantly though, was the necessity to establish who would be responsible for implementing the planned learning experiences. After implementing the EEIC they were aware of the integrated curriculum and the necessity to ensure that the topic of interest and associated learning experiences were integrated throughout all areas of the curriculum following a project approach.

A wide variety of environmental topics of interest occurred during the participatory action research phase of the research and always they were triggered by the children's interest in the natural environment. The teachers recognised that some interests were short lived and could be described as mini projects. Others such as recycling and the wormery became extended projects. A sustained project will deepen children's understanding of a topic of interest. (For instance, a local kindergarten has been

documenting the centre's cat. This began in April 2006 and is ongoing.) The following table highlights the children's interests and the resulting project.

Table 12: Planning using a project approach: Kindergarten

Children's interests	Projects
Rubbish	
(What should we do with our rubbish?)	Recycling
Sea life	Aquarium excursion
Worms	Wormery
Bees	Honey farm excursion
Sea life	Songs of the sea
Plants	Planting
Endangered species	
(A child found information in a sweet packet)	Albatross
	Kiwi
	Pohutukawa tree

Collaboration: A Project Approach to a Community of Learners

The sea life project

The success of the rocky shore excursion and the children's obvious interest in sea creatures was the impetus to organise an excursion to the National Aquarium. The following are field notes of the day from my perspective as the co-researcher during the participatory action research phase of the research when the teachers were leading the research themselves.

Aquarium excursion: desperately seeking Nemo

A kindergarten excursion by bus to the National Aquarium was organised as part of a project on sea creatures. All of the kindergarten children, including the focus children, attended. Focus group parents included Marilyn and her small son who were there with Brooke's nana. Christine attended with Louisa and Dave with Kimberley (in the absence of Janet who was on night shift). On arrival at the aquarium, Carol and Leigh, the information officers, introduced themselves. They explained that the children would be in two groups, the sharks and the

stingrays. Carol explained they would see the fish feeding, the kiwi and the tuatara. While one group went on the aquarium tour, the other would see sea life puppets and get up close and personal with the animals, including a turtle. One child noticed that a shark had a bleeding nose. Carol explained that a shark has a soft nose *like yours.* The diver who fed the fish was quite a comedian. This included playing a rusty anchor like a guitar and putting his flippers on his head. The children had morning tea at the aquarium and they had brought their colour coded recycling bins (green/paper, red/organic, yellow/plastic). Henrietta said: *Well done children. You did very well with your recycling.* During the stingray's aquarium tour Louisa was delighted to see a clown fish: *Finding Nemo! s*he exclaimed. All of the children saw the kiwis, the tuatara and the sea horses(FN, 30.6.04).

To acknowledge the parents' contribution to the community of learners and the importance of collaboration in this process, Henrietta sent out a newsletter outlining the excursion to the aquarium.

Henrietta's newsletter 5. 7. 04

Last Wednesday we went to the National Aquarium. We all experienced this wonderful environment. Our visit to the Aquarium is an annual event. This year our visit linked up with our rocky shore visit in February and our environmental and conservation studies with Cynthia Prince. Prior to our visit to the Aquarium, Carol sent us endangered sea posters. Wednesday was our wettest and coldest day this year but we managed to run between the kindergarten and the bus, bus and Aquarium. The children always enjoy the bus ride and it worked very well being divided into two groups, the sharks and the stingrays. The children enjoyed the story of Pania and especially being involved with the sea life puppets. To support our study we enjoyed a "fish and chip" lunch the following Friday where we were joined by whānau.

Learning experiences:

- We made aquariums in plastic snap lock bags with fish lollies and jelly to take home and eat.
- We made felt boards with felt fish shapes

Resources:

- We have purchased sea creatures and plastic fish bowls
- Posters and books
- National Aquarium of NZ: Life in the ocean (poster)
- Imagine you are a crocodile
- Where's your smile crocodile?
- Big nature facts

Te Whāriki Curriculum goals achieved:

- Well-being Goal 1, 2 & 3
- Belonging Goal 1 & 4
- Contribution Goal 3
- Communication Goal 1 & 2
- Exploration Goal 2, 3 & 4

We had an awesome morning at the Aquarium!

Documentation

The teachers used a variety of documentation. There is a photo showing the "what we have been learning" notice board that is situated in the kindergarten foyer (see Appendix 8).

The aquarium excursion revisited: children's knowledge creation

About three weeks after the Aquarium visit on a routine visit to the kindergarten I spoke with the focus children about their excursion to the Aquarium. I spoke with Kimberley first.

Cynthia: *What happened when we went to the Aquarium?*

Kimberley: *I watched the diver. He did silly things. He put flippers on his head! He put flippers on his hands. He was a silly sausage!*

Cynthia: *Anything else?*

Kimberley: *I saw little fish. I didn't see the shark with the bloody nose.*

At this point another child entered the conversation and said, *we waved to the stingray*.

Kimberley: *I gave the stingray a really grumpy face like this* (she expressed this non verbally).

Brooke, Greta and Charlotte were sitting at the making table. Louisa was at the dough table nearby. I started up a conversation about their recent Aquarium excursion.

Cynthia: *What can you tell me about the Aquarium?*
Brooke: *I saw a shark but not the one with the bleeding nose.*
Greta*: I saw a crab and a stingray.*
Louisa: *I saw a stingray. The diver put his flippers up here* (indicated on her head) *and the shark with the bleeding nose.*
Charlotte: *I saw a stingray like on Nemo.*
Later on in the morning I spoke to Georgia:
Cynthia: *What did you do at the Aquarium, Georgia?*
Georgia: *I saw fish and Kiwis. I saw one Kiwi.* (FN 23.7.04)

The children's recall of the excursion highlighted what was personally significant for them. The shark with the bleeding nose had a significant impact as did the stingray, and to a lesser extent, the diver and the kiwis. In the initial introduction to the Aquarium the children's attention had been drawn by Carol to the shark with the bleeding nose. It seemed like this was uppermost in their mind when they went for the Aquarium tour and they had gone looking for it when viewing the sharks in the overhead tank. The pervasive influence of the film "Finding Nemo" is perhaps the reason for the children's fascination with the stingray at the aquarium. The children had been shown the video at the kindergarten but many would have seen the movie with their parents or friends also. The diver's antics fascinated Kimberley and Louisa while Georgia remembered the kiwis.

These responses to my general enquiry about what had happened on the Aquarium excursion mirrors the research of Hedges (2002) and the results of DeMarie's (2001) study of children visiting the zoo. The children related their experiences from their perspective rather than the hoped for educational benefits the teachers envisaged would occur on the zoo excursion. The children were more interested in things in their everyday environment. For instance the children mentioned cracks in the concrete and other children's shoes. This was opposed to naming zoo animals as would have been expected when children were visiting the zoo for that educational

purpose. In this study the focus children's responses to the Aquarium excursion were also from their perspective. The responses highlighted the children's social construction of knowledge and knowledge creation. They drew on previous experiences such as the movie *Finding Nemo* to make sense of what they were seeing. They also co-constructed knowledge of sharks and why the shark had a bleeding nose by linking what Carol had told them about the fact sharks have soft noses *like yours*. However, Kimberley and Brooke were able to differentiate between the shark with the bleeding nose they had seen originally and the other sharks in the tank. These examples exemplify how children create their own knowledge about a topic of interest within the socio-cultural context of the Aquarium, as well as through interaction with adults.

Emergent Curriculum: Kindergarten

Greta's fascination with seahorses prompted her to bring her grandfather's sea horses to kindergarten. They were preserved and were in a glass jar. She shared them with the children at mat time. This is an excellent example of household funds of knowledge associated with her grandfather's funds of knowledge about ocean diving.

<u>From Greta's profile</u>

We sang our new song about "Seahorses". Greta said she had some dead ones in a jar that Nan gave her: *I will bring them tomorrow*.

The wormery

As indicated earlier the children at the kindergarten had shown an intense interest in worms. Before the wormery was created a child and his father dug up a big worm and brought it into kindergarten.

Mat time discussion

Mary Lou began with a general discussion about making a wormery.

Mary Lou: *What other things will the worms need?*

Children: *Sun, moisture, soil, food.*

Mary Lou: *Where will we get the food?*

Children: *The organic food from the recycling.*

Earlier on Mary Lou had discussed with the children that she fed their organic food to her chooks. She had brought in an organic egg to show them that their organic scraps produced eggs.

Mary Lou: *Do you think this will happen with the worms? Now that we are going to feed the scraps to the worms they will make compost.*

In this discussion, Mary Lou socially constructs knowledge with the children about what the worms need. She assists them to create their own knowledge especially about what to feed them. They have inter-subjectivity about the organic scraps from their daily recycling and the useful purposes it can be put to, such as organic eggs.

A learning story can be about an individual child's learning, or that of a group. In the following example a group learning story is documented.

Learning story: our wormery

Today we created our wormery. A group of children helped Mary Lou to do this including Greta, Louisa and Kimberley. All the children put on gloves to protect their hands from the micro-organisms in the horse manure. They soaked the shredded paper in water first and then they put corrugated cardboard on top. The worms like to live in the corrugations. There was a bag of worms and a bag of horse poo. They scooped out handfuls of worms. The children put the horse manure and the worms into the wormery. They counted the worms and looked to see how big they were. Mary Lou finished the process by adding horse poo. (The learning story contained photos. These were not included for reasons of confidentiality).

Te Whāriki curriculum goals achieved: teacher evaluation

Well-being: Goal 3. The children are protected and safe from harm. They each wore gloves and afterwards they washed their hands and this was supervised.

Contribution: Goal 3. Opportunities for learning are equitable and each child's contribution is valued. The children are given the opportunity to learn alongside others.

Communication: Goal 2: They develop verbal skills for a range of purposes.

Exploration Goal: 2 & 3: The child learns through active exploration of the environment. They are gaining confidence in control of their bodies and they are also learning strategies for active exploration, thinking and reasoning.

It is interesting to note that the teachers did not choose Exploration Goal 4 that alludes to children developing "working theories for making sense of the natural, social, physical and material worlds" (Ministry of Education, 1996, p. 90).

From the profiles

Greta:

Greta cut up bananas and cauliflower into small pieces for the worms.

Greta helped to grate the carrot for the worms.

These entries show Greta's continued interest in the worms and wormery that she was involved in creating. She has inter-subjectivity with the other children about the ongoing responsibility of feeding them. Centre wide everyone took responsibility for feeding the worms. This illustrates inter-subjectivity for all of the children involved in the process.

Louisa:

Louisa helped to cut up the cabbage leaves very finely for the worms. Louisa said, *I found a worm in my mummy's garden. It was getting dirt for his tea*. Christine has brought a container of vegetable scraps for the wormery.

Louisa is creating her own knowledge about worms in this profile entry. Her mother has also been sharing her gardening funds of knowledge with Louisa. Christine is also becoming part of the community of learners at the kindergarten by taking part in the environmental programme the teachers have planned. Louisa has a working theory that worms need food to eat. She knows the worms in the wormery are tiger worms and needed the organic scraps from the kindergarten therefore the worms in her mother's garden must eat dirt for food. She is making connections about what different worms eat when she says, *It was getting dirt for his tea*.

Brooke:

Brooke helped to grate the potato today for the worms.

Brooke is very excited about the wormery that her mum had made for her. She said that they had bought a worm container at the Warehouse and that they went to the lady at Paki Paki who has a worm farm to collect worms. I asked her if her mum could bring it in or take a photo to show us. Maybe she could borrow our digital camera. (see Appendix 9 for learning story).

In these entries Brooke shared her mother's funds of knowledge about wormeries with the children and teachers. Marilyn's knowledge contributed to the kindergarten's community of learners where the teachers, children and parents socially constructed environmental knowledge in the socio-cultural context of the kindergarten.

Learning story: emergent curriculum

Entries from Louisa's profile

Louisa and Christine (her mum) made a kiwi house from a box. They cut out the kiwi, then they pasted on feathers and gathered ferns and grass. They put stars in the sky and snails on the ground. She spoke to the children at mat time and then we sang the kiwi bird song.

Louisa is extending her environmental knowledge in a variety of ways. The unexpected events of the emergent curriculum afford her the opportunity to share her recently created knowledge with the children and the teachers in her kindergarten community of learners. Harris Helm, Berg and Scranton (2004) argue when children are involved in a topic of interest they can possess knowledge above that of adults. Louisa's mother Christine is part of this community of learners also. She shares her funds of knowledge with the children through the realistic home she has helped Louisa create. This includes features such as the stars to indicate kiwis are nocturnal, and the snails for them to eat.

Teaching Strategies

The teachers used a variety of teaching strategies. They read many books to the children to support their environmental interests and the children consulted the books for *recognising bugs*. In their words, *We used lots of books. Books all the time*. Singing was also important: *we loved singing with the children.* This included an environmental tape with *quite a catchy song* on recycling. Recalling and revisiting previous learning, listening to the children and offering feedback occurred regularly. Demonstrating, telling and instructing, and role modelling of caring attitudes were used as strategies especially in the Papatuanuku (nature) area. Aesthetics and the positioning of materials in the science and nature area meant the children could collect precious nature treasures as well as observe the frogs and fish. Mat times (grouping) were used to empower the children to share their environmental knowledge with the community of learners. Excursions were a major strategy and

they used these events to facilitate the children's meaningful environmental learning. More importantly, however, was their awareness of the children's socio-cultural learning and knowledge creation. This was evident in the learning stories and profile entries.

Childcare: Participatory Action Research

Empowerment: the project approach

The decision to lead the research in the second phase using a participatory action research approach was an easy one for the childcare centre staff. They were enthusiastic about the prospect and as I said to them, *you are already doing it*. The success of the bird topic of interest had inspired the staff to continue on with that focus until another topic of interest emerged.

Unlike the kindergarten teachers, the childcare centre staff were very familiar with webs on topics of interest (Jones & Nimmo, 1994). In conjunction with this approach to curriculum planning, the staff also used the notice, recognise and respond approach (Cowie, 2000) to gauging children's environmental interests. In the notice phase all staff would note any interests associated with the environment the children exhibited. These interests may not have been formally recorded, rather the staff would make a mental note of the circumstances surrounding the recognition of the interest. For more formal recording the centre had an inside book and outside book that allowed staff to recognise and record the children's learning and emergent interests in these areas of the centre setting. These books were small school exercise books that were easy to access and write in.

At the centre's monthly staff meeting the staff discussed what had been noticed and recognised some of what had been noticed as an interest worth planning for as a centre topic of interest. As in phase one the focus children's interests guided planning. The centre has a staff of eight who are either employed full time or part time. This could be considered either a strength or a weakness, when endeavouring to support the children's topics of interest. Although there were many eyes noting the children's environmental interests, not all of the interests noted could be catered for. The staff therefore needed to work as a team and reach a consensus on what topic of interest would be planned for and become a centre wide project. Their response to

this discussion resulted in a hand written web or tentative plan as to how they would support the children's environmental interest. All staff could contribute to the plan and they could add to it at any time as the children's interests emerged.

A web should be flexible enough for children and parents to add their ideas. Because of the age of the children the staff wrote down the children's ideas and took on board the ideas of the parents. The parents' response was mostly expressed as bringing resources into the centre on the children's topic of interest. This demonstrated parents' social capital on the topic of interest and this was also expressed in the discussions the parents would have with the teachers on the children's learning. The parents were made aware of the topic of interest in three ways. First they were informed by newsletter. Second, staff would discuss the children's learning on the topic of interest with them when they came to the centre either at the beginning or end of the day. Finally, the parents would be able to see the children's learning from the documentation around the walls of the children's creations and the documentation on the topic of interest. The learning experiences offered and the aesthetic displays on the topic of interest around the centre also served to reinforce to the parents the children's meaningful learning on the topic of interest. For a web of the bird focus, see Appendix 10.

Six main topics of interest arose out of the above process. They were always triggered by the children's interest in the natural environment. As with the kindergarten some interests were short lived and some constituted a project. The following explanation (see over) outlines the children's interests and the resulting project. These topics of interest were birds (a continuation of the EEIC), sea life, insects, worms, Spring and farm animals.

Table 13: Planning using a project approach: Childcare

Children's interests	Project
A bird's nest brought in to the centre (a continuation from EEIC)	Birds
Sharks and Dolphins	Aquarium excursion
Spiders Snails, Slugs	Insects
Worms	Wormery
Children see new leaves on tree	Spring
Children want to know about animals: their babies, their homes and the sounds they make.	Farm excursion

Topics of Environmental Interest

"Spring": an unsuccessful topic

Of the six topics of interest outlined above, five proved successful and one for a variety of reasons did not 'take off'. This topic of interest was Spring and proved, in Diana's words, to be, *too broad*. As with all the topics of interest I had consulted with the teachers about what the children were interested in and then I had gone to the local library to get books on the topic. I went to the children's section of the library and asked the librarian what books there were on Spring. It did not bode well when she herself had to peruse the shelves after finding scant resources on the computer under that key word. All of the available books were of the northern hemisphere Spring. They seemed to have no relevance to Spring in our country in the southern hemisphere and with very different geographical features. There was nothing that the children, who are city dwellers, could relate to as the centre is located in the heart of the city and making a connection with a rural Spring was always going to be 'a big ask'.

Each time I visited the centre during the participatory action research phase, I would get feedback from all the staff present on that day, on how their current project was progressing. On one of my regular visits, Diana related how the Spring topic of

interest had been first noticed. Elizabeth had been outside conversing with the children when they had pointed out to her that the deciduous tree in the sandpit was sprouting leaves. Elizabeth discussed what she had noticed at the staff meeting and suggested they could investigate Spring. Diana, taking a team approach and despite initial reservations, decided to support the suggestion and go with a Spring topic of interest. Her doubts about the relevance of the topic (New, 2000) were confirmed when the children were questioned about what they had learned while engaged in making a collage. They were unable to answer her questions even though she pointed out the work they had completed. This was displayed on the wall (a display of artificial daffodil flowers and baby lambs depicting 'Spring')

Diana was not the only one with reservations, she shared *that all the staff had struggled with it*. This was evident when I asked Jenny how the Spring topic of interest was going. She replied, *to be honest it isn't*. I assured her that it was OK that some interests will *take off* and others will *bomb*. She continued, *It was too big. Easter is in Spring* [in the northern hemisphere] *It's autumn here*. If this teacher was having difficulty grasping these concepts, it is little wonder the children were experiencing the same problem. Neither the teachers nor the children had inter-subjectivity about Spring as it was portrayed in these books. This meant the co-construction of knowledge and learning in a socio-cultural way could not occur. Working with children's interests means seeing things from their perspective (DeMarie, 2001). The staff had thought about Spring in the widest sense so they had thought about many diverse topics such as blossoms and lambs. Jenny summed up what happened by saying, *too big, too many interests associated with the focus of Spring.*

Wells (2001) suggests it takes courage for teachers to learn from their mistakes. Perhaps what should have happened was to investigate planting and growth rather than do Spring. The latter also carries with it the negative connotations of the old inflexible 'themes' that were teacher imposed to coincide with the seasons instead of noticing what the children were really interested in. This illustrates the premise that any project has to be based on the children's interests, passions and preferences and be meaningful to them. It was a giant leap from the children's initial interest in growth to the all-encompassing abstract topic of 'Spring'. This experience was not

entirely negative. The children, through the Spring topic of interest and the emergent curriculum, became very interested in baby animals, where they lived and what sounds they made. This led onto the final topic of interest and project that culminated in an excursion to an animal farm. This allowed the children to experience the animals in a real life New Zealand context. They were able to create their own authentic knowledge about animals with their teachers and parents within a community of learners.

Collaboration: A Project Approach to a Community of Learners

The success of the bird topic of interest continued into the participatory action research phase of the research. The week following the EEIC, two incidents occurred that illustrated that the interest in birds had not stopped even though the two-week EEIC was completed. The first occurred when I was at the centre conducting interviews. I arrived and Diana immediately showed me an exquisite nest made of dough that one of the children had made. It had several round eggs in it and she had made a very life like bird. Later in the afternoon Kylie asked if I knew where the nest was as the child who had made it wanted to show her father. I told her I had put it in the office for safekeeping. This highlights the learning that had occurred as a result of the EEIC and how this child was creating and sharing that knowledge with her father as part of the childcare's community of learners.

Kate related the second incident to me. Three children were at the puzzle table. They were all singing the Kiwi Bird song. They were totally oblivious of the fact that the others were singing it also. The children were *lost in their own worlds* and what eventuated was a perfect round. Kate expressed her delight at this 'happening' as music is her particular strength. This also illustrates these children's creation of knowledge through the medium of singing.

The bird project revisited

On another day I was in the four year old room with Aaron and three other children. The following is an anecdotal narrative of what occurred.

<u>Parrots and other birds</u>

A child pointed out the picture that Aaron's grandmother (Eve) had brought in for the children to support the bird interest.

It was hanging on the wall so the children could see it and refer to it. I said to Aaron: *Your nana brought that in didn't she?* Aaron then pointed to a parrot. I said, *I have a book on parrots I will get it for you.* I returned with the book on parrots. The children and I looked at the book noting the colours and comparing it to the parrot in the picture. We all co-constructed knowledge of the bird in the picture together, including colour, shape and beak. Another child joined us who had been on the DOC excursion. He saw a picture of a Kiwi in one of the books and said, *I saw that at DOC*. I replied, *Yes you did.* Without prompting, that child and another spontaneously sang the Kiwi Bird song. When they got to the line in the song Tuatara lizard they pointed it out on the ABC poster (FN 3. 6 04).

This anecdote illustrates that the children were able to draw on all the knowledge they had created through the learning experiences offered (and the real cockatiel that had been brought in during the EEIC), and to make meaningful connections with what they were seeing both in the books and on the poster. They were able to socially construct knowledge about birds through interactions where all those present had inter-subjectivity about the recent excursion to the DOC centre to learn more about birds.

The sea creatures project

A child had shown an immense interest in sharks. He had been looking at sharks in a book and then went off and drew a shark. This led into the second project after the bird interest had reached phase three of the project approach (Helm & Katz, 2001). This interest in sea creatures would also have been prompted by the centre's close location to the National Aquarium and the beach. This fact is emphasised by Jill in the final combined interview when she commented, *and we were lucky where we are situated we are right over from the beach*. The web that was created as a result of discussions at a staff meeting is featured in Appendix 11.

Learning experiences

As a highlight of the sea creatures project the children visited the Aquarium. The following field notes record the experience from my perspective as co-researcher in the participatory action research.

Aquarium excursion: kiwi bird and tuatara lizard

As part of the sea creatures project the children from the childcare centre visited the National Aquarium. Kate and Jill took a group of children, including some focus children, and enough parents to cover ratios. Ashleigh remained at the centre as she had fallen asleep on the couch. Eve attended with Bethany and Jordan, and Marie was there with Jacob. Marie pointed out the dead fish at the bottom of the tank to Jacob and also a crayfish hidden in a crevice. Kate and I were looking at an exhibit and Kate asked me if I knew what the balls floating on the surface were. I confessed I did not know but thought they were to do with fishing. At this point Marie joined the conversation. *They are to show where the crayfish are*. Sure enough there were the crayfish pots with the balls directly above. Highlights of the excursion were feeding the fish, the antics of the diver, the kiwis, and seeing the tuatara. Bethany found a tuatara and Jill said, *Well done, Bethany.* Marie and Eve shared their funds of knowledge about fishing and goldfish respectively (FN 21.7.04).

The sea creature project continues: anecdotes from the teachers

Kylie brought in an inflatable shark and hung it above the servery. Her daughter had sent it to her from Australia. The children named it Bruce after the shark in "Finding Nemo". After the excursions to the Aquarium, the children according to Diana *had really noticed it* and had shown her the teeth. They had also said *fish and chips*. This was because Kylie owns a fish and chip shop in the community and the children had seen Bruce hanging up in her shop. The children had inter-subjectivity about sharks, both from their excursion to the Aquarium and visits to her shop to buy fish and chips. At the conclusion of the EEIC a child had celebrated a 5th birthday party with the children at the centre. Part of the festivities was hot chips from Kylie's fish and chip shop. Because of Kylie's role both in the centre and in their local community, the

children were learning in a socio-cultural context. Furthermore they were able to socially construct and create their own knowledge about sea creatures.

Pania said that the excursion to the aquarium had been acted out in a variety of ways in the sandpit. She enthused:

> *It's been huge for us. There's stuff around the walls. Kate and Jill have planned lots of learning experiences. Kate wrote a bi-lingual song. We have used a big floor puzzle of dolphins and whales. I also talked to the children about the sea creatures* [whales and dolphins] *on the postcard puzzle you made for us.*

She had also asked the children how they knew if was a dolphin or a whale. The children had said, *a dolphin has a long nose. The whales have long flippers*.

Emergent Curriculum: Childcare

Kate shared that since the Aquarium excursion the children had been very interested in divers and diving equipment: *one child in particular mentions the excursion at least three times a day*. She also shared with me that the children's interest in sea creatures had been sustained over a long period of time. This had surprised her as she had had *preconceived ideas about what the children would be interested in*. In her words, *I didn't realise that the children's interest could last so long*. She reiterated this sentiment at the final combined interview when she said, *I quite surprised myself too. Like, how long a child or children can sustain an interest*. This is one of the benefits of working from the children's interests. Their momentum and the emergent curriculum can sustain a project on their topic of interest for extended periods of time (Helm & Katz, 2001; Katz & Chard, 2000). Kate shared she had written a bi-cultural song about a Taniwha. She commented that when writing the song she needed to be culturally sensitive, for instance, whales are revered in Māori culture. This was evidenced in the movie *Whale rider*. Books for reference were being used to compare sea creatures and to find out more information. I had observed this myself when visiting the centre. This was stated at the final interview when she asserted, *our children never used to have much interest in books now they just get them all the time.*

The insects project: teacher anecdotes

Ashleigh brought in snails to the centre and that led to the insect topic of interest. Her mother had helped her create a home in an old plastic aquarium (Harris Helm et al., 2004). The children continued to use the reference books to find out information. This illustrates well Alice's funds of knowledge as she used the available resources around the home to create the 'snail house'. She in turn supported Ashleigh's passion for snails. Alice was able to share her funds of knowledge about snails with Ashleigh. Snails continued to be a big interest with the children having discussions about parts of the snail, for instance the breathing hole. Diana said the children *used the books* as opposed to it being the teacher's suggestion to do so. She also reported that Jill had taken a group of children out in the van to get worms for the wormery at the centre.

As each new project took place, based on the children's environmental interests, the former topics of interest were not forgotten. The bird interest came full cycle when the children discovered a bird's nest in an eave at the centre. Some baby birds had fallen out of the nest and Jenny took it on herself to care for the birds. She rang Animalz, a local veterinary clinic, and received advice on how to care for them. She discovered she could feed them Jellimeat as well as Molenberg bread. The children took part in creating a home out of a cardboard box and shredded paper for the birds. Through this learning experience, Jenny co-constructed knowledge of caring for birds and feeding them with the children. She even 'baby sat' them at home. They were kept in the office at the centre and then in Diana's shed at home.

This anecdote shows how the project approach can continue long after the third phase of the project has past. An earlier topic of interest can be rekindled and revisited and the knowledge from the original project transferred to the new situation because the community of learners have inter-subjectivity about the topic of interest and are able to create knowledge in a socio-cultural way.

Teaching Strategies

The teachers at the childcare centre used a variety of teaching strategies and like the kindergarten, reading was the most frequently used strategy. Elizabeth offered a consensus: *I just have to say books. They had heaps of interest in books and stuff like*

that. Pictures, they like looking at pictures too. With Kate's considerable talent for music, singing as a teaching strategy to develop knowledge about environmental education was quoted as often as reading. Kate commented, *I was very much involved with the musical side of learning. An example was the latest one* [project], *we were looking at animals and I've introduced this one about where they are sleeping. The dog is sleeping in the kennel*.

Jill was very involved with the aesthetics of the centre and promoting the environmental topic of interest by using the teaching strategy of positioning equipment and materials. She was particularly creative in the papatuanuku (nature) area. She recalled, *we had lots of eye catching areas, inside and outside areas*. All at the childcare centre were aware of facilitating the children's environmental knowledge and learning. Kylie explained, s*o you went from very simple activities* [learning experiences] *to in some cases quite complex ones. Some days you would have the bird cage in the middle with all the books around and the children just loved that sort of thing.* Collecting nature treasures and recalling past events especially the excursions were teaching strategies that were used on many occasions. The staff at the childcare centre employed most of the teaching strategies outlined by MacNaughton & Williams (2004), in varying degrees. Furthermore, they were aware of teaching and learning in a socio-cultural way. The project approach and working with children's interests heightened their awareness of the knowledge creation process. The latter occurred for all three groups of participants (teachers, children and parents) in the community of learners.

The Project Approach: A Critique

The project approach embraces the importance of excursions and planning from the children's interests as part of the process. Therefore, an uncritical acceptance of the project approach needs to be critiqued as it is not as straight forward as is sometimes assumed. In a lower socio-economic area for instance, a teacher-initiated excursion (the Aquarium) might be the only opportunity for children to get that learning experience. Furthermore, the centre has to provide it in order for the children to experience it. Many parents could not afford to go or even think to go. The Aquarium is expensive. For instance on the childcare centre's Aquarium excursion many parents wanted to go but government funding to cover ratios precluded this.

Likewise, the kindergarten needed to get prior approval from the kindergarten association due to the logistics of planning for 30 children. It is ironic that both centres planned an aquarium excursion (unbeknown to the other). For one centre, it was conveniently located on their doorstep. Henrietta's newsletter stated the excursion was an annual event. This teacher-initiated event suggests they were going anyway. Moreover, the structured visit was an easy option as it catered for young children. This begs the question is it actually based on children's interests or is it something that would make a good centre excursion? Either way it is still a second hand experience as children would need to be in the sea to experience sea life first hand.

Following children's interests takes time and energy. Do you just take one child (interested in sharks) or do you take everyone? Picking up on children's interests, essential for sustained projects, is difficult because of the sheer numbers of children. A teacher could recognise one child's interest or perhaps a group, but not all the children. Thirty children to two teachers (kindergarten) or even the better ratios in childcare, is a limitation. Tables 12 and 13 are evidence that there were many mini projects over the duration of the research in phase two. However, there were few long term projects as the ratio of teachers to children and time precluded this.

Planning is important in the project approach. Teachers need to be aware of children's observed interests, document them and share them with staff and parents. Furthermore, teachers need to plan. It is not enough to say "we work with children's interests" (therefore do not need to plan). Planning, teaching strategies and implementing the project approach to extend children's environmental interests are an essential part of the project approach.

Relationships: Shared understandings

The following table illustrates the shared understandings both communities of learners had about the children's environmental topics of interest. It also illustrates the increased collaboration that occurred between the teachers and the parents at both centres. In the final interview both the teachers and parents from each centre reflected on their involvement in the project approach to environmental education, one way shared understanding occurred.

Table 14: Relationships: Shared understandings

Phase two: Participatory action research: A community of learners		
Environmental education: Project approach		
	Kindergarten project: Kiwis	Childcare project: Insects/snails
Teachers	The kiwi house Henrietta *We actually made a kiwi house* [referring to the kiwi house made by Louisa and Christine]. *We had the kiwis out on the table and she* [Louisa] *had actually taken one home.*	The snail house Pania *A wonderful mum* [Alice] *made a snail house with her* [Ashleigh] *and she brought that in to show us.*
Children	Henrietta [Louisa's profile] *Louisa and Christine* [her mum] *made a kiwi house from a box. She* [Louisa] *spoke to the children at mat time and then we sang the kiwi bird song.*	Pania *She* [Ashleigh] *still has that snail house in a plastic fish tank. And there are also three parents interested in the snails.*
Parents	Christine *I've learnt lots actually* [when referring to the kiwi house]. *Especially if I have been here* [kindergarten] *'cause I learn off the teachers and then I go off and teach it to Louisa.*	Cynthia: *She made a snail house.* Alice: *It was a fish tank.* Cynthia: *She is really passionate about snails.* Alice: *Yes, she is!*

The parents were supporting the children's environmental interests by providing 'houses' for the children's creatures of nature at both centres.

Summary

During phase two relationships, knowledge creation and the community of learners emerged as themes supported by the participatory action research process. However knowledge creation emerged as the predominant the theme. Both centres made the decision to lead the research themselves in phase two using a participatory action research process. I empowered and enabled the teachers at both centres to work with the children's environmental topics of interest by being 'a guide on the side' and offering relevant resources. During phase two, many environmental topics of interest were documented, with sea creatures proving a popular choice at both centres. An excursion to the National Aquarium based on the project of sea creatures, was the result. From this experience the focus children, teachers and parents at both centres were able to create their own knowledge on sea life, and other environmental topics of

interest. This was illustrated when the parents at both centres supported the children to make ‘houses’ for their creatures of nature. Through the emergent curriculum the children’s environmental interests were further supported. The teachers used a variety of teaching strategies. Reading (books) was the teaching strategy preferred by both centres. In phase two, collaboration with parents to create a community of learners was more evident at both centres. This meant getting them ‘on board’ with the children’s environmental topics of interest. The parents were able to contribute their social capital to support the children’s environmental interests. Funds of knowledge about wormeries and domestic birds cemented a home centre link. The following chapter outlines the process by which each centre created their own conceptual artefact in the form of a community of learners.

Chapter Seven: Collaboration and a Community of Learners

Introduction

The previous chapter discussed the teachers' decision to lead the research using participatory action research and the project approach to create a community of learners. The purpose of this chapter is to examine how a community of learners evolved through the process of participatory action research to promote environmental knowledge creation. To that end, it addresses research questions four and five.

In the first phase of the research, the two-week EEIC acted as a 'trial run' to familiarise the teachers with the tenets of environmental education and working with children's environmental topics of interest. My role was that of advisor and resource provider but not facilitator of the EEIC. Figure 3 shows this process and the rudiments of a community of learners evolving to promote environmental education within the early childhood curriculum at both centres.

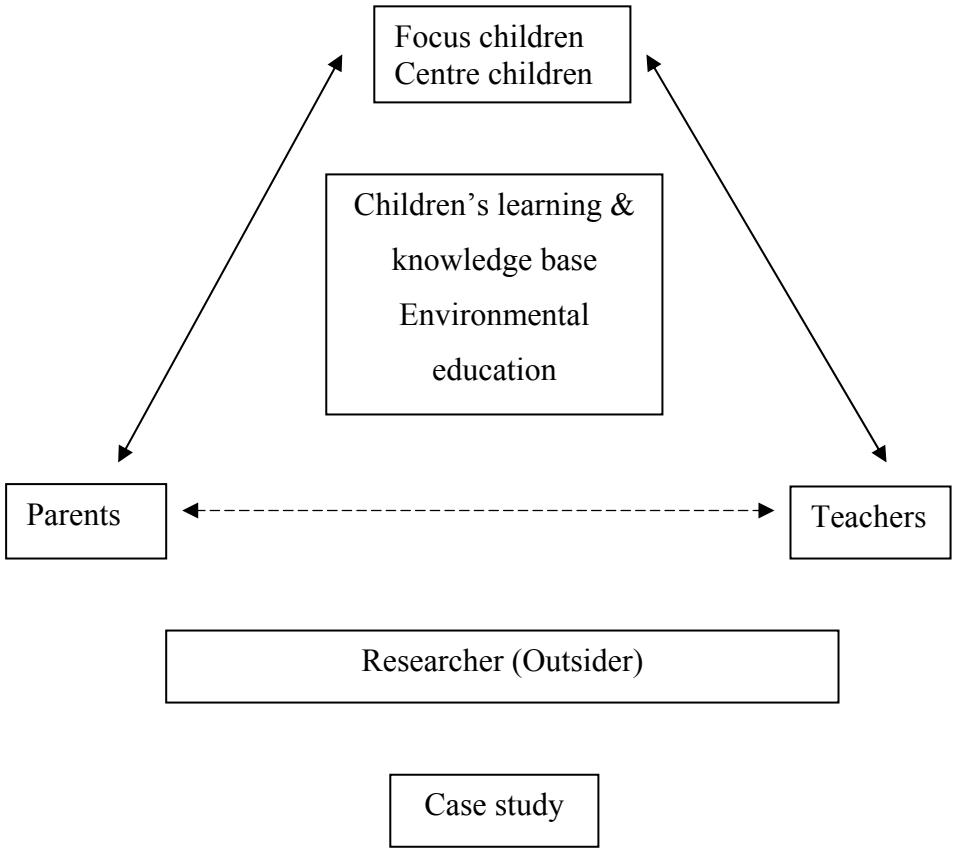

Figure 3: Phase one: Beginnings of a community of learners

The triadic figure displays the focus children and centre children at the apex of the pyramid. This indicates the importance of their role in the learning process. The parents, teachers and researcher are featured at the base of the pyramid supporting the children's learning. The two-way arrows indicate that the focus child-parent and the focus child-teacher dyads have supported the children's environmental learning and that learning has occurred.

The perforated line at the base of Figure 3 indicates that at the conclusion of phase one, only a perfunctory use of the parents as a resource to support the children's learning had occurred at either centre. That is consistent with the findings of Meade (2001) regarding parents and the project approach. Despite this fact, the figure shows that the rudiments of a community of learners to promote environmental education in the early childhood curriculum had occurred. However, in order for a community of learners to evolve using participatory action research, the teachers at both centres would need to collaborate with the parents to complete the triangle. This would include valuing the parents' funds of knowledge and social capital regarding the environment. Taking credence of these two parental factors would culminate in the creation of a community of learners to promote environmental education and enhance the knowledge creation process for all of the participants of a community of learners.

Collaboration in a Community of Learners

To collaborate with their parents was certainly the desire of the teachers at both centres during phase two. Collaboration was the key when considering the potential of the parents' environmental funds of knowledge and social capital. By accessing these parental factors they would be able to further enhance the focus children and centre children's learning and knowledge base. Furthermore, they would facilitate their own environmental knowledge creation process as well as that of parents. Henrietta explained how she encouraged collaboration with the parents at the kindergarten. When asked how she involved the families in their community of learners she said, *I did a lot of verbal communication. I really used my parents the whole way through. I got tremendous support. It was brilliant wasn't it?* She spoke about all the kindergarten parents not just the focus parents. She commented, *It was great. Parents whose children weren't even involved but sort of wanted to be*

involved, to make the commitment. And I think it was because I was so enthusiastic about it, it just brought them on board.

The teachers at the childcare centre shared these sentiments about parental collaboration in their centre's community of learners. Communication was also seen as pivotal to the creation of a community of learners. Diana commented, *And to let them know what's going on …talking to them so that, you know, I really try to get them involved*. Kylie asserted, *the parents who might not be interested were, simply because the child was so enthusiastic and we were so enthusiastic*. For Jenny creating a community of learners meant, *inviting the parents on a lot of things and showing them the process of learning*. McCaleb (1997) supports close collaboration with parents. She argues that: "parents and communities need to be seen as equal contributors of understanding and knowledge to the educative process" (p. 26); a principle that is also central to participatory action research.

Although the teachers were enthusiastic in this combined interview about the creation of a community of learners in their centres, other variables impacted on the establishment of a community of learners. For instance, at the kindergarten work commitments impacted as Trish worked night shift and Carol full time. Different variables impacted on the community of learners at the childcare centre. Work was not an issue as most of the parents were not in paid employment. However, motivation to be fully involved in the research process was an issue and was evident when Denise did not attend the second interview. Eve, (her mother), apologised profusely for her then insisted that Denise ring me personally to apologise for her absence. Denise's reluctance to be involved meant that Eve had to responsible for Aaron (her grandson) and her own daughter Bethany's involvement in the research, especially on the excursions. In Denise's defence as a young mother, the research may not have been a priority as she had a younger child at home to care for. However, this did limit her involvement in the centre's community of learners. When the final interview occurred, Eve ensured Denise's presence by bringing her. This was to their credit as they were the only ones who attended from the childcare centre.

It takes time to establish trust and reciprocal relationships in a community of learners and the teacher-parent relationship is important. For instance, although Grace

(parent) was involved in learning experiences at the childcare centre, Jordan (son) was her first priority. He demanded her attention which limited her interactions with the teachers. She would interact with Jordan first, then the other children and lastly with the teachers. This was a limitation to the creation of a community of learners but perhaps a reality of working with parents in early childhood. Finally, my presence in the centres must have seemed daunting to parents from lower socio-economic areas. This was particularly so for the childcare centre that caters for young mothers and single parent families. They saw me as the expert on environmental education. I was viewed in a similar light to the teachers as the 'all knowing professional'. My comparative age could also have been a factor, as for the young mothers, I would have been the age of their own mothers. For that reason it took time to establish trust with them and this could have impacted on the process of creating a community of learners in both centres.

Despite these limitations, a community of learners that responded to children's environmental interests was created at both centres. The collaborative participation of the parents, the teachers' use of participatory action research and the knowledge creation of the children, parents and teachers were contributing factors in this process.

Children's Learning: A Socio-Cultural Approach

"A socio-cultural approach focuses on how children's communities, their activities, and relationships with members of their communities collectively guide children's development and education" (Goncu & Katsarou, 2000, p. 221). This description of a socio-cultural approach highlights the learning that occurred for the children in their communities of learning at both centres in the second phase of the research. The children interacted with all members of their community not just the disparate child-parent and child-teacher dyads that were representative of interactions in the first phase of the research. The teachers' provision of curricular projects based on the children's environmental interests offered opportunities for all members of the community of learners to collaborate to enhance the children's learning and knowledge base about the environment.

To fully implement a socio-cultural approach to the teaching of environmental education the teachers needed an understanding of the culture of the children at their

centre. This was essential if the teachers were to enhance the children's environmental knowledge through the community of learners. Goncu (1999a) conceptualises culture in two ways: first, culture as an independent variable and second, culture as a system of meaning. The first concept views a child's culture as an independent variable such as age, gender, development or education. This notion led to research that attributed differences in children's lives to differences in their development. Middle class western children were seen as the benchmark and this resulted in erroneous conclusions about low income or minority children's development and learning.

If this was the way the teachers in this research viewed the children's culture it would have had a detrimental effect on their learning, as both centres were located in lower socio-economic areas. This was not the case, however, as both centres were aware of the children's cultural backgrounds. They had a shared understanding of what was valued by the child's family. For instance at the kindergarten, *We did 250 meals* [for a hangi (Māori feast)] *so that was really huge* [community] *involvement*. When referring to how children learn Kylie, at the childcare centre, valued the children's home culture: *Anything happening around us in our area and in their particular background.* This knowledge allowed them to view the children's culture as a system of meaning. In this view, culture is not seen as a variable rather it is viewed as integral to a child's development. Furthermore, development and culture are seen as inseparable. The children are part of their cultural community and have shared meanings about what is valued in that community. This concept of culture greatly enhanced the children's learning within each centre's community of learners.

The concept of culture was illustrated when the focus children were asked who had helped them learn about their environmental topics of interest. Four out of five children at the kindergarten stated it was their mother who had helped them to learn. A typical answer was, *My mummy helping me*. The same was true of the childcare centre. Along with their mother helping them to learn, came other members of the child's family such as *my dad* or *my uncle told me that*. Bethany from the childcare centre learned through the tools of the culture (Wertsch, 1991) and stated she had learned with the help of *the telly*. Eve verified this in the parents' combined interview when she said, *she links things when she sees it on TV, back to the Aquarium*.

However, the most interesting response came from one child at each centre. Brooke at the kindergarten, stated, *I learned it all by myself* while Nicholas from the childcare centre replied in a similar vein by saying, *myself*. This supports Cullen's (1998b) view that children develop a sense of themselves as learners. Both children had created their own knowledge within the centre's community of learners. However, none of the children seemed to realize the role of the teacher in their learning.

Inter-subjectivity

Inter-subjectivity is a process of reaching a shared understanding when adults interact with children on a topic of interest and reach mutual agreements about the knowledge content. This can occur through play collaboration with peers, problem solving collaboratively with teachers and collaboration with the children's homes (Goncu & Katsarou, 2000). This concept was evident when the children were asked to recall excursions they had been on during the participatory action research phase of the research.

The children in both centres remembered the excursions that had taken place during phase two of the research. Both centres went to the Aquarium to support the children's interest in sea creatures. Excursions were seen as a valuable way to support the children's meaningful learning on an environmental topic of interest. Jill said, *We've made the outing go with the project*. Henrietta concurred, *There is always some underlying interest. The sea creatures project was very successful*. The importance of excursions for children's socio-cultural learning had been discussed. Both teachers, therefore, were aware that the Aquarium excursion would support the view of Palincsar (1998) "that from a socio-cultural perspective learning and development will take place in socially and culturally shaped contexts" (p.354). When asked about the excursions, Bethany from the childcare centre and Brooke from the kindergarten spoke about the interactions that took place amongst the community of learners.

Cynthia: *Can you remember when we went to the Aquarium?*
Bethany: *Yep.*
Cynthia: *What were the sharks doing?*
Bethany: *Um…all in the water.*

Cynthia: *Were they above your head or along the side?*
Bethany: *Yep above my head.*
Cynthia: *What else did you see at the Aquarium?*
Bethany: *Um* (pointing at me)
Cynthia: *You saw me there did you?*
Bethany: A*nd my mummy* (at this point she mentions several other children who went on the excursion with her*).*

Bethany was able to recall the Aquarium excursion but more importantly she recalled the childcare centre's community of learners and especially the fact her mother was there. She interacted with those who attended and learned together with them in a socio-cultural way (Lee & Smagorinsky, 2000). She was able to create her own knowledge in a group situation where the community of learners had a shared understanding and inter-subjectivity about sea life. Eve was able to further elaborate on the learning that occurred for Bethany. *Yeah, like she recognises the Aquarium when we go past. We were driving past there the other day and she was doing this* [non verbal action]. *I think it was more the dolphins. She was talking about the dolphins.* Eve has inter-subjectivity with Bethany and a shared understanding of what happened on the Aquarium excursion. Long after the event Eve was able to extend Bethany's learning and helped her create in-depth environmental knowledge because they had both shared in the socio-cultural learning experience of visiting the Aquarium.

Brooke was able to recall her excursion to the Aquarium also. Her mother, brother and nana also were part of the learning experience and assisted her knowledge creation.

Brooke: *We've gone to visit the Aquarium.*
Cynthia: *You've visited the aquarium, yes.*
Brooke: *And we saw a diver. And he was feeding the fish. And we saw a shark pass by. It was swimming.*
Cynthia: *Was it over your head. Or just down the side?*
Brooke: *It was down the side. Um lots and lots of clown fish.*
Brooke: *And I saw Nemo at the movies.*

Cynthia: *So you saw Finding Nemo. What else did you see?*
Brooke: *Lots and lots of fish.*

Brooke learned about sea creatures along with her kindergarten's community of learners in a socio-cultural way. She acknowledges this with the use of *we* to indicate they learned together. Finding Nemo, the movie, was also mentioned in reference to the fact Brooke had seen a Clown Fish at the Aquarium. She shared the experience with Marilyn at home. The diver made a big impression on Brooke. Marilyn recalls, *It's funny though about the diver. I think I heard more about the diver…and it's about the fish* [visiting the Aquarium]. *But the diver was so funny mum.* This illustrates the shared meaning and inter-subjectivity that Brooke has with her mother about the Aquarium excursion. It also illustrates Goncu's (1999b) concept of culture as a system of meaning. Marilyn obviously valued the excursion to the Aquarium as an educative experience (*it's about the fish*). On the other hand while Brooke tacitly agreed with her mother's values, the antics of the diver took precedence.

Children's Learning: A Knowledge Creation Approach

In the final interview the children were asked to *tell me what you know about… birds, sea creatures, insects*. This question gave the children an opportunity to co-construct knowledge with me and to demonstrate how they create their own environmental knowledge. Furthermore I had inter-subjectivity about many of the topics of interest that the children had investigated at each centre through the project approach.

Jacob had a passionate interest in birds and this was verified in a conversation I had with Marie at the centre. Jacob's intense interest in birds indicates a naturalist intelligence, one of the multiple intelligences of children (Gardner, 1999). This intelligence was added to Gardner's original seven intelligences and "involves the capacity to recognise and identify patterns and relationships in the natural environment, and the ability to recognise and take responsibility for the affect one has on the environment" (Hirsh, 2004, p. 134). The teachers, through the project approach and the many learning experiences offered, also extended Jacob's learning about birds. The family have birds at home and Marie (his mother) supported his interest in birds by helping Jacob to identify birds on the computer and taking him to

feed the ducks after childcare. The following example illustrates his learning and knowledge base about birds.

Cynthia: *Okay, what do you know about birds?*
Jacob: *The birds bite each other and they...some fight.*
Cynthia: *Why do they fight?*
Jacob: *They fight over the bread. And after kindy the ducks are hungry. After kindy we go down and feed the ducks with the old bread.*
Cynthia: *And you feed them with old bread.*
Jacob: *Yes yucky bread. Ducks eat yucky bread.*

Jacob is demonstrating a socio-cultural approach to learning about birds by feeding the ducks in a social context with his mother and sister. He is also socially constructing and creating his own knowledge about what ducks eat. He is aware of their characteristics and behaviour when he feeds them. He is also able to recall that they bite each other and fight over the *yucky bread* that is considered too old to be eaten by his family. Jacob is demonstrating the foundational domain knowledge he has about birds (Wellman & Gelman, 1998). This example also demonstrates the power of a community of learners and shows the importance of the home-centre link (Ministry of Education, 1996). Bridge (2001) in her research on parent involvement gained similar results. She found that home and centre were no longer separate places (for learning) but became an extension of each other. In phase two of this study the children, parents and teachers collaborated and were all focussed on the children's environmental interest in birds. They all had inter-subjectivity about the topic of birds and this resulted in in-depth learning for the children.

At the kindergarten, Brooke was able to demonstrate a great deal of knowledge about kiwis including aspects of naturalist intelligence (Gardner, 1999). In the final term the topic of interest was endangered New Zealand birds and the kiwi was one of the favoured species. Henrietta also reported that kiwis were *almost an overriding interest* that had lasted all year.

Cynthia: *Okay do you remember learning about a kiwi?*
Brooke: *They cannot fly.*

Cynthia: *They cannot fly that's right.*

Brooke: *Um, baby ones are scared of heights.*

Cynthia: *Yes.*

Brooke: *And they know the road to go down to the sea.*

Cynthia: *Right.*

Brooke: *And they are shy, people come towards them the kiwis run away.*

Cynthia: *Do they?*

Brooke: *They come out at night.*

Cynthia: *That's right because they are nocturnal aren't they?*

Brooke: *And they sleep in the day.*

Cynthia: *What else do kiwis do?*

Brooke: *In the nest they protect their babies.*

Cynthia: *Yes they do. Why do they have to do that?*

Brooke: *Because some naughty people or some naughty foxes or some naughty dogs might eat them.*

Brooke is demonstrating that she is able to co-construct knowledge with me as well as create her own knowledge because we both had inter-subjectivity about kiwis. This domain specific knowledge (Wellman & Gelman, 1992) included their characteristics and habitat. Of particular interest is the fact she mentions that predators could kill the baby kiwis and that the mothers protect them. Brooke has moved from merely knowing facts about kiwis to creating knowledge that the kiwi is an endangered species. This is a significant move and illustrates well that the teachers have emphasised the environmental education concept of conservation. Marilyn supported her learning at home. She reported that Brooke often sang the kiwi song. She commented, *I think that's a good way for them to remember. The kiwi's got a long beak and all the things she should know that make them different. It's an excellent little song.* This example exemplifies the meaningful learning that can occur in a community of learners (Rico & Shulman, 2004) when all the protagonists collaborate and have inter-subjectivity about the children's environmental learning within a community of learners.

Creating a Community of Learners: Parental Collaboration

When considering the creation of a community of learners it is important to recognise the process necessary for a community of learners to become a reality in an early childhood centre. To this end two perspectives were involved in the process of teacher-parent collaboration to create a community of learners in order to promote environmental education in the early childhood curriculum in this study. When interviewed, the teachers and the parents each had their own perspective on how this occurred. The teachers identified excursions, the child's environmental interest, documentation, and parental involvement and contribution, as factors that enhanced the creation of a community of learners. The parents highlighted home-centre links, supporting children's environmental interests at home and the centre, and appreciating the teacher's contribution, as essential factors that created a community of learners.

Pivotal to the process of creating a community of learners was the teachers' appreciation of the knowledge that the parents brought to the centre about the natural environment and environmental issues. This took the form of parental household funds of knowledge and social capital. Both these concepts occurred through the social network of their families and community. Moreover, the early childhood centre provided a strong social network as it offered shared values and understandings of the importance of including environmental education as an integral part of the early childhood curriculum.

When creating their centre's community of learners, the teachers were able to tap into the parents' environmental funds of knowledge. Furthermore, through the participatory action research approach, the teachers were able to utilise parental funds of knowledge as a useful resource when introducing environmental education into the early childhood curriculum. For instance at the kindergarten, Marilyn was able to share her funds of knowledge about her home wormery. This household knowledge proved invaluable when Sophie had to care for the kindergarten's wormery in the absence of Mary Lou. Likewise Marie's funds of knowledge about domestic birds within her household enhanced the childcare centre's project on birds.

Grace offered an insightful example of social capital when she was offering advice to a friend about the importance of caring for our children in the same way we care for the natural environment.

> *Yes well I was trying to explain to a girlfriend of mine she's only nineteen and her son's two. I said 'we've got to look after these kids `cause they are the youth and we're not the youth anymore'. And I told her that. She goes, but I'm only nineteen. I go yeah, but you've had your life. You know that's what I sort of was going through because I had Jordan when I was eighteen. But yeah, and I just sort of said you know these kids are our kids and they're just going to get bigger and that's really what life is all about. Look after the kids and give them the best.*

In this example Grace is illustrating her social capital by sharing her value system with a friend in her social network. Her experience of being involved in the participatory action research at the centre had made her aware that people are also part of the natural environment and need the same respect as all of the other living creatures. She was aware of her responsibilities as a parent and was pointing this out to her friend. Grace was also aware that the trust between the two friends would cement their relationship and make it more likely that her friend would heed her advice.

The description of social capital outlined above offered the teachers at both centres the opportunity to collaborate with the parents at their centre. This was necessary if they were to achieve their goal of creating a community of learners to promote environmental education at their respective centres. The participatory action research approach used in phase two of the research proved a very effective vehicle for this to happen. Through the social network of the early childhood centre, the teachers were able to develop trust with the parents through ongoing communication about what they hoped to achieve in their project approach to environmental curriculum. For example, Diana shared that the research had allowed her to get to know the parents better. At the kindergarten, Henrietta enlisted the help of a grandmother to research the children's topics of interest. In both these instances, the teachers and families held shared values about the importance of environmental education. The importance of supporting the children's environmental interests was also a shared vision. Through effective home-centre links they were able together to enhance the children's

environmental learning and knowledge base. As a result, a community of learners knowledgeable about the environment was created.

Parental Involvement in a Community of Learners: Teacher Perspective

The teachers identified four ways in which the parents were involved in their centres' community of learners. These were excursions, documentation, children's environmental interests and finally parental involvement and contribution.

Excursions

The use of the project approach at both centres meant that excursions were seen as a way to involve the parents in the community of learners. For example, Henrietta used excursions *to expand on different ideas put to us as staff* [by parents]. The honey farm excursion was an example of this and was the result of a child's interest in bees. Diana encouraged parental empowerment by keeping the parents informed about the programme and encouraging their participation. The topic of interest of animals resulted in a planned excursion to an animal farm. She commented, *They've been really keen. This next outing we've got so many coming we're hiring a bus.*

Documentation

Both centres used documentation (MacNaughton & Williams, 2004) as a way to improve relationships with parents and create a community of learners. Henrietta spoke about the kindergarten's 'what we have been learning board'. She enthused, *we have a board up with children in the photos and we have a board of different* [environmental] *posters*. Jenny mentioned, *doing learning stories has been really good. It really draws them in*. Jill reported that the project approach, *because it was such a big focus had made the children feel empowered to discuss the documentation and to share their knowledge with their parents*.

Children's environmental interests

The teachers at both centres encouraged the parents to be part of the environmental education curriculum and to take an interest in the children's topics of interest. This developed the parents' confidence that their involvement was valued. Kate explained, *if a child has an interest we try to encourage it by talking to the parents about it quite enthusiastically and generally they pick up on it*. Diana mentioned Eve bringing in

the painting of the birds and commented, *yeah they really got behind us on it*. This was certainly the case with the recycling at the kindergarten. Henrietta shared, *the parents bring in potato peels and carrots*. The recycling at the kindergarten and the wormery meant parents were able to support the children's environmental interests in both these aspects of environmental education.

Parental involvement and contribution

Many instances of parental involvement were mentioned and this highlighted the valuable home-centre link. Learning was not confined to either context, rather it was a combination of both that resulted in the creation of a community of learners to introduce environmental education into the early childhood curriculum at both centres. An example from each centre is representative of the parental involvement and contribution that occurred at both centres. Henrietta spoke of a parent's contribution of some tadpoles and the resultant learning within the kindergarten's community of learners.

> *We had 12 tadpoles, four or five died. And so every week we changed the water, we went down to the stream and brought the water and the children brought the food. And it was just amazing. It was exciting for me to actually be able to get them to frogs. And then in the second term Megan took them and released them because we couldn't keep them for the hibernation part. The kids talked about next year we'll actually do that. So that was really neat.*

During the insect project at the childcare centre Pania shared, *a wonderful mum* [Alice] *made a snail house with her* [Ashleigh] *and she brought that in to show us. She still has that snail house in a plastic fish tank. And there are also three parents interested in the snails.*

These two examples along with all the previous examples of parental involvement serve to illustrate how the teachers at both centres created a community of learners. Both the teachers and the parents had shared meanings and inter-subjectivity about the promotion of environmental education within the early childhood curriculum. The empowerment of the parents was evidenced by their enthusiastic involvement in the excursions. Meaningful relationships between the teachers and the parents occurred through parental appreciation of the documentation of the children's environmental

topics of interest. The parents' support of the children's environmental topics of interest and the teachers' appreciation of the parents' environmental knowledge and funds of knowledge was also a feature. Finally, the parents' involvement and contribution within the community of learners demonstrated how teachers can create a community of learners consisting of parents, teachers and children who are knowledgeable about the environment. This notion is consistent with the centre of innovation research (Ryder & Wright, 2005).

Parental Involvement: Parent Perspective

To ascertain parental involvement in the creation of a community of learners by the teachers at both centres, the parents were asked what form their involvement took. Four themes were highlighted; home-centre links, supporting children's environmental interests at home, appreciating the teachers' contribution and affective attitudes. Larsen and Haupt (1997) argue that a desire to support children's learning is the primary motivation for parental involvement and this was demonstrated in this study. This happened in a variety of ways. The social network of the kindergarten offered a platform for the parents to utilise their social capital for the benefit of the community of learners. Their social capital supported the various environmental topics of interest associated with the project approach, as well as allowed them to contribute their environmental funds of knowledge.

Home-centre links

Linking learning from the centre with home and vice versa was important to the parents. Denise from the childcare centre had taken an interest in the insect project and ensured Aaron had continued this topic of interest at home. Eager to support Aaron's learning she decided to take a spider to the centre to show the children. Denise takes up the story.

I went to tip something down the sink and there's this huge spider came running up beside me. Oh we'll take this down to day care and show the kids. It was a white tailed spider and it was really big but I didn't realise they were poisonous.

Kylie continues the story at the childcare centre.

Kylie: *And we had the unfortunate incident with the white tailed spider."*

Cynthia: *Did someone get bitten?*

Kylie: *No. Someone said 'oh the spider's on the little boy'. And I didn't know it was a white tail so I grabbed the spider and put it back in the thing. And then someone said 'did you know that was a white tail?' So we got it back and it didn't hurt, thank God.*

This illustrates the hazards of bringing insects into the centre without knowledge of whether or not they are poisonous. Denise wanted to support the children's topic of interest and as she said, *I had the right idea*. She was indeed sharing her social capital based on home-centre relationships, with her centre's community of learners and her enthusiasm was to be commended. However, the parents, children and teachers learned a valuable lesson that day about the reality of nature and the need to have knowledge about the natural environment.

Marilyn created a wormery at home. She wanted to compost food scraps and to use the compost created by the worms in her garden. This is an example of household funds of knowledge. Marilyn involved Brooke in this process. They got the basic wormery kit from the Warehouse (a general merchandise, bulk retailer) and visited the worm farm to get the worms. Marilyn's funds of knowledge were put to good use when Sophie needed her advice on the wormery at the kindergarten. Marilyn displayed her social capital about relationships between herself and Sophie. She realised she could build on that to co-construct knowledge with Sophie about wormeries. She recalled:
She [Sophie] *said 'I really don't know'. She said 'well you've got one haven't you and I said yes'. So I went to have a look and I said 'I don't think it is going very well' – so I sort of helped out with that.*

Marie (a parent) stressed the importance of home-centre link when she emphasised that learning should not just occur at the centre. She commented, *like they're learning something somewhere, there's no point just keeping it there. It needs to be at home too*. In her view the social capital in both settings should benefit the children's environmental learning. Lin et al (2001) concur and argue that social capital, like human capital, has a 'payoff' for both parties when social capital is shared.

Supporting children's environmental interests at home

The premise of social capital is that relationships matter (Field, 2003). The following two examples (one from each centre) illustrate the children's theories of the world and the co-construction of knowledge between mother and child on the concept of death as a part of nature. The examples also add credence to the notion that children create their own knowledge about the process of dying. Grace supported Jordan's environmental learning at home and spoke about taking him to the beach because Jordan's father wanted to collect paua. This is an example of funds of knowledge as Jordan's father has knowledge of this Māori cultural practice and was supplying food for the household. While this was happening Grace and Jordan collected shells and noticed a dead sheep on the beach. Grace explained to Jordan, *well he just died and he was a bit thirsty because it's really hot on the beach. He goes 'oh yeah he's alright'. The sheep. He wasn't like sad or anything. He said 'oh mum he died' so he's alright*. This illustrates Jordan's acceptance of the cycle of life and what Bell (2005) describes as the nature metaphor of 'nature as a wilderness'.

Janet supported the planting topic of interest at home. She shared that Kimberley had a garden and she called it a pet cemetery. This was because Kimberley's cat had died and they had buried it in the garden. Janet reported that Kimberley had said, *oh we have a pretty cat buried and it is going to make the flowers grow*. Kimberley is demonstrating the environmental education concept of composting. Janet shared that Kimberley's grandmother had died recently and Kimberley had attended the funeral and there had been 'ashes'. Kimberley was reflecting on the death process and relating this to the burial of her cat. Bowman et al. (2001) argue that scientific reasoning as is illustrated here can be used to verify children's growth in learning.

Appreciating the teachers' contribution

The parents at both centres appreciated the effort put in by the teachers. This was evident in their responses. Marilyn appreciated the *time and effort* put in by the teachers. When picking up Brooke she noticed the documentation, *and they write up we've planted beans and then I start to look at other things and I think its all nature Yeah*. Carol commented, *I really noticed the wormery. There were things up on the notice board, charts and pictures*. This supports the value put on documentation by Henrietta as a way to involve the parents at the centre. Grace stayed at the childcare

centre every Wednesday to support Jordan and the other children's learning. She noticed what was up on the walls and discussed this with Jordan. More importantly, however, she commented on the improvement in Jordan's learning. She reflected, *just thinking now, he has been drawing pictures. He never used to. There never used to be pictures in his folder now there's pictures of animals.* This highlights the contribution made by the teachers to create a community of learners to promote environmental education in the early childhood curriculum. Alice also appreciated the effort the teachers were putting in. She explained it thus: *anything they* [the teachers] *show you, I show my daughter. Sharing knowledge from the teachers with my daughter.* This illustrates the reciprocal nature of social capital based on relationships (Field, 2003) and provides evidence that the childcare centre had created a community of learners.

Not all of the parents were able to be fully involved in the creation of a community of learners at the centres. Work and family commitments precluded this. According to Marsh (1995), this is the main stumbling block to parent involvement and this applied to Carol and Janet. Larsen and Haupt (1997) concede that time is the biggest impediment to parental involvement in educational institutions. Marilyn summed up the work/family commitment at both centres. Finding time to read the profiles was a case in point. She commented, *they* [parents] *don't seem to read it. You just pick up your kids and drop them off.* However, some parents at both centres stayed and offered hands on involvement with the children. This had not occurred in the first phase of the research and adds weight to a community of learners being created at both centres through participatory action research. Christine was actively involved at the kindergarten while Grace and Eve spent valuable time with the children at the childcare centre. Tijus, Santoline and Danis (1997) attest to the benefit of involving parents in the centre programme with children from lower socio-economic backgrounds. They found that when parents worked alongside the teachers more complex cognitive interactions occurred for the children and this was evident in Grace and Alice's responses.

Affective attitudes

Attitudes of care and respect for nature and the natural environment are an important part of environmental education (Prince, 2004). Grace related an incident at home

that involved a clash of values between her and her mother. Grace had wanted to encourage Jordan's interest in snails and had prepared an ice cream container with weeds and snails. Grace's mother was against the whole project and tried to deter her. Grace relates the conversation that occurred between her, her mother and Jordan. Grace said, *my mum said: you know you don't have snails as pets… tell him that snails are not good 'cause they eat plants. And he said no, no they're alright*. This example illustrates Grace's desire to support Jordan's interest in snails and to model a sense of wonder towards nature. It also shows Jordan's sense of wonder and caring attitudes towards nature. This was in sharp contrast with her mother's attitude that snails were *not good* because they eat plants. This is a commonly held belief and many packets of snail bait attest to this. For gardeners, snails are pests that need to be eradicated (Elliot & Emmett, 1997).

Parental transformation: A Change In Attitudes

The participatory action research process and the creation of a community of learners to introduce environmental education into the early childhood education curriculum resulted in a transformation (Fullan, 2003) in the parents. This was evident when the parents were asked what learning had occurred for them during the research process. A comparison of interview data revealed a change in attitudes towards the environment and an awareness of environmental issues. Grace and Angela's responses were typical. Grace reported that she now recycled her cans. She enthused, *me and mum recycle cans now*. *You taught us to recycle*. When asked what she had learned through the research process she confided, *probably to be more respectful of the environment*. Angela offered a similar response at the kindergarten. She said, *You helped me and my child to understand what happens when you don't look after the environment. I knew about it but never really promoted it. I was a bit resistant.* The use of *you* in these instances refers to involvement in the community of learners at their centres.

Angela's explanation of the learning that occurred for her confirmed how the participatory action research process had evolved to create a community of learners. Central to this process was Greta. Angela commented, *I've learned to recycle and to have a garden. I would not have done these things previously*. *But Greta is a very persistent girl*. The demonstration of environmental education principles at the

kindergarten had an impact on Angela. She confided, *but seeing Greta at kindergarten with all the things labelled* [recycling buckets] *it has made me aware*. This is an excellent example of the creation of a community of learners. All three protagonists are learning together about the responsible disposal of waste, a central tenet of environmental education.

Bell (2005, pp. 50-51) posits the notion of five environmental 'moments' of sense-making and action. These are conceptualising, knowing about, knowing how to respond, responding and acting. Conceptualising about the environment is related to sense-making about environmental issues or problems. Knowing about the environment is acquisition of new knowledge for environmental decision making. Knowing how to respond is about moral and ethical knowledge of a suitable response to the environment. Responding includes having motives and values about the environment but not actioning them. Acting the final 'moment' is about changing behaviour. It means learning new behaviours and abandoning the old. Both Grace and Angela had progressed through all five environmental 'moments' of environmental sense-making and action and arrived at changed behaviour. They replaced their old behaviour concerning recycling to new behaviour for sustainable living.

New learning

The chance to learn new things was highlighted by several parents at the childcare centre. For instance, Alice said she had learned new facts about snails due to Ashleigh's passion for snails. She said, *I learned snails can live under water, breathe under water*. Both Marie and Grace spoke of the learning that had occurred for them as part of the bird project at the childcare centre. For Christine it was learning about the wormery at the kindergarten. She stated, *If you had said to me about a wormery last year I wouldn't have had a clue. I wouldn't have known what a wormery was*. These examples show that the parents have become an integral part of each centre's community of learners.

Awareness of environmental education

Although all the parents had gained a greater understanding of the importance of introducing environmental education into the early childhood curriculum, it was Carol

who articulated this for the others. She explained, *I have become more aware of environmental education, the subject. It was just a title. It is to me how it grows, plants and animals*. This example highlighted the fact that the participatory action research process, and the creation of a community of learners at the kindergarten, had deepened Carol's awareness of environmental education. Because of her own learning she was now able to recognise the importance of environmental education as an integral part of the early childhood curriculum.

Awareness of children's learning processes

Several parents highlighted gaining an awareness of the learning process for children (Bransford et al., 1999). Marie spoke of *learning how they are learning* while Christine appreciated the way the teachers simplified environmental concepts for the children *so they don't get bored with big words*. However, it was Marilyn who outlined the importance of the learning process. Marilyn reflected, *I think I just learnt by watching the process of how children learn*. Eve agreed, *I understand them more. I understand what they want to learn.* Eve and Marilyn have inter-subjectivity about the learning process and Marilyn articulated this as it applied to Brooke.

Marilyn said, *cause a couple of times she said to me 'I don't want to go to kindy today'. And I said 'why?' And she said 'I like playing but I don't like learning'. I thought I didn't realise she knew that word. And I said 'learning is fun isn't it? Learning new things? 'Oh yeah but I'd rather just play'. But they don't realise they are learning.*

Athey (1990) found through her research that parents were very interested in their children's activities at the centre. Marilyn has discovered through the participatory action research process and the creation of a community of learners that children learn through play. Marilyn explained the process of learning well when she talked about how children bring things to kindergarten and talk to the teachers about them as well as their lives in the home context. She shared, *she'll* [Brooke] *come home and tell me where they* [the children] *live. They live on a farm. So they find it interesting what other kids get up to*. This epitomises the community of learners and the shared meanings of the social capital of the children Brooke attends kindergarten with. The example illustrates the three-way communication that happens when a community of learners is fully functioning (Ramsey et al., 2005). Christine offered this explanation.

She said, *how the teachers are teaching me, and me going myself and looking for information, so I can learn about it to pass it onto Louisa. Which she passed on to the kids here.*

Teacher Transformation: New Environmental Learning

The use of participatory action research in the second phase of the research and the teacher's desire to create a community of learners to introduce environmental education into the curriculum in their respective centres brought about a change in the teachers. They became more aware of working as a team and of the children's capacity to learn through challenging learning experiences that encourage competence in children (Bowman et al., 2001). This was especially so through the project approach and the children's topics of interest. When the teachers were asked what learning had occurred for them, learning new things, researching topics of interest and a greater awareness of the environment were some examples offered. For instance, Elizabeth discovered that the blue whale was the biggest whale. She confided, *I was discussing with the children the biggest whale and I thought the hump back whale was…so I went home and researched it and found out the blue whale is actually the biggest thing on earth. That was huge learning for me*.

Henrietta stated, *Well I've learned heaps through this really. I've become more positive towards the environment and conservation and it's made me more aware of what we've done.* Sophie agreed, *Well I was really impressed when I came back to see enthusiasm and the things the children were learning. I grew up on the land. I took it for granted, and thought it was common sense. But it's not at all. It's not until you think about the environment. And that's really good*.

In the second phase and by using a participatory action research approach, the teachers at both centres had created a conceptual artefact in the form of a community of learners. This occurred through developing trust, collaborating with the parents and valuing their involvement, in the centre curriculum. By valuing the parents' environmental funds of knowledge and their social capital the teachers' aim to create a community of learners was achieved.

The strengths and limitations of focus groups

The use of focus groups for teachers and parents was an essential research instrument to gain valuable information on environmental knowledge creation. It also gauged the participants' beliefs, attitudes and perceptions about environmental education. As outlined earlier the final combined parent focus group interview proved problematic. The lack of attendance and the end of year timing of the focus group made it impossible to organise another time to meet. Therefore, the use of individual interviews was the only alternative.

The teachers at both centres encouraged the parents to be involved both at home with their child but also at the centre. At the kindergarten the wormery inspired Marilyn to have her own wormery at home and to encourage Brooke to take part in the daily feeding. Brooke's nana benefited from this family's social capital and she too was involved in feeding the worms. Marilyn was also able to offer her funds of knowledge about wormeries and she did this with the teachers at the kindergarten. At the childcare centre Marie was able to share her funds of knowledge about domestic birds. This led her to support Jacob's interest in birds. The social network of her family (also interested in domestic birds) meant she had funds of knowledge about the bird topic of interest at the centre.

Figure 4 (see over) shows that the two-way triadic relationship among all three protagonists of the community of learners was finally complete.

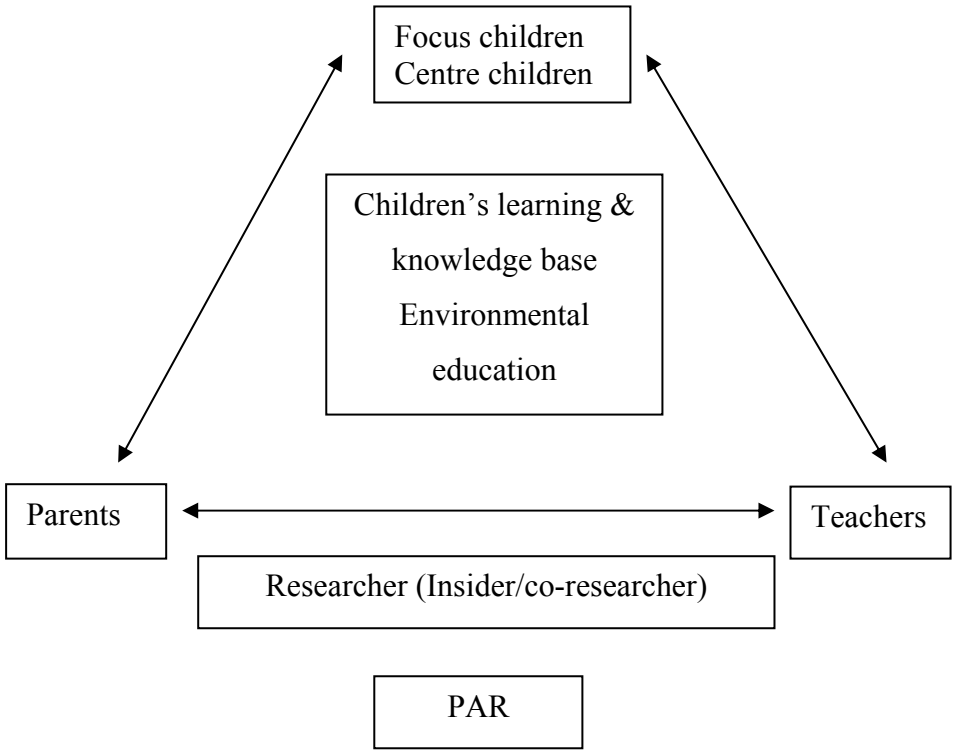

Figure 4: Phase two: A Community of Learners is Created

Community of Learners: Transformation

At the conclusion of the EEIC only cursory involvement by the parents had occurred. They took a supporting role rather than the active role required to create a community of learners. This meant that after phase one the community of learners had not yet been created. This was achieved in phase two by the teachers taking charge of the research. The participatory action research methodology acted as a vehicle to bring the parents on board through the project approach, the emergent curriculum and the children's topics of interest. This approach allowed all the proponents of the community of learners to create their own knowledge about the environment.

Both centres created a community of learners through collaboration with the parents to enhance the children's learning and knowledge base. This epitomised the effective collaboration outlined by Head (2003). It was evident from the responses at the combined interview when teachers from both centres offered examples of how they created a conceptual artefact in the form of a community of learners at their respective centres. They had inter-subjectivity about the participatory action research process and what they had hoped to achieve in phase two of the research. Emphasis was

placed on how a curriculum based on children's environmental interests, the project approach, and parental empowerment can be instrumental in creating a community of learners. This was especially so when they talked about the involvement of the parents in the community of learners. Teachers from both centres shared that they valued the input of the parents and this is consistent with the research of Ryder and Wright (2005). They also valued the environmental knowledge the parents contributed to a community of learners to promote environmental education in the early childhood education curriculum. It also meant that their combined knowledge about the process of creating a community of learners was 'distributed'. This promoted environmental education within the early childhood curriculum and a combined commitment to a community of learners.

Combined commitment

The following table (see over) illustrates the relationship of combined commitment by all proponents of the community of learners to create their own environmental knowledge.

Table 15: Relationships: Combined commitment

Phase 2: Participatory Action research: Community of learners		
Environmental education: Environmental knowledge creation		
	Kindergarten: the wormery	Childcare: birds
Teachers	Henrietta *Mary Lou went to that meeting* [on creating a wormery] *and we've taken the wormery from there and hence we got totally into recycling with the children.*	Kylie *Once again a little girl made a bird and an egg out of dough. So we sort of pointed that out to the parent when they came in.*
Children	Brooke: *I've got a square one.* Cynthia: *So what's in the wormery?* Brooke: *Worms and food. They just eat yukky food people don't like. Yep, I feed the worms. One day my Nana came over and she gave him* [Reece] *one to feed the worms 'cause she thought they may bite her. But worms don't have teeth.*	Cynthia: *Do you remember we went to feed the birds at the park?* Ashleigh: *The birds were hungry and we had bringed them bread. We went on the swings at the park.*
Parents	Marilyn *I said to her* [Sophie] *I said you need more worms because that's quite a big worm farm. So I told her where I got the worms from. I thought it was quite cheap and the lady was very helpful.*	Marie *Jacob wanted to look up New Zealand birds that were around home. And then on the computer it had pictures of New Zealand birds and he was looking through them trying to figure out what birds were around home.*

The community of learners comprising teachers, focus children and parents at both centres illustrates the theme of relationships and combined commitment to environmental education. In Table 15 above all three perspectives at the kindergarten are evident in the responses about the wormery. Equally, references to the bird topic are evident at the childcare centre.

The inter-subjectivity between the two centres continued and culminated in research presentations featuring the 'research stories' of the teachers from both centres. These occurred individually to begin with and then in a combined research presentation at a local tertiary institution in August 2005. The research presentations allowed for the reporting of the 'work in progress' of the research. They took place during and after the completion of the fieldwork stage of the research. Diana and I were involved in a

presentation in November 2004 on creating a community of learners to introduce environmental education into the centre's early childhood curriculum. She shared with the audience her research experience working with the children's environmental interests using a project approach. Sharing her documentation of the children's learning was of particular interest. Henrietta presented her story to a kindergarten conference in July 2005 in her local area. She shared with her colleagues her research journey. She highlighted the benefit of creating a community of learners that valued parental knowledge and children's interests as the starting point of the project approach. Mary Lou was there to share her experience on wormeries with the audience who showed considerable interest.

In the combined presentation, Henrietta again reflected on her research experiences sharing with the audience her initial reluctance to take part. However, her enthusiasm for the project approach was clearly evident to the audience. Pania and Kate shared their 'research stories'. The research symposium allowed Kate to demonstrate her considerable strength in early childhood music. It included a performance of one of her original songs complete with her colleagues from the audience joining her in the performance.

The sharing of their research stories and their combined presentation at the research symposium indicated the goodwill between the two centres. It highlighted their inter-subjectivity about the benefits of creating a community of learners to promote environmental education. This was a public demonstration that a transformation had taken place.

Chapter Summary

In this chapter, parental involvement in the community of learners and the collaboration needed to create a conceptual artefact was outlined from a teacher and parent perspective. Parent's social capital was able to be demonstrated with the support of each early childhood centre and was aided by the participatory action research process. Environmental education gained at the centre was supported at home through the parents' funds of knowledge and in turn this knowledge was contributed at the early childhood centre. This resulted in more meaningful learning and knowledge about environmental education. Furthermore, all the proponents of

the community of learners had inter-subjectivity about the community of learners and environmental education and their environmental knowledge creation.

Focus children, parents and teachers from both centres demonstrated how they created knowledge about their environmental 'passions'. Documentation of the projects was a way that the teachers invited the parents' participation. Although the parents were not involved in data collection or action planning, the teachers documented the children's learning and shared it with the parents as part of the participatory action research process. Furthermore, it was the participatory action research process that led to a transformation for both the teachers and the parents. Moreover, respectful attitudes towards the natural environment and a commitment to a more sustainable lifestyle resulted. New learning and knowledge creation occurred for both the parents and the teachers. The parents became more aware of the children's learning processes, while the teachers, through researching children's environmental topics of interest, gained knowledge and insight about the natural environment.

In the final chapter the research process is discussed. The five main research questions are addressed as they relate to the themes of knowledge creation, collaborative participation, a community of learners and relationships. Implications for teachers, reflections on methodology and suggestions for future research are also explained.

Chapter Eight: Discussion and Conclusion

Introduction

The discussion chapter addresses the main research questions. Four themes emerged in the study: knowledge creation, collaborative participation, a community of learners and relationships. Question one, what constitutes the environmental education knowledge base of preschool children? and question two, what knowledge does the family contribute to children's environmental education learning and knowledge base? are discussed using the findings of interview one. Knowledge creation is used to explain the teachers' role in the implementation of the EEIC in phase one and answered question three, how do teachers perceive their role in the implementation of environmental education into the early childhood curriculum? The teachers' use of the project approach in phase two answers question four, what contribution do early childhood teachers make to children's environmental learning and knowledge base? This question is examined under the themes of collaborative participation and a community of learners and relationships. These themes are also used to address question five, in what ways does participatory action research methodology and the community of learners concept evolve to promote environmental education within the early childhood education setting? Implications for teachers of the research, reflections on methodology and suggestions for future research are also explained.

Baseline Environmental Knowledge

Four environments were used for analysis: natural, play, human made and social (Florgaitis et al., 2005). All of the children identified the natural environment in all 12 photos indicating environmental awareness, which is contrary to the findings of Prince (1994) where play items were identified first. Findings in this study indicate a greater awareness of the natural environment by the children.

Parental knowledge and awareness were expressed either tentatively or definitely. An awareness of environmental issues reflected Fien's (1993) ecological positions of cornucopia, accommodation, eco-socialism and gaianism. The majority of the parents recycled household rubbish although the downsides were emphasised. Most parents' responses reflected education *about, in* and *for* the environment (Fleer, 1998; Palmer & Neal, 1994). Responses at the childcare centre were predominately *for* the environment indicating a greater awareness of environmental issues. Conversely, the

responses from the kindergarten parents did not reflect this awareness. Furthermore, links between environmental education and a need for sustainable living and protecting the planet were not apparent. As gaining baseline knowledge about environmental education from the participants was the primary focus, the four themes of knowledge creation, collaborative participation, community of learners and relationships had not yet emerged. However, the children's awareness of the environment and the parents' environmental knowledge was significant for the subsequent research as they were able to draw on it to create new environmental education knowledge.

Knowledge Creation

A socio-cultural/knowledge creation approach

Since the advent of *Te Whāriki* (Ministry of Education, 1996) a socio-cultural approach to learning has become accepted philosophy. However, some would argue that in many centres the gap between theory and everyday practice is still evident. The teachers' role in the socio-cultural approach is to support children's learning by implementing environmental education into the early childhood curriculum. However, this study argues that this is only part of the way children learn. Children also create their own knowledge within the socio-cultural context of their homes and the early childhood setting. This leads to meaningful learning when it is grounded in their own socio-cultural experience of their homes and the early childhood setting. Many examples from this study provide evidence of the socio-cultural/knowledge creation approach to children's learning.

Children's domain knowledge about biology for instance is supported by the knowledge creation process. Both Brooke and Jacob had domain knowledge about kiwis and other birds respectively. This socio-cultural/knowledge creation approach led to deeper knowledge of their environmental topics of interest. Excursions are another way that children can learn in a socio-cultural manner while at the same time creating their own knowledge. Bethany's knowledge about dolphins was supported and verified by Eve's inter-subjectivity about the aquarium excursion. The socio-cultural/knowledge creation approach also acknowledges parents' use of their social capital (values, relationships) and household funds of knowledge. This was evident in

Jacob's interest in birds and Brooke's home wormery. Both children created their own environmental knowledge about their topic of interest.

Knowledge creation can also be displayed in children's dramatic play, singing and artwork. The children's artwork at the conclusion of the research highlighted the personally meaningful environmental learning that had occurred for them. An interest in books for information and enjoyment is another way knowledge can be created. The focus children in this study used books and created their own knowledge based on their self motivated interests, passions and preferences. Support was given for this form of knowledge creation through the community of learners. The recycling bins at the kindergarten that were developed as part of a topic on rubbish were another example.

Megan's experiment on pollution proved the long lasting benefits of the socio-cultural/knowledge creation approach to environmental education. After the mat time discussion, Brooke was able to share with her friend her knowledge about pollution and to make the connection that it was *Megan's water*. Brooke was creating her own knowledge 'in the world' by using the experiment to deepen her understanding of pollution in the community.

Children learn in a socio-cultural way (Goncu & Katsarou, 2000). Culture as a system of meanings is espoused by Goncu (1999b). The teachers at both centres were very aware of the shared meanings and culture that was valued by the centre families. The majority of children, when asked who had helped them to learn about their environmental topics of interest, said members of their family had helped them. Bethany's *the telly* supports Inagaki and Hatano's (2002) assertion that children learn through the social practice of watching television. Brooke and Nicholas were aware of themselves as learners (Cullen, 1998a).

An interesting finding here is that not one of the children thought that the teachers at their centre had helped them to learn. However, this finding could indicate the children's limited meta-cognitive ability to reflect on how learning comes about. Teachers could further support learning by being aware of their interactions with children. One way is to use meta-cognitive dialogues with children to assist them

understand the what, why and how of learning (Prince, 1994). Conversely, the children's responses about their environmental learning highlighted the importance of the parent-child interactions that occurred in their homes. It also adds credence to the notion of culture as a system of meaning (Goncu, 1999b).

Te Whāriki: A Critique

If environmental education is to be fore-grounded within *Te Whāriki* (Ministry of Education, 1996) the early childhood curriculum, existing critiques (Cullen 1996, 2000) need to be taken into consideration in order for environmental education to become education for sustainability in the 21st century. (Potter, Douglas & Selby-Neal, 2004). Although the implementation of environmental education was the focus of this research, education for sustainability is seen as the way forward in the decade of sustainability 2005-2014. Potter et al. (2004) suggest environmental education has often taken an 'against' stance on environmental issues whereas education for sustainability concentrates on positive outcomes for the same issue. This approach takes into account the social justice, cultural, political and economic aspects of people's lives. Moreover, Figure 1 (page 15) in this research outlines education for the environment through appropriate action; this accords with the concept of education for sustainability. Interestingly, Potter et al.'s publication only recognises primary and secondary school provisions of education for sustainability. This research advocates for the knowledge, skills and attitudes to be instilled earlier, at the early childhood level.

TeWhāriki is hailed as a socio-cultural curriculum. However, the pervasiveness of developmental psychology is still evident (Cullen, 2003). An emphasis on individual child development means that although teachers espouse the use of a socio-cultural approach to early childhood education, a free play, non interventionist approach is still visible in many centres (Meade, 2000). If this is the case, a socio-cultural approach to environmental education as advocated in this research, could be difficult to achieve. Conversely, if teachers have a deeper understanding of the benefits of a socio-cultural approach to environmental education where the child is seen as integral to a community of learners, this could become a reality.

Cullen (2003) has raised the issue of teachers' interpretation of *Te Whāriki.* She cites the issue of teachers' interpretation of the acknowledgement of diversity as an under-interpretation of *Te Whāriki* while the opposite is true of their interpretation of *Te Whāriki's* holistic aspect. For instance teachers saw *Te Whāriki* as acknowledging a child's 'culture' therefore, respecting diversity was a given. In her view the over interpretation of the holistic principle of *Te Whāriki* occurs when holism is interpreted as following children's interests within a free choice curriculum. This superficial interpretation allows teachers to justify existing play-based practice and the strong developmental psychology under-pinning associated with it. This 'business as usual' approach prevents teachers following a socio-cultural pedagogy where teachers gain environmental content knowledge and extend children's interests through long term projects.

A similar finding occurred in this research where teachers used the weaving metaphor as a justification that environmental education was an integral part of *Te Whāriki* and was therefore woven throughout the document. This assumption needs 'unpacking' and a different perspective offered. Perhaps the reason for this interpretation by the teachers is that *Te Whāriki* is not explicit about environmental education content. This lack of explication makes it difficult for teachers to gain the necessary environmental education content to integrate environmental education into the centre curriculum. Furthermore, this makes supporting children's interests through the project approach an arduous task. The wide consultation process involved in the development of *Te Whāriki resulted* in an 'all things to all people' curriculum that is difficult to interpret (Nuttall, 2003).

If in the future *Te Whāriki* is revised, it is recommended here that education for sustainability is fore-grounded, as it is presently both in New Zealand and worldwide. This could occur through the present structure of the document and a specific goal on sustainability with the associated learning outcomes: knowledge, skills, and attitudes added to each of the five strands. This would address the present difficulty of interpretation while at the same time suggesting socio-cultural ways to interpret education for sustainability. The process could be assisted through the use of relevant reflective questions that encourage teachers to take a questioning stance on their practice. Furthermore, it would give education for sustainability (and environmental

education) equal status with the other goals under each strand, thus highlighting its importance in early childhood education.

Collaborative participation

The participatory action research process was especially suited to the establishment of a community of learners in a lower socio-economic location. It invited the involvement of parents through collaboration with teachers. Furthermore, their combined confidence in their ability to lead the research and to plan a meaningful environmental education programme was strengthened. Participatory action research is about people constructing and reconstructing their social reality (Kemmis & McTaggart, 2000) and this is what both centres achieved.

Through participatory action research the participants in the community of learners sought to change their existing practice in the social situation of the centre. They worked collaboratively in the community of learners to promote environmental education in early childhood curriculum. This emphasised the participation component of participatory action research. Their endeavours led to transformation (Fullan, 2003) in attitudes towards the environment and notions of sustainable living.

The conceptual artefact of the community of learners was the vehicle to create their own environmental knowledge. Fals Borda (2001) argues that participatory action research is the theology of oppressed peoples. This parallels the use of the participatory action research process that occurred in both centres located in lower socio-economic areas by empowering the teachers to lead the research and working collaboratively with the parents. The research on funds of knowledge (Moll, 2000) was also conducted in lower socio-economic areas and valued the knowledge brought to the school [centre] from the home. The participatory action research process used in this study strengthened the home-centre links also.

The use of participatory action research in this study was an opportunity to give credibility to this research process (Kemmis & McTaggart, 2000). This was achieved through the examination of ways in which the conceptual artefact of a community of learners was created. This in turn answered question five that investigated in what ways does participatory action research methodology and the community of learners

concept evolve to promote environmental education within the early childhood education setting? Participatory action research accepts multiple truths while acknowledging the truths of others. The teachers acknowledged parental funds of knowledge and their social capital. Furthermore, they acknowledged children's theories of the world thus conceding that a teacher's perspective is not the only one.

The participatory action research methodology assisted the teachers through cycles of observation of children's environmental interests, collecting data, analysing data, reflection on data and planning for another cycle. They were able to engage in dialogue with the parents and children and reflect on how environmental education was being integrated into all areas of the curriculum. Furthermore, they were able to reflect on their own practice and analyse how they could research content knowledge, implement an environmental education programme and create a community of learners.

The project approach as used by the teachers at both centres has three phases: choosing a topic of environmental interest, providing supporting curriculum and finally reflection on the success (or otherwise) of the project. This cyclic process complemented the participatory action research process and was embedded in the teachers' centre practice. An example of the teachers developing a questioning stance was when the teachers at the childcare centre chose the topic of interest of Spring This was not a successful project. However, on reflection the teachers were able to build on the children's interest in baby animals, culminating in an excursion to a farm for all the participants in their community of learners.

A weakness of the participatory action research design was the fact the teachers did not have an input into the research questions, an essential component of participatory action research. They instead chose to follow my research questions. Although this was not ideal, in reality these research questions became the overarching questions (especially question five), while the teachers used the children's environmental questions as the starting point for not only the project approach but the participatory action research process also.

In the first phase of the project approach gauging children's topics of environmental interest was the first step. For instance, what shall we do with our rubbish? was a question posed at the kindergarten. In the second phase the teachers offered supporting curriculum and in phase three they used the feedback from the parents to reflect on the environmental education programme and the community of learners.

The success of the project approach, supported by participatory action research, continued on after the completion of the research. At the kindergarten the wormery and the recycling buckets became an integral part of the programme. Equally, at the childcare centre Diana shared with me the documentation of a project based on the children's interest in planets

The use of many and varied teaching strategies by the teachers, was supported by participatory action research. Teachers used questioning extensively to extend children's environmental learning. However, they needed to take cognisance of the children's limited language and use a range of strategies to support the co-construction of knowledge. By doing this they reinforced the importance of children and teachers learning in a socio-cultural way by creating knowledge in the context of the early childhood centre. The children's interest in books for reference (Inagaki & Hatano, 2002) and for pleasure was supported by the reading teaching strategy. A significant finding was that children were empowered to seek out information on their topics of interest without teacher prompting. This aided their knowledge creation process.

To sum up, the empowering process of participatory action research was the vehicle for the creation of a conceptual artefact (a community of learners). All of the participants were able to create their own environmental knowledge as a result.

A Community of Learners

Considering the findings of this research, what qualities facilitate the creation of a community of learners? The knowledge creation process was pivotal to creating a conceptual artefact in the form of a community of learners. Bereiter (2002) argues that this knowledge process is innovative. Moreover, the teachers at both the centres

became ‘creative experts’ who lead the field of early childhood education by creating a community of learners to promote environmental education.

Collaboration between all participants in the community of learners allows for knowledge creation. This is especially so for the teachers and parents where the building of trust and reciprocal relationships results in knowledge creation. This was highlighted when Marie (a parent) shared her funds of knowledge about crayfish on the childcare excursion to the Aquarium (see p. 170). Her contribution illustrated well a community of learners where all participants (teacher, parent, child and researcher) were able to create knowledge about crayfish together. Knowledge creation occurs through planned and spontaneous learning experiences and was evident in the perspectives offered by the teachers and the parents about how their communities of learners were created. Teachers respecting parents’ knowledge and their household funds of knowledge brought from home, allowed them to form collaborative relationships with the parents. The parents in turn were able to share their social capital through the social networks of the early childhood centre.

Creating a community of learners works in harmony with *Te Whāriki* (Ministry of Education, 1996), as it supports a socio-cultural approach to implementing an integrated curriculum (New, 2000). The project approach (and the emergent curriculum) and documentation based on children’s environmental topics of interest are integral to this process. A community of learners also reinforces the principles of *Te Whāriki,* empowerment, holistic development, family and community and relationships.

The creation of a community of learners empowers all the participants to become involved. Moreover, parents empower teachers to plan a meaningful environmental curriculum by their contribution of their household funds of knowledge and their social capital based on relationships. Holistic development is promoted through a community of learners. This is achieved through the teachers’ acceptance of the child’s home background, their culture and the knowledge they bring from the home to the centre. A community of learners values the integral part family and community play in children’s knowledge creation. This was evidenced in the children’s responses about who helped them to learn. Rather than teachers it was members of

their family they quoted. A community of learners also allows for an appreciation of the wealth of knowledge and opportunities for children to explore the wider world of the community. Excursions, based on their environmental interests are an example. Teachers can also tap into the knowledge and expertise in the community, for instance the teachers' use of the environmental centre.

Head's (2003, p. 59) five principles highlight the qualities of a community of learners. First, multiple zones of proximal development were demonstrated with the recycling at the kindergarten. All the participants created their own knowledge about recycling and in turn learned about sustainable lifestyles. Second, a community of discourse was evident in the conversations surrounding the documentation of the children's environmental learning and excursions. These were indicators of this principle and conversations occurred among all participants of the community of learners (teacher-child, parent-child teacher-parent and child-child). Third, negotiation of meaning was evident in the shared understandings between the teachers, other children and the parents about the inter-subjective experience of the aquarium excursion and sea life. Fourth, appropriation of ideas was illustrated by the wormery at the kindergarten and the idea was extended by the parents who created their own wormeries at home. Finally, common knowledge and individual expertise that grows out of its creation was demonstrated when, by the end of the study, the community of learners had created their own knowledge about the natural environment and gained a heightened awareness of environmental education in early childhood.

A community of learners can extend beyond the walls of the centre and the sharing of the research stories by the two centres was an example of this. Both centres were able to demonstrate a combined commitment to the benefits of creating a conceptual artefact (a community of learners). It has long been a vision of mine that in early childhood education we should be able to value and appreciate the contributions of philosophically diverse early childhood providers within the early childhood sector. Farquhar (2005) shares a similar view. She advocates for the many philosophically diverse centres that parents can choose from when considering early childhood education for their children. The sharing of research stories by the teachers from two different early childhood provisions illustrates well their reciprocal appreciation of each other's research contributions.

Relationships

Relationships were a central theme throughout the study. At the conclusion of the EEIC in the first phase of the research, the teacher-child relationship was evident, but the parent-teacher relationship was only tentatively forming. Therefore, the getting to know you stage had only just begun. As the second phase of the research progressed and the community of learners began to emerge, all the participants of the community of learners had shared understandings about environmental education and the children's topics of environmental interest. Finally, when the conceptual artefact of a community of learners was formed, it became a relationship of shared commitment to promote environmental education within the early childhood curriculum and the wider community.

Relationships are pivotal to social capital and they are central to the creation of a community of learners that places teachers, parents and children in an equal relationship as co-learners. Therefore teachers are not seen as all-knowing experts. Through teachers valuing the knowledge brought to the centre from the home, the uniqueness of every child and their parents is acknowledged, thus strengthening the home-centre links. This knowledge is epitomised in the funds of knowledge and social capital that parents contribute to the community of learners.

At the outset of the study funds of knowledge and social capital were considered separate theoretical concepts. As the study progressed it became increasingly difficult to differentiate between the two. An example was the establishment of a wormery by Marilyn. Was this her household funds of knowledge or was it her social capital? It could be argued it was her household funds of knowledge because she established the wormery as an inexpensive source of fertiliser for her home garden. Through this process she was also able to share her funds of knowledge with Sophie when advice was needed about the wormery at the kindergarten. Equally, she shared her social capital with Sophie through her relationship in the social network of the kindergarten. Her social capital (values, relationships) was also evident at home. The wormery supported sustainable living and was valued through the family activity of feeding the worms. This in turn strengthened her relationship with Brooke, Reece and her mother. Teachers therefore need to be aware that these two concepts although theoretically separate are connected by the common feature of networks (home and

centre). Furthermore, the collaborative relationships formed can result in these separate theoretical concepts becoming one united concept that strengthens the knowledge creation process and the creation of a community of learners.

Implications for Teachers

This research raises several implications for teachers. It is important for early childhood teachers to realise how crucial it is to start early (from birth) with environmental education (Wilson, 1996). Children are capable of understanding environmental issues and, in age appropriate ways, to respond in meaningful ways (Prince, 2004). An understanding of the tenets of environmental education, *about, in* and *for* is pivotal to implementing environmental education in the early years (Fleer, 1998; Palmer & Neal, 1994; Prince, 2004). Equally important is the knowledge that environmental education is not a separate subject, but integral to early childhood curriculum (Florgaitis et al., 2005; Ministry of Education, 1996).

Te Whāriki (Ministry of Education, 1996) is underpinned by a socio-cultural approach to learning. This occurs in the context of the centre and the home. Therefore, it is vital that teachers acknowledge the children's home culture and have inter-subjectivity and shared meanings with them on topics of environmental interest. The creation of a community of learners (a conceptual artefact) in early childhood centres is a way for teachers to implement an environmental education programme. Central to this process are home-centre links. A community of learners comprises a triad of teachers, children and parents. The teachers should acknowledge the parents' contribution, and in turn the parents should appreciate the teachers' efforts. This can result in a collaborative, meaningful partnership with parents as outlined in the principle of family and community espoused in *Te Whāriki*. Valuing the parents' social capital and funds of knowledge is one way this can take place.

Another way is to support the environmental knowledge creation of all the participants in a centre's community of learners. This is achieved through a two way, inseparable, reciprocal process that enriches the environmental knowledge creation of teachers, parents and children. Teachers need to be aware of the importance of this way that children and adults learn. The current socio-cultural approach to learning in

most early childhood centres does not place emphasis on children creating their own knowledge through a knowledge creation process.

The project approach is a vehicle for the implementation of environmental education. It begins with noticing children's environmental interests. Once these are recognised teachers need to have content knowledge and an understanding of children's theories (Simmons et al., 2005) and naïve biology (Inagaki & Hatano, 2002). Hedges (2002), advocates for teacher content knowledge and general knowledge about children's topics of interest to support children's learning. Content knowledge is the factual and conceptual knowledge while general knowledge is useful for meaning making in children's social and cultural lives. These two kinds of knowledge can be combined into teachers' pedagogical knowledge to support their teaching practice and effective outcomes for children. *Te Whāriki* does not place emphasis on content knowledge, fearing a downward push from the school curriculum. Hedges (2002) argues that, far from undermining the play-based philosophy, teacher content knowledge supports children's own content knowledge and learning.

Researching topics of interest to gain content knowledge and recognising children's domain knowledge (Wellman & Gelman, 1992, 1998) can be undertaken by both teachers and parents. Although not expected to know everything they can use books and the internet to increase their own content knowledge and general knowledge to create new knowledge about the environment within the community of learners.

Gaining content knowledge requires teachers to not only acquire content knowledge but impart it to children. Hedges (2002) reported that teacher confidence allowed them to share their content knowledge with children, thus strengthening the children's knowledge of their topic of interest. Planning is essential and this can be achieved through curriculum webs that support an emergent curriculum (Jones & Nimmo, 1994). Excursions (Hedges, 2004) that support children's topics of interest can lead to deeper environmental understanding of children's knowledge creation (Bereiter, 2002). Therefore, content knowledge about education for sustainability and environmental education should be an essential component of both pre-service and in-service (Florgaitis et al, 2005) teacher education, and be funded accordingly by the government (Ministry of Education).

Another aspect to consider for both pre-service and in service teacher education would be for there to be an increased awareness in early childhood of the importance of environmental education as an integral part of the early childhood curriculum. Creating a community of learners to promote environmental education is one way this can be achieved. A community of learners comprises teachers, children and parents. Therefore, teachers will need to employ strategies to engage parents in the community of learners, such as encouraging them to contribute resources on the children's topics of environmental interest, and valuing their involvement in excursions. Teachers will also need to value the parents' role in their children's learning and the centre's community of learners. Most importantly teachers will also need to be open to children's topics of environmental interest and pick up on them and support their interests to become long term projects.

For the project approach to lead to long term projects that lead to deeper environmental understanding not just mini projects, it takes time. The bird interest at the childcare centre was an example of a long term project as outlined in the Reggio Emilia approach. The centre's proximity to the beach and the length of time the children attended during the day were important factors. The fact the full day childcare had a homelike atmosphere was reflected in the teacher-child relationship and lessened the expert-novice divide. Moreover, the emergent curriculum picked up on children's emerging interest in birds. The sessional nature of the kindergarten, where the teachers must have a Diploma of Teaching (ECE) and where different groups of children attended for shorter periods of time during the day, could have influenced the length of the projects undertaken. Teachers therefore need to look for ways to allow projects to become an ongoing process rather than a series of mini projects based on children's changing interests.

Resources to support children's topics of interest are essential (Prince, 2000, 2004). The need to be well resourced in order to integrate environmental education into the early childhood curriculum was a finding of Prince's research. Therefore, I provided environmental education literature on learning experiences and information on forming a community of learners. I also supported both centres with books to research the children's topics of environmental interest as well as providing my own

publication. For that reason, my knowledge of the importance of resources to support the teachers' implementation of environmental education could have influenced the outcomes of the study. This study emphasised the importance of books and television as resources to support children's environmental learning (Inagaki & Hatano, 2002). It can also be a way to instil knowledge for children with limited language as was the case at both centres. Government agencies such as DOC and the Ministry of Fisheries in New Zealand can provide relevant learning resources and these can be complementary to teachers working with resources initiated through the parents' funds of knowledge and social capital.

It is important for teachers to be able to use and articulate appropriate teaching strategies (MacNaughton & Williams, 2004) and to have content knowledge to support learning through the project approach, based on children's topics of environmental interest. As evidenced by the data presented (see for instance Table 15), the children in this study had limited language. Teachers, therefore, need to be particularly skilled at using a range of teaching strategies; for example singing, reading, describing and questioning to co-construct knowledge with children. In this study questioning was identified as an important teaching strategy to use in supporting the children's environmental knowledge creation. Teachers, therefore, need to find ways to extend children's conversations on environmental topics of interest and questioning is a meaningful way to achieve this. A simple question such as what do you know about worms? can provide an opener for deeper discussion and allows the teacher and child to share their knowledge. This co-construction of knowledge is central to a socio-cultural approach to learning where teachers and children become co-learners. The funds of knowledge parents share with their children on environmental topics of interest (worms) can also be a starting point. Furthermore, this creates inter-subjectivity about topics of environmental interest and is strengthened by discussion both at home and at the centre. This process can assist teachers to extend children's language, knowledge base and learning through the use of parental funds of knowledge. This study highlighted many teaching strategies such as reading, singing, describing, the positioning of materials and documentation that are particularly relevant to the implementation of environmental education.

Reflections on Methodology

Contributions of the study

This study highlighted the efficacy of participatory action research as a research methodology (Kemmis & McTaggart, 2000). It also highlighted how this process is participatory and suitable for working with a community of learners in centres in lower socio-economic areas. The participatory nature of participatory action research allowed the teachers to appreciate the parents' funds of knowledge and social capital. Furthermore, the parents' contribution of the latter strengthened the environmental knowledge creation process at both centres.

The teachers' decision to lead the research in phase two offered them equal status as co-researchers (Kemmis & McTaggart, 2000). The project approach and the emergent curriculum acted as a vehicle for the teachers to pick up on children's environmental topics of interest and allowed some interests to become long term projects. The teachers' documentation of the project approach invited parental involvement in the community of learners they created, while at the same time valuing the parents' funds of knowledge and social capital. More importantly, this study illustrated how both these concepts can become one united concept that is encapsulated in the socio-cultural networks of the early childhood centre and the home. Through these networks, the parents were able to appreciate the teachers' efforts. Furthermore, the parents' involvement and contribution at the centre further enhanced the knowledge creation process of all participants in the community of learners. This study illustrated how knowledge is created through the participatory and collaborative socio-cultural approach to learning pervasive in early childhood education. It has also highlighted how this taken for granted approach to learning progressed in the contexts of this study to become a knowledge creation process supported by participatory action research methodology and the creation of a community of learners.

Participatory action research is an empowering research methodology (Fals Borda, 2001; Fals Borda & Rahman, 1991; Park et al., 1993; Rahman, 1993). The cyclical quality of participatory action research allowed the teachers to engage in planning, reflection and dialogue about their practice. Through systematic data collection, analysis of data, and reflection on data they were able to monitor the creation of a

community of learners and gauge the effectiveness of the project approach to environmental education. The teachers were able to integrate environmental education into the curriculum through this research process. Environmental education within the early childhood curriculum, as outlined in this study, highlighted the importance of content knowledge *about, in* and *for* the environment. It also emphasised the use of appropriate teaching strategies for the co-construction of knowledge such as questioning. The context of the early childhood centre encouraged the development of social capital by both parents and teachers through the shared network of the early childhood centre. This was achieved through relationships, shared understandings and values about the importance of environmental education as an integral part of the early childhood curriculum.

Limitations of the study

This study solely investigated teachers' implementation of environmental education into early childhood curriculum. Because of this focus the notion of sustainability in environmental education in early childhood was not investigated. Sustainability has become a very important facet of environmental education in recent times and a large body of literature attests to this. This study also investigated the creation of a community of learners. This conceptual artefact demonstrated collaboration by all participants. Although all of the teachers at both centres were involved in the research, the research design meant only a small sample of parents and children were involved at both centres. Despite anecdotal evidence of the contribution and involvement of other members of each centre's community of learners, this could not be investigated for reasons of time and ethical considerations.

Future Directions for Research

These limitations suggest future directions for research. This study has shown participatory action research to be effective for use in early childhood centres located in lower socio-economic areas. A future study could investigate how participatory action research supports parental funds of knowledge, social capital and the extent of parent involvement in a community of learners, in diverse socio-economic areas and communities. The project approach, the integrated curriculum and the emergent curriculum were investigated in this study as they relate to environmental education.

Future research could investigate other subjects in the early childhood curriculum such as mathematics or science and how these link with environmental education. In order to test further the emerging theory about the role of a community of learners to promote environmental education within early childhood curriculum, a number of 'variables' would need to be tested through a multiple case study design. For example, trying the creation of a community of learners in different types of centres, such as playcentres; geographical locations, such as inland or large city; different socio-economic levels and different groups of teachers, for instance in a university city.

In this research a case study was employed in the first phase. This allowed the teachers to gain confidence in the research process and to choose whether or not they wished to use a participatory action research methodology in phase two. Future research could employ a participatory action research methodology from the outset. This would empower teachers to lead the research from the beginning using a similar model to the Centres of Innovation. They could investigate the knowledge creation thesis as it relates to all the participants in their centre's community of learners. A younger researcher with less knowledge of environmental education could lessen the expert-novice divide. The resulting relationship would be one of co-researcher, one of the tenets of participatory action research. As the teachers would be leading the research they would be able to choose their own research questions that would be more socially and culturally relevant to the community of the centre (or centres) served.

Two early childhood centres, a childcare and a kindergarten located in a provincial city, were used in this study. A future study could use a combination of centres with different educational philosophies such as Te kohanga reo (Māori language nest), playcentre or Steiner centres located in large urban cities. This could illustrate unique funds of knowledge /social capital associated with these backgrounds. This study was conducted in the North Island of New Zealand. Conducting research in the South Island could reveal different geographical and associated socio-cultural perspectives. A study into the promotion of sustainable life styles would be timely as we enter the decade of sustainability. It could highlight how a community of learners within early

childhood education could work in unison to realise sustainable lifestyles for communities in the 21st century and the growth of networks to facilitate social capital.

Conclusion

The preceding discussion has outlined the two phase research process that occurred in two early childhood centres that culminated in the creation of a conceptual artefact (a community of learners) to integrate environmental education into an early childhood curriculum. This study argues that children, teachers and parents create their own knowledge together. This is explained theoretically by Bereiter (2002) in his *knowledge creation metaphor*. Bereiter acknowledges socio-cultural collaborative learning (characteristic of the *participation metaphor*). However, the point of difference is that new knowledge is created as part of the knowledge creation process. This process therefore moves beyond learning through doing to a process of new knowledge creation. New knowledge is created through the collaborative efforts of the community of learners using a project approach to environmental education.

The knowledge creation process was evidenced in phase one. Children created their own knowledge about various topics of environmental interest. This process was further enhanced in phase two when teachers led the research using participatory action research. Through the creation of a community of learners, they were able to collaborate with the parents so all the participants of the community of learners were able to create their own knowledge about the environment. Central to this collaboration was the teachers' valuing of the parents' social capital and funds of knowledge. The inter-relationship of these two concepts focuses on the shared notion of networks. These networks inherent in parental social capital led the parents to share their environmental funds of knowledge with the teachers. This process, in turn, strengthened the networks in the context of the early childhood centre. Furthermore, it was these networks supported by the participatory action research methodology that led to a knowledge creation approach to environmental education and to the creation of the conceptual artefact of a community of learners.

References

Alerby, E. (2000). A way of visualising children's and young people's thoughts about the environment: A study of drawings. *Environmental Education Research, 6*(3), 274-276.

Alton Lee, A., & Nuthall, G. (1992). A generative methodology for classroom research. *Educational Philosophy and Theory, 22*(2), 29-55.

Anderson, J. R., Reder, L. M., & Simon, H. A. (1996). Situated learning and education. *Educational Researcher, 25*(4), 5-11.

Anning, A. (2004). The co-construction of an early childhood curriculum. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 57-68). London: Sage Publications.

Anning, A., & Edwards, A. (1999). *Promoting children's learning from birth to five.* Buckingham: Open University Press.

Arce, E. (2000). *Curriculum for young children: An introduction*. Albany, NY: Delmar Thomson Learning.

Athey, C. (1990). *Extending thought in young children: A parent teacher partnership*. London: Paul Chapman.

Aubrey, A., David, T., Godfrey, G., & Thompson, L. (2000). *Early childhood education research: Issues in methodology and ethics.* London: Routledge Falmer Press.

Babbie, E. (2001). *The practice of social research* (9th ed.). London: Wadsworth/Thompson Learning.

Babbie, E. (2004). *The practice of social research* (10th ed.). Southbank, Victoria: Wadsworth/Thomson Learning.

Ball, D. L., & Wilson, S. M. (1996). Integrity in teaching: Recognising the fusion of moral and intellectual. *Educational Research Journal, 33*(1), 155-192.

Bassey , M. (1999). *Case study research in educational settings.* Buckingham: Open University Press.

Bayes, C. (2005). *Provocations of Reggio Emilia and Te Whāriki.* Paper presented at the Reggio Emilia Provocations, July, Auckland, New Zealand.

Bell, D. R. (2005). Environmental learning, metaphors and natural capital. In J. Foster & S. Gough (Eds.), *Learning, natural capital and sustainable development: Options for an uncertain world* (pp. 49-65). New York: Routledge.

Bereiter, C. (1990). Aspects of an educational learning theory. *Educational Research, 60*, 603-624.

Bereiter, C. (2002). *Education and mind in the knowledge age*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature and implications of expertise*. La Salle, IL: Open Court.

Beston, A. (2006, February 18). Up to our knees in disposables. *Weekend Herald,* p. A12.

Bogdan, R. C., & Biklen, S. K. (2003). *Qualitative research for education: An introduction to theories and methods* (4th ed.). Boston: Allyn & Bacon.

Bowman, B., Donavan, M. S., & Burns, M. S. (Eds.). (2001). *Eager to learn: Educating preschoolers*. Washington, DC: National Academy Press.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (1999). *How people learn: Brain mind experience and school*. Washington, DC: National Academy Press.

Brennan, M. (2005). *'They just want to be with us' Young children learning to live the culture: A post Vygotskyian analysis of young children's enculturation into a childcare setting.* Unpublished PhD thesis, Victoria University, Wellington.

Bridge, H. (2001). Increasing parent involvement in the pre school curriculum: What an action research case study revealed. *International Journal of Early Years Education, 9*(1), 7-21.

British Educational Research Association Early Years Special Interest Group. (2003). *Early years research: Pedagogy curriculum and adult roles, training and professionalism*. Southwell, Notts: British Educational Research Association.

Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge, MA: Harvard University Press.

Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-270). Cambridge, MA: MIT Press/Bradford Books.

Brown, A. L., Metz, K. E., & Campione, J. C. (1996). Social interaction and individual understanding in a community of learners: The influence of Piaget and Vygotsky. In A. Tryphon & J. Voneche (Eds.), *Piaget-Vygotsky: The social genesis of thought* (pp. 145-170). Hove: Psychology Press.

Brown, J. S., Collins, A. E., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Bruner, J. (1990). *Actual minds, possible worlds.* Cambridge, MA: Harvard University Press.

Bruner, J. (1996). *The culture of education*. Boston: Harvard University Press.

Carr, M. (2001). *Assessment in early childhood settings: Learning stories*. London: Paul Chapman.

Carr, M., Lee, W., & Jones, C. (2004). *Kei tua o te pae: Assessment for learning: Early childhood exemplars*. Wellington: Learning Media.

Carr, W., & Kemmis, S. (1986). *Becoming critical: Education knowledge and action research*. London: Falmer Press.

Carson, R. (1956). *The sense of wonder*. New York: Harper & Row.

Chapman, D. J. (2004). *Education for the environment: Towards teacher empowerment.* Unpublished thesis: Massey University, Palmerston North, New Zealand.

Christensen, P., & James, A. (Eds.). (2000). *Research with children: Perspectives and practices*. London: Falmer Press.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Coleman, J. (1987). Families and schools. *Educational Researcher*, 32-38.

Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology Supplement, 94*, 95-120.

Coleman, J. S. (1994). *Foundations of social theory*. Cambridge, MA: Belknap Press.

Costello, P. J. M. (2003). *Action research*. London: Continuum.

Cowie, B. (2000). *Formative assessment in science classrooms.* Unpublished Ph D., University of Waikato, Hamilton, New Zealand.

Cullen, J. (1994). Why retain a developmental focus in early education. In E.J. Mellor & K. M. Coombe (Eds.), *Issues in early childhood education services: Australian perspectives* (pp. 53-64). Dubuque.

Cullen, J. (1998a). Influences on young chidren's knowledge: The case of road safety education. *International Journal of Early Years, 6*, 39-48.

Cullen, J. (1998b). *What do teachers need to know about learning in the early years?* Paper presented at the Early Childhood Development Unit Seminar, Auckland, 23 April.

Cullen, J. (1999). Children's knowledge teacher's knowledge: Implications for early childhood teacher education. *Australian Journal of Teacher Education, 24*(2), 15-25.

Cullen, J. (2001). An introduction to understanding learning. In V. Carpenter, H. Dixon, E. Rata & C. Rawlinson (Eds.), *Theory in practice for educators* (pp. 47-69). Palmerston North: Dunmore Press.

Cullen, J. (2003). The challenge of Te Whāriki. In J. Nuttall (Ed.), *Weaving Te Whāriki: Aotearoa New Zealand's early childhood curriculum document in theory and practice* (pp. 269-290). Wellington: New Zealand Council for Educational Research.

Cullen, J. (2004). Adults co-constructing professional knowledge. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 69-79). London: Sage.

Cullen, J., & Allsop, G. (1999). *Enriching the knowledge base of children's play.* Paper presented at the Seventh Early Childhood Convention, Whakatu, Nelson, New Zealand, September.

Cullen, J., & Bevan-Brown, J. (1999). *Resourcing special education in early childhood: Data base and best practice validation*: Final report to Ministry of Education, IPDER, Massey University.

Dahlberg, D., Moss, P., & Pence, A. (1999). *Beyond quality in early childhood education and care: Post-modern perspectives*. London: Falmer Press.

Davidson, C., & Tolich, M. (Eds.). (1999). *Social Science research in New Zealand*. Auckland: Longman.

Davis, J., & Elliott, S. (2003). *Early childhood environmental education: Making it mainstream*. Watson, ACT: Early Childhood Australia Inc.

Davis, J., Rowntree, N., Gibson, M., Pratt, R., & Eglington, A. (2005). Creating a culture of sustainability at campus kindergarten. In W. Leal Filho (Ed.), *Handbook of sustainability research* (pp. 563-594). Frankfurt: Peter Lang.

Deans, J., Brown, R., & Dilkes, H. (2005). A place for sound: Raising children's awareness of their sonic environment. *Australian Journal of Early Childhood, 30*(4), 43-47.

DeMarie, D. (2001). A trip to the zoo: Children's words and photographs [Electronic Version]. *Early Childhood Research and Practice* 3. Retrieved June 2, 2001 from http://www.ecrp.uiuc.edu/v3nl/demarie.html.

Denzin, N. K. (1978). *The research act* (2nd ed.). New York: McGraw-Hill.

Denzin, N. K., & Lincoln, Y. S. (1994). *Handbook of qualitative research*. London: Sage.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *The handbook of qualitative research* (2nd ed.). London: Sage.

Diaz, R. M., Neal, C. J., & Amaya-Williams, M. (1990). The social origins of self regulation. In L. C. Moll (Ed.), *Vygotsky and education* (pp. 127-154). Cambridge: Cambridge University Press.

Dika, S. L., & Singh, K. (2002). Applications of social capital in educational literature: A critical synthesis. *Review of Educational Research, 72*(1), 31-60.

Dittman, L. (1974). *Curriculum is what happens*. Washington, DC: National Association for the Education of Young Children.

Dixon, B. (2001). Purposeful learning: A study of water. *Early Childhood Research and Practice, 3*(2), 1-18.

Drever, E. (1997). *Using semi-structured interviews in small scale research*. Edinburgh: Scottish Council for Research in Education.

Driver, R., Asoko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher, 23*, 5-12.

Drummond, M. J. (2000). Starting with children - towards early years curriculum. In C. Clouder, S. Jenkinson & M. Large (Eds.), *The future of childhood, alliance for childhood: Articles for the Brussels conference, rights to children - a bridge to the future* (pp. 27-36). Brussels: Hawthorne Press.

Duncan, J. M. (2001). *Restructuring lives: Kindergarten teachers and the education reforms 1984-1996.* Unpublished thesis submitted for the degree of Doctor of Philosophy of the University of Otago, Dunedin.

Edwards, A. (2001). Qualitative designs and analysis. In G. MacNaughton, S. A. Rolfe & I. Siraj-Blatchford (Eds.), *Doing early childhood research: International perspectives on theory and practice* (pp. 117-135). Crows Nest, Australia: Allen & Unwin.

Edwards, C., Gandini, L., & Forman, G. (Eds.). (1993). *The hundred languages of children: The Reggio Emilia approach to early childhood education*. Norwood, NJ: Ablex Publishing.

Edwards, C., Gandini, L., & Forman, G. (Eds.). (1998). *The hundred languages of children* (2nd ed.). London: Ablex Publishing.

Edwards, S. (2003). New directions: Charting the paths for the role of sociocultural theory in early childhood education and curriculum. *Contemporary Issues in Early Childhood, 4*(3), 251-266.

Eliason, C., & Jenkins, L. T. (2003). *A practical guide to early childhood curriculum*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Elliot, S., & Emmett, S. (1997). *Snails live in houses too: Environmental education for the early years* (2nd ed.). Melbourne: RMIT Publishing.

Fals Borda, O. (2001). Participatory action research in social theory: Origins and challenges. In P. Reason & H. Bradbury (Eds.), *Handbook of action research: Participative inquiry and practice* (pp. 27-37). London: Sage.

Fals Borda, O. (Ed.). (1998). *People's participation: Challenges ahead*. New York: Apex.

Fals Borda, O., & Rahman, M. A. (Eds.). (1991). *Action and knowledge: Breaking the monopoly with participatory action research*. New York: Intermediate Technology/Apex.

Farquhar, S. E. (2005). *How to pick remarkable quality childcare and education*. Porirua, New Zealand: Childforum Research Network.

Farrell, A., Tayler, C., Tennent, L., & Gahan, D. (2002). Listening to children: A study of child and family services. *Early Years: Journal of International Research and Development, 22*(1), 27-38.

Feldman, A. (1995). *Conversation as research: A self study of the teaching of collaborative action research.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Field, J. (2003). *Social capital*. London: Routledge.

Fien, J. (1993). *Education for the environment: Critical curriculum theorising and environmental education*. Geelong: Deakin University.

Fleer. (1998). What is environmental education? *Every Child, 4*(4), 6-7.

Fleer, M., Anning, A., & Cullen, J. (2004). A framework for conceptualising early childhood education. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 175-189). London: Sage Publications.

Fleer, M., & Williams-Kennedy, D. (2001). Looking in and not seeing myself mirrored back: Investigations of some indigenous families' view on education. *Curriculum Perspectives, 21*(3), 52-55.

Florgaitis, E., Daskolia, M., & Liarakou, G. (2005). Greek kindergarten teachers' practice in environmental education. *Journal of Early Childhood Research, 3*(3), 299-320.

Fritch, W. S. (1999a). *Large or small? Public or private? What matters most in the formation of social capital.* Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada.

Fritch, W. S. (1999b). *An overlooked role of high school athletics: The formation of social capital and parental involvement.* Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada.

Fukuyama, F. (1995). *Trust: The social virtues and the creation of prosperity*. London: Hamish Hamilton.

Fullan, M. (2003). *Changing forces with a vengence*. London: Routledge Falmer.

Gardner, H. (1999). *Intelligences reframed: Multiple intelligences for the 21st century*. New York: Basic Books.

Gibbons, P. H. (2004). *Learning through participation in a playcentre routine.* Unpublished thesis in partial fulfilment of Master of Education (Early Years), Massey University, Palmerston North.

Gillon, M. (2002). Terms of engagement in Porirua: A case study for civic action on health. In D. Robinson (Ed.), *Building social capital*. Wellington: Victoria University Wellington.

Goldstein, L. S. (2000). Ethical dilemas in designing collaborative research: Lessons learned the hard way. *International Journal of Qualitative Studies in Education, 13*(5), 1-14.

Gollop, M. (2000). Interviewing children: A research perspective. In A. Smith, N. Taylor & M. Gollop (Eds.), *Research policy and practice* (pp. 18-36). Auckland: Pearson Education.

Goncu, A. (1999a). Children's and researchers' engagement in the world. In A. Goncu (Ed.), *Children's engagement in the world: Socio-cultural perspectives* (pp. 3-22). Cambridge: Cambridge University Press.

Goncu, A. (Ed.). (1999b). *Children's engagement in the world: Sociocultural perspectives*. Cambridge: Cambridge University Press.

Goncu, A., & Katsarou, E. (2000). Commentary - constructing socio-cultural approaches to literacy education. In K. A. Roskos & J. F. Christie (Eds.), *Play and literacy in early childhood: Research from multiple perspectives* (pp. 221-230). Mahwah, NJ: Lawrence Eribaum.

Gonzales, N., Moll, L. C., & Amanti, C. (2005a). Introduction: Theorising practice. In N. Gonzales, L. C. Moll & C. Amanti (Eds.), *Funds of knowledge: Theorising practices in households, communities, and classrooms* (pp. 1-24). Mahwah, NJ: Lawrence Erlbaum Associates.

Gonzales, N., Moll, L. C., & Amanti, C. (Eds.). (2005b). *Funds of knowledge: Theorizing practices in households, communities, and classrooms*. Mahwah, NJ: Lawrence Erlbaum Associates.

Gonzales, N., Moll, L. C., Floyd-Flenery, M., Rivera, A., Rendon, P., Gonzales, R., et al. (1995). Funds of knowledge for teaching in Latino households. *Urban Education., 29*(4), 443-470.

Gorham, P. J., & Nason, P. N. (1997). Why make teachers work more visible to parents. *Young Children, 52*(5), 22-26.

Gough, N. (1987). Learning with environments: Towards an ecological paradigm of education. In I. Robottom (Ed.), *Environmental education: Practice and possibility*. Geelong: Deakin University.

Graue, E. M., & Walsh, D. J. (1998). *Studying children in context: Theories methods and ethics*. Thousand Oaks, CA: Sage.

Greenburg, J. B. (1989). *Funds of knowledge: Historical constitution, social distribution and transmission.* Paper presented at the Annual Meeting of the Society of Applied Anthropology, April, 1989, Santa Fe, NM.

Greeno, J. G. (1998). The situativity of knowing, learning and research. *American Psychologist, 53*(1), 5-26.

Greenwood, D., & Levin, M. (1998). *Introduction to action research: Social research for social change.* London: Sage Publications.

Grieshaber, S. (2001). Equity issues in research designs. In G. MacNaughton, S. A. Rolfe & I. Siraj-Blatchford (Eds.), *Doing early childhood research: International perspectives on theory and practice.* (pp. 136-146). Crows Nest: Allen & Unwin.

Halpern, D. (2005). *Social capital*. Cambridge: Polity Press.

Harris Helm, J., Berg, S., & Scranton, P. (2004). *Teaching your child to love learning: A guide to doing projects at home*. New York: Teachers College Press.

Harris, J. C., Lowenstein, M., & Scott, R. (2001). Insiders and outsiders: Perspectives of urban action research. In J. Zeni (Ed.), *Ethical issues in practitioner research* (pp. 123-148). New York: Teacher's College Press.

Hart, R. A. (1997). *Children's participation: The theory and practice of involving young citizens in community development and environmental care*. London: Earthscan Publications.

Hatherley, A., & Sands, L. (2002). So what is different about learning stories? *The first years: Nga tau tuatahi*. *New Zealand Journal of Infant and Toddler Education, 4*(1), 8-12.

Head, G. (2003). Effective collaboration: Deep collaboration as an essential element of the learning process. *Journal of Educational Enquiry, 4*(2), 47-62.

Hedges, H. (2001). A right to respect and reciprocity: Ethics and educational research. *New Zealand Research in Early Childhood Education, 4*, 1-18.

Hedges, H. (2002). *Subject content knowledge in early childhood curriculum and pedagogy.* Unpublished thesis in partial fulfilment of Master of Education (Early Years), Massey University, Palmerston North.

Hedges, H. (2004). A whale of an interest in sea creatures: The learning potential of excursions. *Early Childhood Research and Practice, 6*(1). Retrieved on July 7, 2004, from http://ecrp.uiuc.edu/v2006n2001/hedges.html

Hedges, H., & Cullen, J. (2003). The tooth fairy comes, or is it just your mum and dad?: A child's construction of knowledge. *Australian Journal of Early Childhood, 28*(3), 19-24.

Helm, J. H., & Katz, L. G. (2001). *Young investigators: The project approach in the early years.* New York: Teacher's College Press.

Hirsh, R. A. (2004). *Early childhood curriculum: Incorporating multiple intelligences, developmentally appropriate practice and play*. Boston: Pearson Education.

Hutchinson, D. (1998). *Growing up green: Education for ecological renewal*. New York: Teacher's College Press.

Inagaki, K. (1992). Piagetian and post Piagetian concepts of development and their implications for science and development in early childhood. *Early Childhood Research Quarterly, 7*, 115-133.

Inagaki, K., & Hatano, G. (2002). *Young children's näive thinking about the biological world*. New York: Psychology Press.

Jackman, H. L. (2005). *Early childhood curriculum: A child's connection to the world* (3rd ed.). Clifton Park, NY: Thomson Delmar Learning.

Johnson, R. J. (1989). Philosophy ideology and geography. In D. Gregory & R. Walford (Eds.), *Horizons in human geography*. London: MacMillan.

Jones, E., & Nimmo, J. (1994). *Emergent curriculum*. Washington, DC: National Association for the Education of Young Children.

Jordan, B. J. (2003). *Professional development making a difference for children: Co-constructing understanding in early childhood centres.* Unpublished thesis for Doctor of Philosophy in Education, Massey University, Palmerston North.

Jordan, B. J. (2004a). *Co-construction in communities: Empowering children and teachers.* Paper presented at the 12th Annual Conference Australian Research in Early Childhood Education, Monash University, 21-23 January.

Jordan, B. J. (2004b). Scaffolding learning and co-constructing understandings. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 31-42). London: Sage.

Kahne, J., & Bailey, K. (1999). The role of social capital in youth development: The case of "I had a dream" programmes. *Educational Evaluation of Policy Analysis, 21*(3), 321-343.

Katz, L. G., & Chard, S. C. (2000). *Engaging children's minds: The project approach* (2nd ed.). Stamford, CT: Ablex.

Kemmis, S., & McTaggart, R. (2000). Participatory action research. In N. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 567-605). Thousand Oaks: Sage.

Kemmis, S., & Wilkinson, M. (1998). Participatory action research and the study of practice. In B. Atweb, S. Kemmis & P. Weeks (Eds.), *Action research in practice: Partnerships for social justice in education* (pp. 21-36). London: Routledge.

King, M. P., Henderson, G. E., & Stein, J. (Eds.). (1999). *Beyond regulations: Ethics in human subjects research*. Chapel Hill: University of Carolina Press.

Kohlberg, L., & Mayer, R. (1972). Development as the aim of education. *Harvard Education Review, 42*(4), 449-496.

Konzal, J. L. (2001). Collaborative inquiry: A means of creating a learning community. *Early Childhood Research Quarterly.*(16), 95-115.

Kostelnik, M. J., Soderman, A. K., & Whiren, A. P. (2004). *Developmentally appropriate curriculum: Best practices in early childhood education*. Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Kreuger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research* (3rd ed.). Thousand Oaks: Sage.

Lareau, A., & Horvat, E. M. (1999). Movements of social inclusion: Race, class, and cultural capital in family school relationships. *Sociology of Education, 72*, 37-53.

Larsen, J. M., & Haupt, J. H. (1997). Integrating home and school: Building a partnership. In C. H. Hart, D. C. Burts & R. Charlesworth (Eds.), *Integrated curriculum and developmentally appropriate practice: Birth to age eight* (pp. 389-447). New York: State University of New York Press.

Lather, P. (1991). *Getting smart: Feminist research and pedagogy with/in the postmodern*. New York: Routledge.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lee, C. D., & Smagorinsky, P. (Eds.). (2000). *Vygotskian perspectives on literary research: Constructing meaning through collaborative inquiry*. New York: Cambridge University Press.

Lee, P. (2002). *I know the answer...but what's the question? Action research as a natural process for teachers.* Paper presented at the NZARE Conference, Massey University, Palmerston North, New Zealand.

Lewin, K. (1946). Action research and minority problems. *Journal of Social Issues, 2*, 34-36.

Lewis, A., & Lindsay, G. (2000). Emerging issues. In A. Lewis & G. Lindsay (Eds.), *Researching children's perspectives* (pp. 189-197). Buckingham: Open University Press.

Lin, N., Cook, K., & Burt, R. S. (Eds.). (2001). *Social capital: Theory and research*. New York: Aldine de Gruyter.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.

Litosseliti, L. (2003). *Using focus groups in research.* London: Continuum.

Lovelock, J. E. (1979). *Gaia: A new look at life on earth*. Oxford: Oxford University Press.

MacArthur, J., Purdue, K., & Ballard, K. (2003). Competent and confident children? Te Whāriki and the inclusion of children with disabilities in early childhood education. In J. Nuttall (Ed.), *Weaving Te Whāriki: Aotearoa New Zealand's early childhood curriculum document in theory and practice* (pp. 131-160). Wellington: New Zealand Council for Educational Research.

MacNaughton, G., & Williams, G. (2004). *Techniques for teaching young children: Choices in theory and practice* (2nd ed.). Frenchs Forest, NSW: Pearson Prentice Hall.

Malaguzzi, L. (1993). For an education based on relationships. *Young Children, 11*(93), 9-13.

Marsh, C. (1995). Quality relationships and quality practice in nursery school. *International Journal of Early Years, 3*(2), 29-45.

Martin, S. (1994). *Take a look: Observation and portfolio assessment in early childhood*. Ontario: Addison-Wesley Publishers.

Massey University Human Ethics Committee. (2002). *Checklist for research, teaching and evaluations involving human participants*. Palmerston North: MUHEC.

May, H. (2003). *Concerning women considering children: Battles of the childcare association.* Wellington: Te Tari Puna Ora o Aotearoa, New Zealand Childcare Association.

May, H., & Carr, M. (2000). Empowering children to learn and grow - Te Whāriki: The New Zealand early childhood curriculum. In J. Hayden (Ed.), *Landscapes in early childhood education: Cross-national perpsectives on empowerment - a guide for the new millennium* (pp. 153-169). New York: Peter Lang.

McCaleb, S. P. (1997). *Building communities of learners: A collaboration among teachers students families and the community*. New Jersey: Lawrence Erlbaum Associates.

McDonald, G. (1982). *Working and learning: A participatory project on parent-helping in New Zealand Playcentre*. Wellington: New Zealand Council for Educational Research.

McNamara-Horvat, E. M., Weininger, E. B., & Lareau, A. (2003). From social ties to social capital: Class differences in the relations between schools and parent networks. *American Educational Research Journal, 40*(2), 319-351.

McTaggart, R. (1998a). Enhancing validity in participatory action research. *A Journal for Teachers of Adults, 49*, 3-20.

McTaggart, R. (1998b). Issues for participatory action researchers. In O. Zuber-Skerritt (Ed.), *New directions in action research* (pp. 243-255). London: Falmer Press.

Meade, A. (2000). If you say it three times, is it true? Critical use of research in early childhood education. *International Journal of Early Years Education, 8*(1), 15-26.

Meade, A. (2001). The project approach and parent involvement. *Early Childhood Practice, 3*(1), 6-14.

Meade, A. (Ed.). (2005). *Catching the waves: Innovation in early childhood education*. Wellington: NZCER Press.

Mertens, D. M. (1998). *Research methods in educational psychology: Integrating diversity with quantitative & qualitative approaches*. London: Sage Publications.

Merton, R. K., Fiske, M., & Kendall, P. (1990). *The focused interview: A manual of problems and procedures* (2nd ed.). New York: The Free Press.

Ministry for the Environment. (1996). *Learning to care for the environment: Perspectives on environmental education: A discussion document*. Wellington: Author.

Ministry for the Environment. (1998). *Learning to care for our environment: A national strategy for environmental education*. Wellington: Author.

Ministry for the Environment. (1999). *Learning to care for the environment: A national strategy for environmental education*. Wellington: Author.

Ministry of Education. (1993). *The New Zealand curriculum framework*. Wellington: Learning Media.

Ministry of Education. (1996). *Te Whāriki: He Whāriki Matauranga mo nga mokopuna o Aotearoa: Early childhood curriculum*. Wellington: Learning Media.

Ministry of Education. (2002). *Pathways to the future: Nga Huarahi Arataki.* Wellington: Learning Media.

Ministry of Education. (2002). *Picking up the pace*. Retrieved April 29, 2002, from www.minedu.govt.nz

Ministry of Education. (2004). Sociocultural assessment: He aromatawai ahurea paapori. In Ministry of Education (Ed.), *Kei tua o te pae: Assessment for learning: Early childhood examplars*. Wellington: Learning Media.

Moll, L. C. (2000). Inspired by Vygotsky: Ethnographic experiments in education. In C. D. Lee & P. Smagorinsky (Eds.), *Vygotskian perspectives on literacy research: Constructing meaning through collaborative inquiry* (pp. 256-258). Cambridge: Cambridge University Press.

Moll, L. C., Amanti, C., Neff, D., & Gonzales, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory and Practice, 31*, 132-141.

Mortari, L. (1997). Children's ideas of nature: The social construction of a "nature set". In P. J. Thompson (Ed.), *Environmental education for the 21st century: International and interdisciplinary perspectives* (pp. 245-268). New York: Peter Lang.

Mutch, C. (2005). *Doing educational research: A practitioners guide to getting started*. Wellington: NZCER Press.

New, R. S. (1992). An integrated early childhood curriculum. In C. Seefeldt (Ed.), *The early childhood curriculum: A review of current research* (pp. 286-322). New York: Teachers College Press.

New, R. S. (2000). An integrated early childhood curriculum: Moving from the what and the how to the why. In C. Seefeldt (Ed.), *The early childhood curriculum: Current findings in theory and practice* (3rd ed., pp. 265-287). New York: Teachers College Press.

Newman, J., Griffin, P., & Cole, M. (1989). *The construction zone: Working for cognitive change in school*. New York: Cambridge University Press.

Newson, J., & Newson, E. (1975). Inter-subjectivity and transmission of culture. *The Bulletin of the British Psychological Society, 28*, 437-456.

Nuttall, J. (2004). *Why don't you ask someone who cares? Teacher identity, intersubjectivity and curriculum negotiation.* Unpublished thesis: Victoria University, Wellington.

Nuttall, J. (2005). *Pathway to the future? Doing childcare in the era of New Zealand's early childhood strategic plan.* Wellington: Institute for Early Childhood Studies, Victoria University of Wellington.

Nuttall, J. (Ed.). (2003). *Weaving Te Whāriki: Aotearoa New Zealand's early childhood curriculum document in theory and practice*. Wellington: New Zealand Council for Educational Research.

OECD. (2001). *The well being of nations: The role of human and social capital*. Paris: OECD.

Paavola, S., Lipponen, L., & Hakkarainen, K. (2002). Epistemological foundations for CSCL: A comparison of three models of innovative knowledge communities. In G. Stahl (Ed.), *Computer support for collaborative learning: Foundations for a CSCL community:* (pp. 24-31). Boulder Colorado: CSCL.

Palinscar, A. S. (1998). Social constructivist perspectives on teaching and learning. *Annual Review of Psychology*, 345-375.

Palmer, J. (1995). Environmental thinking in the early years: Understandings and misunderstandings of concepts related to waste management. *Environmental Education Research, 1*(1), 35-45.

Palmer, J., & Neal, P. (1994). *The handbook of environmental education*. London: Routledge.

Palmer, J., Suggate, J., Bajd, B., Tsaliki, E., Duraki, D., Paraskevopoulos, S., et al. (1999). Emerging knowledge of distant environments: An international study of four and six year olds in England Slovenia and Greece. *European Early Education Research Journal, 6*(2), 17-38.

Palmer, J. A., Grodsinski-Jurczak, M., & Suggate, J. (2003). Thinking about waste: Development of English and Polish children's understanding of concepts related to waste management. *European Early Education Research Journal, 11*(2), 117-139.

Paprotna, G. (1998). On the understanding of ecological concepts by children of preschool age. *International Journal of Early Years Education, 6*(2), 155-164.

Park, P., Brydon-Miller, M., Hall, B. L., & Jackson, T. (Eds.). (1993). *Voices of change: Participatory action research in the United States and Canada*. London: Bergin & Garvey.

Pea, R. D. (1988). *Distributed intelligence and education*. Palo Alto, CA: Institute for Research on Learning.

Pea, R. D., & Gomez, L. (1992). Distributed multimedia learning environments. *Interactive Learning Environments, 2*(2), 73-109.

Penrose, P. (1998). *Take another look Tirohia ano: A guide to observing children He momo arahi ki te tiro i nga tamariki* (2nd ed.). Auckland: New Zealand Playcentre Federation.

Phenice, L. A., & Griffore, R. J. (2003). Young children and the natural world. *Contemporary Issues in Early Childhood, 4*(2), 167-171.

Piaget, J. (1952). *The origins of intelligence in children*. New York: International Universities Press.

Piaget, J. (1964). Development and learning. In R. E. Ripple & V. N. Rockcastle (Eds.), *Piaget rediscovered: A report of the conference on cognitive studies and curriculum development* (pp. 30-42). Ithaca: Cornell University.

Pinder, R. (2006, April 4). We're dumping far too much trash says mayor. *Hawke's Bay Today,* p. 5.

Podmore, V. N. (2004). Questioning evaluation quality in early childhood. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 149-158). London: Sage.

Popper, K. R. (1972). *Objective knowledge: An evolutionary approach*. Oxford: Clarendon Press.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology, 24*, 1-24.

Poskitt, J. (1995). Action research: Assisting teacher development. *Principal, 10*(2), 12 -14.

Potter, N., Douglas, L., & Selby-Neal, R. (2004). *See change: Learning and education for sustainability.* Wellington: Parliamentary Commissioner for the Environment.

Prince, C. M. (1994). *Promoting an awareness of the natural environment: A meta-cognitive approach.* Unpublished MEd project, Massey University, Palmerston North.

Prince, C. M. (2000). Teacher's perceptions of environmental education in early childhood. *New Zealand Research in Early Childhood Education, 3*, 109-123.

Prince, C. M. (2004). *Environmental education in the early years*. Palmerston North: Kanuka Grove Press.

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon Schuster.

Rahman, M. A. (1993). *People's self-development: Perspectives on participatory action research; a journey through experience*. Dhaka: University Press.

Ramsey, K., Breen, J., Sturm, J., Lee, W., & Carr, M. (2005). Roskill South kindergarten: Centre of innovation. In A. Meade (Ed.), *Catching the waves: Innovation in early childhood education* (pp. 25-30). Wellington: NZCER Press.

Reason, P. (1994). Three approaches to participatory inquiry. In N. K. Denzin & Y. S. Lincoln (Eds.), *The handbook of qualitiative research* (pp. 324-339). Thousand Oaks CA: Sage.

Reedy, T. (2003). Toku rangatiratanga na te mara-matauranga: "Knowledge and power set me free ..." In J. Nuttall (Ed.), *Weaving Te Whāriki: Aotearoa New Zealand's early childhood curriculum document theory and practice* (pp. 51-77). Wellington: Council for Educational Research.

Rico, S. A., & Shulman, J. H. (2004). Invertebrates and organ systems: Science instruction and fostering a community of learners. *Journal of Curriculum Studies, 36*(2), 159-181.

Rinaldi, C. (1993). The emergent curriculum and social constructivism. In L. Gardini & G. Forman (Eds.), *The hundred languages of children*. Norwood, NJ: Ablex.

Riojas-Cortez, M. (2001). Preschoolers' funds of knowledge displayed through sociodramatic play episodes in a bilingual classroom. *Early Childhood Education Journal, 29*(1), 35-40.

Robinson, D. (Ed.). (2002). *Building social capital*. Wellington: Institute of Policy Studies at Victoria University.

Robinson, V., & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools*. Thousand Oaks, CA: Sage.

Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. Oxford: Oxford University Press.

Rogoff, B. (1995). Observing socio-cultural activity on three planes: Participatory appropriation, guided participation and apprenticeship. In J. V. Wertsch, P. Del Rio & N. Alverez (Eds.), *Socio-cultural studies of mind* (pp. 139-164). New York: Cambridge University Press.

Rogoff, B. (1998). Cognition as a collaborative process. In D. Kuhn & R. S. Siegler (Eds.), *Handbook of child psychology* (5th ed., Vol. 2, pp. 679-744). New York: John Wiley.

Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.

Rogoff, B., Goodman Turkanis, C., & Bartlett, L. (2001a). Lessons about learning as a community. In B. Rogoff, C. Goodman Turkanis & L. Bartlett (Eds.), *Learning together: Children and adults in a school community* (pp. 3-17). Oxford: Oxford University Press.

Rogoff, B., Goodman Turkanis, C., & Bartlett, L. (Eds.). (2001b). *Learning together: Children and adults in a school community*. Oxford: Oxford University Press.

Rogoff, B., Paradise, R., Mejia Arauz, R., Correa-Chavez, M., & Angelillo, C. (2003). First hand learning through intent participation. *Annual Review of Psychology, 54*, 175-202.

Ryder, D., & Wright, J. (2005). Innovations in New Beginnings pre school. In A. Meade (Ed.), *Catching the waves: Innovation in early childhood education* (pp. 15-24). Wellington: NZCER Press.

Ryle, M. (1988). *Ecology and socialism*. London: Radius.

Salomon, G. (Ed.). (1993). *Distributed cognitions: Psychological and educational considerations*. New York: Cambridge University Press.

Schoenfeld, A. H. (2004). Multiple learning communities: Students, teachers, instructional designers, and researchers. *Journal of Curriculum Studies, 36*(2), 237-256.

Sfard, A. (1998). On two metaphors of learning and the danger of choosing just one. *Educational Researcher, 27*(2), 4-13.

Shulman, L. S., & Sherin, M. G. (2004). Fostering communities of teachers as learners: Disciplinary perspectives. *Journal of Curriculum Studies, 36*(2), 135-140.

Simmons, H., Schimanski, L., McGarva, P., Cullen, J., & Haworth, P. (2005). Teachers researching young children's working theories. *Early Childhood Folio 9*, 18-22.

Siraj-Blatchford, I. (2004). Quality teaching in the early years. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 137-148). London: Sage.

Siraj-Blatchford, I., & Sylva, K. (2000). *Effective pedagogy in the early years: A confidential report to the DFES, London*. London: London University College of Education.

Siraj-Blatchford, I., Sylva, K., Muttock, S., Gidden, R., & Bell, D. (2002). *Researching effective pedagogy in the early years*. Research report No. 356, Department for Education and Skills. London: HMSO.

Smith, A. B. (1996). The early childhood curriculum from a sociocultural perspective. *Early Child Development and Care, 115*, 51-64.

Snook, I. (1997). Schools and the right to privacy. *Access: Critical Perspectives on Cultural and Policy Studies in Education, 16*(1), 1-9.

Snook, I. (1999). The ethics and politics of social research. In C. Davidson & M. Tollich (Eds.), *Social science research in New Zealand* (pp. 69-81). Auckland: Longman.

Stake, R. E. (2000). Case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 435-454). Thousand Oaks: Sage.

Stanley, W. B., & Nelson, J. L. (1986). Social education for social transformation. *Social Education, 50*(8), 528-533.

Sterling, S. (1993). Environmental education and sustainability: A view from holistic ethics. In J. Fien (Ed.), *Environmental education: A pathway to sustainability* (pp. 69-98). Geelong: Deakin University.

Stewart, D. W., & Shamdasani, P. N. (1998). Focus group research: Exploration and discovery. In L. Bickman & D.J. Rog (Eds.), *Handbook of applied social research methods* (pp. 505-526). Thousand Oaks, CA: Sage.

Stone, W., Gray, M., & Hughes, J. (2003). *Social capital at work: How families' ties and civic ties relate to labour market outcomes*. Melbourne: Institute of Family Studies.

Sumner, C. (1979). *Reading ideologies: An investigation into Marxist theory of ideology and law*. London: Academic Press.

Tijus, C. A., Santoline, A., & Danis, A. (1997). The impact of parental involvement on the quality of day-care centres. *International Journal of Early Years Education, 5*(1), 7-20.

Valsiner, J. (1998). Ontology of co-construction of culture within socially organised social settings. In J. Valsiner (Ed.), *Child development within culturally constructed environments* (Vol. 2, pp. 283-297). New Jersey: Ablex.

Velez-Ibanez, C. (1988). Networks of exchange among Mexicans in the US and Mexico: Local level mediating responses to national and international transformations. *Urban Anthropology, 17*(1), 27-51.

Velez-Ibanez, C. (1993). US Mexicans in the borderlands: Being poor without the underclass. In J. Moore & R. Pinderhughes (Eds.), *In barrios: Latinos and the underclass debate* (pp. 195-220). New York: Russell Sage Foundation.

Vygotsky, L. S. (1978). *Mind in society: The development of higher order psychological processes* (M. Cole Ed.). Cambridge, MA: Harvard University Press.

Wadsworth, Y. (1998). What is participatory action research? *Action Research International* Retrieved March 25, 2003, from http://www.scu.educ.au/schools/gcm/ar/ari/p-ywadsworth98.html

Wellman, H. M., & Gelman, S. A. (1992). Cognitive development: Foundational theories of core domains. *Annual Review of Psychology, 43*, 337-375.

Wellman, H. M., & Gelman, S. A. (1998). Knowledge acquisition in foundational domains. In D. Kuhn & R. S. Seigler (Eds.), *Handbook of child psychology: Cognition perception and language* (5th ed., Vol. 2, pp. 523-573). New York: John Wiley.

Wells, G. (Ed.). (2001). *Action, talk, and text: Learning and teaching through inquiry*. New York: Teachers College Press.

Wertsch, J. V. (1991). *Voices of the mind: A socio-cultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1995). The need for action in socio-cultural research. In J.V. Wertsch, P. Del Rio & A. Alvarez (Eds.), *Socio-cultural studies of mind*. New York: Cambridge University Press.

Wertsch, J. V., Del Rio, P., & Alvarez, A. (Eds.). (1995). *Socio-cultural studies of mind*. New York: Cambridge University Press.

Whyte, W. F. (Ed.). (1991). *Participatory action research*. London: Sage.

Wilkinson, T. M. (2001). The core ideas of research ethics. In M. Tollich (Ed.), *Research ethics in New Zealand* (pp. 18-24). Auckland: Longman.

Williams-Kennedy, D. (2004). Building bridges between literacies. In A. Anning, J. Cullen & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 80-118). London: Sage.

Williams, T., & Robinson, D. (2002). Social capital-based partnerships: A Maori perspective and a comparative approach. In D. Robinson (Ed.), *Building social capital* (pp. 14-30). Wellington: Victoria University Wellington.

Wilson, R. A. (1993a). Educators for the earth: A guide for early childhood instruction. *The Journal of Environmental Education, 23*(2), 15-21.

Wilson, R. A. (1993b). *Fostering a sense of wonder in the early years*. Columbus, OH: Greydon Press.

Wilson, R. A. (1994). *Young children's thoughts on the environment.* Paper presented at the International Conference of the North American Association for Environmental Education, Cuncun, Mexico, September.

Wilson, R. A. (1996). *Starting early: Environmental education during the early years.* from ERIC Digest ED402147

Wood, E., & Attfield, J. (2005). *Play learning and the early childhood curriculum* (2nd ed.). London: Paul Chapman Publishing.

Wylie, C. (2001). *Ten years old and competent, the fourth stage of the competent children project: A summary of the main findings*. Wellington: New Zealand Council for Educational Research.

Yin, R. K. (1989). *Case study research: Design and method* (2nd ed.). Newbury Park, CA: Sage.

Zellermayer, M., & Tabak, E. (2006). Knowledge construction in a teachers' community of enquiry: A possible road map. *Teachers and Teaching: Theory and practice, 12*(1), 33-49.

Zuber-Skerritt, O. (1993). Improving learning and teaching through action learning and action research. *Higher Education Research and Development, 18*(1), 45-58.

Appendix 1: Initial permission letters

Cynthia Prince
75 Simla Avenue
Havelock North

Senior Teacher
Heretaunga Kindergarten Assoc. (INC)
404 Hastings Street
Hastings

To whom it may concern
Re: Permission to conduct research

I am requesting permission to conduct Doctoral (Ed D) research in a Kindergarten in your Association, as outlined below. This would be under the supervision of Massey University.

Project title: The creation of a community of learners to promote environmental education in early childhood curriculum.

Summary of the project

- The study will comprise a case study of two early childhood education centres, a childcare centre and a kindergarten. The participants will be the teachers and children in these early childhood settings. A target group of five children (a mix of boys and girls), as well as a group of six to eight parents will be chosen at each centre. The study will investigate the creation of a community of learners, to promote environmental education, using an environmental education integrated curriculum. The study will be conducted in two phases. A case study will be the methodological approach for the first phase. At the end of this phase, depending on the confidence of the participants, a choice of participatory action research will be suggested for the second phase. Participants will either choose to continue with the case study, or a participatory action research approach, or possibly a combination of both. Five main questions (with sub questions) on the topic will be investigated. Data collection methods will be audio taped focus group interviews (adults) and semi structured interviews (children) as well as narrative and anecdotal observations. The data analysis will involve reflexive analysis of the data.

I would appreciate your advice on a suitable Kindergarten to take part in the research. A Kindergarten that is interested in research, and promoting care of the natural environment, would be an advantage. I am currently employed at the Eastern Institute of Technology in Taradale. My position is Lecturer in Early Childhood Education, on the Diploma of Teaching (ECE) Programme.

My interest in the topic of Environmental Education has been longstanding. In 1994, for my Masters research (MEd) I investigated children's awareness of the natural environment. In 2000, this interest continued and I investigated whether or not Environmental Education was considered an integral part of an early childhood centre's philosophy. This research was conducted in 6 early childhood centres, in the Hawkes Bay region.

I would appreciate your consideration of this matter and look forward to your reply. If you have any questions regarding this research, please do not hesitate to contact me, or my Supervisors at Massey University.

Researcher and Supervisors Contact Details:

- Researcher:
- Cynthia Prince
- 75 Simla Ave
- Havelock North.
- Phone (06) 8777 333
- cynthia.prince@xtra.co.nz

- Supervisor (First):

- Professor Joy Cullen
- Massey University, Hokowhitu
- Phone (06) 356 9099 Ext 8955
- J.L.Cullen@massey.ac.nz

- Supervisor (Second)
- Doctor Jenny Poskitt
- Massey University, Hokowhitu
- Phone (06) 356 909
- J.L.Poskitt@massey.ac.nz

Thank you in anticipation.

Yours sincerely
Cynthia Prince

Cynthia Prince
75 Simla Avenue
Havelock North

The Manager
Governing Body Committee
Childcare Centre
Napier

To whom it may concern

Re: Permission to conduct research

I am requesting permission to conduct Doctoral (Ed D) research in your Childcare Centre, as outlined below. This would be under the supervision of Massey University.

Project title: The creation of a community of learners to promote environmental education in early childhood curriculum.

Summary of the project

- The study will comprise a case study of two early childhood education centres, a childcare centre and a kindergarten. The participants will be the teachers and children in these early childhood settings. A target group of five children (a mix of boys and girls), as well as a group of six to eight parents will be chosen at each centre. The study will investigate the creation of a community of learners, to promote environmental education, using an environmental education integrated curriculum. The study will be conducted in two phases. A case study will be the methodological approach for the first phase. At the end of this phase, depending on the confidence of the participants, a choice of participatory action research will be suggested for the second phase. Participants will either choose to continue with the case study, or a participatory action research approach, or possibly a combination of both. Five main questions (with sub questions) on the topic will be investigated. Data collection methods will be audio taped focus group interviews (adults) and semi structured interviews (children) as well as narrative and anecdotal observations. The data analysis will involve reflexive analysis of the data.

If your childcare centre has an interest in research in early childhood, and promoting care of the natural environment, this would be an advantage. However this would not be essential to take part in the research. I am currently employed at the Eastern Institute of Technology in Taradale. My

position is Lecturer in Early Childhood Education, on the Diploma of Teaching (ECE) Programme.

My interest in the topic of Environmental Education has been longstanding. In 1994, for my Masters research (MEd) I investigated children's awareness of the natural environment. In 2000, this interest continued and I investigated whether or not Environmental Education was considered an integral part of an early childhood centre's philosophy. This research was conducted in 6 early childhood centres, in the Hawkes Bay region.

I would appreciate your consideration of this matter and look forward to your reply. If you have any questions regarding this research, please do not hesitate to contact me, or my Supervisors at Massey University.

Researcher and Supervisors Contact Details:

- Researcher:
- Cynthia Prince
- 75 Simla Ave
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- Phone (06) 8777 333
- cynthia.prince@xtra.co.nz

- Supervisor (First):

- Professor Joy Cullen
- Massey University
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- Supervisor (Second)
- Massey University, Hokowhitu
- Doctor Jenny Poskitt
- Phone (06) 356 909
- J.M.Poskitt@massey.ac.nz

Thank you in anticipation.

Yours sincerely
Cynthia Prince

Appendix 2: Consent process

Appendix 2A

INVITATION

To take part in research at your centre

Project Title

Creating a community of learners to promote environmental education in early childhood Curriculum.

Greetings

My name is Cynthia Prince and I am a lecturer in early childhood education at the Eastern Institute of Technology In Taradale Hawkes Bay. This project is my Doctorate research in education. I am doing my research through Massey University in Palmerston North. I have gained permission to conduct this research in your centre from the Kindergarten Association/Governing Body of the Childcare Centre, as well as the teachers at your centre. I am now approaching you to take part.

I need 6-8 parents/guardians and 5 children (3-5 years) to be involved in the project. The children will need to be attending the centre for the duration of the research (i.e. not going to school prior to the end of the research period) or at the least the first phase. A child's home and those who have the closest contact with the child, in that setting, are very important in a child's life. Therefore it would be good if you could be involved along with your child either as an individual or a couple. You may on the other hand, want to take part without your child and that is an option also.

The research will be conducted in two phases over a one year, period. If you are interested in taking part you will receive an information sheet outlining the research and a consent form for your consideration. At this point, fill out the reply form (attached) and return it to the centre. You can place it in the box provided at the entrance to your centre.

I look forward to hearing from you.

Signed

Dated

Appendix 2B

REPLY FORM

Name

I would like to discuss taking part in the research project to be conducted by Cynthia Prince.

Project Title

Creating a community of learners to promote environmental education in early childhood curriculum.

With my child
Without my child

I understand it is my choice to take part, and that an information sheet outlining the research and a consent form will be given to me for my consideration.

Signed Dated

Appendix 2C

Project Title

Creating a community of learners to promote environmental education in early childhood education

INFORMATION SHEET

Teacher/Centre

Researcher and Supervisors Contact Details

- Researcher:
- Cynthia Prince
- 75 Simla Ave
- Havelock North.
- Phone (06) 8777 333
- Cynthia.prince@xtra.co.nz

- Supervisor (First):

- Professor Joy Cullen
- Massey University, Hokowhitu
- Phone (06) 356 9099 Ext 8955
- J.L.Cullen@massey.ac.nz

- Supervisor (Second)
- Massey University, Hokowhitu
- Doctor Jenny Poskitt
- Phone (06) 356 909
- J.M.Poskitt@massey.ac.nz

Introduction

My name is Cynthia Prince and I am a lecturer at the Eastern Institute of Technology in Taradale Hawkes Bay. This project is my Doctorate research in Education. The purpose of the project is to investigate the creation of a community of learners to promote environmental education in early childhood curriculum. It is hoped that this collaborative research will benefit you and your centre as you gain valuable knowledge of the natural environment. The opportunity to plan learning experiences to promote environmental education will emphasize your role in enhancing caring attitudes towards the natural environment.

Your Participation

I have written letters to the Kindergarten Association and the Governing Body of the Childcare Centre. I have obtained written permission to conduct this

research. I would like you to take part in this research. This will occur only after you have fully considered the information on this information sheet and the time commitment involved. The research will not proceed until a response for full participation is received from you. As this is collaborative research, and is a positive process, it is not anticipated that there will be any risk or discomfort to you.

Project Procedures

The data that will be collected as part of this research will only be used for that purpose. It will be collated and analyzed using emerging themes and will be stored in a locked cabinet at my home. It will be disposed of at the end of the retention period (5 years). Your confidentiality will be assured. No participant will be identifiable in the final document, as pseudonyms will be used. A summary of the research will be sent to you, along with other participants in the research. A copy will also be sent to the Kindergarten Association and the Childcare Centre Governing Body.

Your Involvement

The research will be conducted over one year in two early childhood centres (one kindergarten, one childcare centre). The research will be conducted in two phases. Phase one will span terms one and two and phase two terms three and four. In phase one, after consultation with you, your involvement will be in one of these two terms. In phase one I will be using a case study approach to the research. This will mean I will lead the research and assist you with the planning (by offering resources and advice) for implementing your environmental education integrated curriculum. During this time it is hoped you will gain experience and confidence in the research process.

At the conclusion of phase one, you will be offered the choice in phase two, of continuing with the case study approach, or being involved in participatory action research. Participatory action research, as the name suggests, means you will participate in the research and lead the planning and implementation of the environmental education integrated curriculum. This will occur as you are involved in action research cycles. My role will be one of mentor, advisor and motivator for you to conduct the research in your centre.

Your participation will involve planning and implementing two, two week, environmental education integrated curriculum implementations. The curriculum implementation could be longer in phase two if you chose participatory action research. In phase one you will be involved in three ½ hour interviews (guided by an interview schedule), one before the curriculum implementation and one after. In phase two there will be one interview after the curriculum implementation. Written observations will be part of this process. Access to individual child assessment records (to gain relevant information about the environmental education integrated curriculum) will be requested. Your permission to take photographs of your centre's natural environment and the local community will be sought. No children will be included. Your permission will also be sought for access to the parents and children at your centre to be interviewed and observed as part of the research. You will be consulted about all research procedures. Once you have agreed to this, I will send out an invitation to the parents at your centre inviting them to take part in the research. I will need 6-8 parents and 5 target children (3-5years) to take part in the research. The children will need to be attending the centre for the duration of the research (i.e. not going to school prior to the end of the research period) or at least the first phase. A reply form will be included with the invitation and the parents can place it in a box at the entrance to the centre. Information sheets and consent forms will be available to the parents.

Your Rights

You have the right to:

- decline to participate;
- decline to answer any particular question;
- withdraw from the study at anytime;
- ask questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
.
- be given access to a summary of the findings when it is concluded.

I also understand that I have the right to ask for the audio tape be turned off at any time during the interview.

Project Details

If you have any questions about this project, you can contact the researcher, Cynthia Prince telephone (06) 8777 333 e-mail cynthia.prince@xtra.co.nz or research supervisors Professor Joy Cullen Massey University telephone (06) 356 9099 Ext 8955 e-mail J.L.Cullen@massey.ac.nz Doctor Jenny Poskitt Massey University telephone (06) 356 9099 e-mail J.M.Poskitt@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Protocol NO/NO *(insert protocol number).* If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Campus Human Ethics Committee: Palmerston North, telephone 06 350 5249, email S.V.Rumball@massey.ac.nz.

Appendix 2D

Project Title

Creating a community of learners to promote environmental education in early childhood curriculum

CONSENT FORM

Teacher/Centre

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF FIVE (5) YEARS

I have read the information sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask any further questions at any time.

I agree/do not agree for photographs to be taken of the centre's natural environment.

I agree/do not agree to allow the researcher to access relevant individual child assessment records, (held at the centre), as part of the research process.

I agree/do not agree for written observations to be taken as part of the research process.

I agree/do not agree to the interview being audio taped.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: ..... **Date:** .....

Full Name – printed .....

11/ 10/ 03

Appendix 2E

Project Title

Creating a community of learners to promote environmental education in early childhood education

Information Sheet

Parent

Researcher and Supervisors Contact Details

- Researcher:
- Cynthia Prince
- 75 Simla Ave
- Havelock North.
- Phone (06) 8777 333
- cynthia.prince@xtra.co.nz

- Supervisor (First):

- Professor Joy Cullen
- Massey University, Hokowhitu
- Phone (06) 356 9099 Ext 8955
- J.L.Cullen@massey.ac.nz

- Supervisor (Second)
- Massey University, Hokowhitu
- Doctor Jenny Poskitt
- Phone (06) 356 909
- J.M.Poskitt@massey.ac.nz

Introduction

My name is Cynthia Prince and I am a lecturer at the Eastern Institute of Technology in Taradale Hawkes Bay. This project is my Doctorate research in Education. The purpose of the project is to investigate the creation of a community of learners to promote environmental education in early childhood curriculum. It is hoped that this research will enhance your child's knowledge and attitudes towards the natural environment. It is important that this learning occurs in the early years. Your involvement in their education provides a valuable link between the knowledge gained at home, and what is learned at the centre. Through your child's interactions at home, and with the teachers and other children at the centre, their learning will be enhanced through a process of learning together.

Your Participation

The teachers at your centre have agreed to participate in this research and I would like you to take part also. This will occur only when you have fully considered the information on this

information sheet. The research will not proceed until a response for full participation is received from you. As this is collaborative research and is a positive process, it is not anticipated that there will be any risk or discomfort to you.

Project Procedures

The data that will be collected as part of this research will only be used for that purpose. It will be collated and analyzed using emerging themes and will be stored in a locked cabinet at my home. It will be disposed of at the end of the retention period (5 years). Your confidentiality will be assured. No individual will be identifiable in the final document, as pseudonyms will be used. A summary of the research will be sent to you along with other participants in the research. A copy will be sent to the Kindergarten Association and the Childcare Governing Body.

Your Involvement

The research will be conducted over a year in two early childhood centers (one kindergarten and one childcare centre). The research will be conducted in two phases. Phase one will span terms one and two and phase two terms three and four. After consultation with you your involvement will be in one of these terms in both phases. Your involvement will be three one hour, audio taped focus group interviews, guided by interview questions. In phase one there will be one interview before the environmental education integrated curriculum and one after. In phase two there will be a combined focus group interview (with parents from both centers) after the curriculum implementation. If you wish, you can be involved in the environmental education integrated curriculum at your centre including excursions.

Your Rights

You have the right to:

- decline to participate;
- decline to answer any particular question;
- withdraw from the study at any time;
- ask questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the findings when it is concluded.

I also understand that I have the right to ask for the audio tape be turned off at any time during the interview.

Project Contacts

.
If you have any questions about this project you can contact the researcher Cynthia Prince telephone (06) 8777 333 e-mail cynthia.prince@xtra.co.nz or research supervisors Professor Joy Cullen Massey University telephone (06) 356 9099 Ext 8955 e-mail J.L.Cullen@massey.ac.nz Doctor Jenny Poskitt Massey University telephone (06) 356 9099 e-mail J.M.Poskitt@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Protocol NO/NO *(insert protocol number).* If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Campus Human Ethics Committee: Palmerston North, telephone 06 350 5249, email S.V.Rumball@massey.ac.nz

Appendix 2F

Project Title

Creating a community of learners to promote environmental education in early childhood curriculum

CONSENT FORM

Parent

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF FIVE (5) YEARS

I have read the information sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask any further questions at any time.

I agree/do not agree to allow the researcher to access relevant individual child assessment records, (held at the centre), as part of the research process.

I agree/do not agree to be interviewed as part of focus group interviews.

I agree/do not agree to the interview being audio taped.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: ..... **Date:** .....

Full Name – printed .....

11/ 10/ 03

Appendix 2G

Project Title

Creating a community of learners to promote environmental education in early childhood education

INFORMATION SHEET

Parent/Child

Researcher and Supervisors Contact Details

- Researcher:
- Cynthia Prince
- 75 Simla Ave
- Havelock North.
- Phone (06) 8777 333
- cynthia.prince@xtra.co.nz

- Supervisor (First):

- Professor Joy Cullen
- Massey University, Hokowhitu
- Phone (06) 356 9099 Ext 8955
- J.L.Cullen@massey.ac.nz

- Supervisor (Second)
- Doctor Jenny Poskitt
- Massey University, Hokowhitu
- Phone (06) 356 909
- J.M.Poskitt@massey.ac.nz

Introduction

My name is Cynthia Prince and I am a lecturer at the Eastern Institute of Technology in Taradale, Hawkes Bay. This project is my Doctorate research in Education. The purpose of the project is to investigate the creation of a community of learners to promote environmental education in early childhood curriculum. It is hoped that this collaborative research will enhance your child's knowledge of the natural environment. It is important that this learning occurs in the early years. Your involvement in their education provides a valuable link between the knowledge gained at home and what is learned at the centre. Through your child's interactions at home, and with the teachers and other children at the centre, their learning will be enhanced through a process of learning together.

Your Participation

I would like your child to be involved in this research. This will only occur after you have fully considered the information on this information sheet and the commitment involved. This research will not proceed until a response for full participation is received from you. As this is collaborative research and is a positive process, it is not anticipated that there will be any risk or discomfort to you.

Project Procedures

The data that will be collected, as part of this research, will only be used for that purpose. It will be collated and analysed using emerging themes, and will be stored in a locked cabinet at my home. It will be disposed of at the end of the retention period (5 years). Your confidentiality will be assured. No individual will be identifiable, in the final document, as pseudonyms will be used. A summary of the research will be sent to you, along with other participants in the research. A copy will also be sent to the Kindergarten Association and Childcare Centre Governing body.

Your Child's Involvement

The research, will be conducted over a one year period, in two early childhood centres. Your child will be involved in three ¼ hour interviews. Natural environment pictures will be shown to your child and questions asked about them. The interviews will take place in the sight of the teachers, in a quiet place. If your child shows signs of discomfort or distress, the interview will be terminated. Written observations will be conducted as part of the environmental education integrated curriculum. This will involve your child being observed participating in the curriculum learning experiences. Access to your child's individual assessment records, (to gain relevant information about the environmental education integrated curriculum), will be requested as part of the research process.

Your Rights (Parent)

You have the right to:

- decline to participate;
- decline to answer any particular question;
- Withdraw from the study at any time;
- ask questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;

.

- be given access to a summary of the findings when it is concluded.
-

I also understand I have the right to ask for the audio-tape to be turned off at any time during the interview.

Your Rights (Child)

You have the right to:

- decline to participate;
-
- decline to answer any particular question;

-
- withdraw from the study at any time.
-

I also understand that I have the right to ask for the audio-tape to be turned off at any time during the interview.

Project Contacts

If you have any questions about this project you can contact the researcher Cynthia Prince telephone (06) 8777 333 e-mail cynthia.prince@xtra.co.nz or research supervisors Professor Joy Cullen Massey University telephone (06) 356 9099 Ext 8955 e-mail

J.L.Cullen@massey.ac.nz Doctor Jenny Poskitt Massey University telephone (06) 356 9099 e-mail J.M.Poskitt@massey.ac.nz

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Protocol NO/NO *(insert protocol number).* If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Campus Human Ethics Committee: Palmerston North, telephone 06 350 5249, email S.V.Rumball@massey.ac.nz.

Appendix 2H

Project Title

Creating a community of learners to promote environmental education in early childhood curriculum

CONSENT FORM

Parent/Child

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF FIVE (5) YEARS

I have read the information sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask any further questions at any time.

I agree/do not agree to allow the researcher to access relevant individual child assessment records, (of my child, held at the centre), as part of the research process.

I agree/do not agree for written observations of my child to be taken as part of the research process.

I agree/do not agree to my child being interviewed as part of the research process.

I agree/do not agree to the interview being audio taped.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: ..... **Date:** .....

Full Name – printed .....

11/10/03

Appendix 2I

Project Title

Creating a community of learners to promote environmental education in early childhood curriculum

Consent Form ☻☼☼☼☻ Child

To be read to the child before signing:

Hello……(name) my name is Cynthia and I am, at your centre to be part of a programme about nature. I have talked to your Mother about the programme and she said it is OK for you to join in.

I will be showing you some pictures about nature and I will be asking you some questions about the pictures. I will be using a tape recorder to tape what you say. Before I do this, I will ask you if it is alright with you. I will ask you if you are ready to have you turn, and if you want to ask me anything before we start.

Child Consent

I would like to join in the nature play and talk to Cynthia about it.

Name:

Signed:

Appendix 2J

Project Title

Creating a community of learners to promote environmental education in early childhood education

Focus Group

CONFIDENTIALITY AGREEMENT

I ..... (Full Name – printed)

agree to keep confidential all information and procedures concerning the project Creating a community of learners to promote environmental education in early childhood curriculum .....

Signature: ..... **Date:** .....

Full Name – printed .....

11/ 10/ 03

Appendix 2K

Project Title

Creating a community of learners to promote environmental education in early childhood education curriculum

TRANSCRIBER'S AGREEMENT

I ..... (Full Name - printed) agree to transcribe the tapes provided to me.

I agree to keep confidential all the information provided to me.

I will not make any copies of the transcripts or keep any record of them, other than those required for the project.

TRANSCRIBER

Signature: ..... **Date:** .....

WITNESS

Signature: ..... **Date:** .....

Full Name - printed .....

Appendix 3

Field Notes/Cover sheet Date: 18/3/04 Time: 8.45-12.30

Space (Physical setting)	Kindergarten Day Four EEIC
Actors (People in the situation)	Teachers S & A Focus children T M R J T G B is sick
Activities/Events (Related acts taking place)	Puzzle on mat – J amongst group Read book to 3 children Mat time
Objects (Artefacts, physical things present)	Experiment. Onions/carrots books see resources
Acts (Specific actions of participants)	Explanation of experiment An explanation of trip to Rocky shore Boy's visit to aquarium L's incidental conversation B's weta story
Time (Sequence, acts, activities, events)	Free play mat time mat time
Goals (What people are trying to achieve)	To make connections with the 'interest' of EE and the Rocky Shore visit
Feelings (What people feel and express)	Concentration excitement (boy who had gone to the aquarium)

Adapted from Poskitt (2003)

Appendix 4

Observation Schedule:

* Teaching Strategies

Time: 8.45am Date: 18.03.04 Focus Child: J	Narrative Observation Centre: Situation/ circumstances	Reflective comments/ analysis
Focus Child J	I arrived at Kindergarten and a group of children were on the mat with the new sea puzzle. J was amongst the group they were making up the puzzle. A child finds a turtle. One child asks about the mermaid. A child asks me to read to them. Firstly N (a child) asks me to read to her. It's a board book Tahi Rua Toru Wha. 1234 whale 2 tuatara 3 eels 4 owls 5 kiwi 6 snakes 7 fish 8 kereru 9 crayfish 10 penguins (see resources) Two children then joined me and looked at the By the Seashore Touch and Feel book we had a discussion on coral (I had brought in). I showed them the coral on the calendar and told them it was the great barrier reef. This is the book S had read previously. We talked about the rocky shore trip. We then read Life in the Ocean. The children were then called to mat time.	My role The mermaid and turtle are actual pictures
9.15 T	T and G (focus children) are making seaweed pictures "I am sharing with my friends. "My picture is finished" T helps G get her name out so G can name her work T goes to the magnetic board and gets G's name. G looks at her name and writes it. I ask G to tell me about her picture "I found that at the rocky shore" (pointing to the pine frond "I found rocks and some snails and seaweed"	continued interest in things she had found at the rocky shore
A	Group mat time teachers A & S. *Grouping Facilitating Positioning "Morena tamariki mai "Did you all have a lovely big sleep yesterday?" "I think we were all tired"	*Questioning Recalling (meaning teachers)

Child	A child has a show and tell. The children look at a transformer (toy) from MacDonalds. An eagle	
A	It has a little magnet in it. Maybe it is a fake magnet. It could be in upside down. Says how the teachers aide put a magnetic strip on the other way and it did not stick.	A talks about the magnet board for the names
S	They look at the experiments (which are carrot tops) they have on the shelf. Pass them like the "hot potato" song (going around circle)	A slow process *Singing
S	Look at these ones that have water. They have green things (carrot tops) They are growing	The two experiments are being passed around together
S	"look this one is shrivelled "can you see the difference?"	* Describing
* Reinforcing learning of rocky shore trip	What a wonderful day for making music Haere mai everyone Singing	Song
A Focus child T , A	e noho "Now yesterday what did we do?"	* Recalling
A	We went to the rocky shore walked on rocks and found some stuff. "What did we find at the Rocky Shore?" "A starfish" "Was it a big or a small starfish?" "Small"	* Questioning * Co-constructing
children	Some crabs I found a fish and it was tiny" "I found a massive crab"	
A A	"Was that under a big rock?" "One child from School found a "big mumma""	* Describing
Focus Child Good Observation of A what happened R at the rocky shore	When we lifted the rock it had holes in it "What do you think we found in the holes?" "Snails and crabs" "I found a crab at the rocky shore under a little rock " "How big was it?"	*Questioning * Recalling * Recalling * Co-constructing * Listening
A R	"Small"	
A R	"Did you put it into your hand?" "No"	* Questioning

A R	"I wonder what it would feel like?" "I put one on my hand and it tickled"	*Co-constructing
A A A	"What else did I find on the rocks?" "A little sea slater" "We found a centipede It was so quick it ran away. It is long with lots of legs"	* Describing * Recalling
S S	"There were lots of limpets" "Limpets that were stuck to the rock"	* Describing
A	"Big black ones and green ones" There shells are hard.	
A	"I was bit disappointed with the rocky shore trip this year last year found a big starfish big crabs there was a lot more sea life"	Have discussed pollution previously * Philosophising
A	I am wondering if the sea is polluted because of the floods" "I wonder if sewage went into the sea".	Shows children a picture book
Pollution Link A A A	"see where it is brown" I think it was polluted I think that is why there was not as much sea life this year.	* Describing has been reported in local newspaper
Focus Child G	"I found a crab It didn't move" "It was a brown one"	
Focus Child T	"And I found a crab and put it in the bucket mum and I did it. It just about moved and we got it"	Linking with instruction before rocky shore trip * Reinforcement
A	"Why didn't we bring sea life back to the kindergarten?"	
Children	"It would have died" (if they bought it back to the kindergarten).	
	Says that a boy has been to the aquarium. He went after the rocky shore trip. He proceeds to describe cleaning the tank. he has a great imagination and lots of nonverbal communication to describe the experience. He says there is new feature at the Aquarium He role plays what the crocodile does at the aquarium for the whole group.	Starts with his mouth and then crocodile eyes * Feedback
A Children	Do you think it would be good life to be a crocodile at the aquarium? "no"	

	"He eats plankton"	
	A discussion took place about what plankton was. I said I thought it was little fish.	Shows teachers do not know everything and that to we have to look up about it 100
A	Thought it was a form of seaweed. S decided to look it up in the dictionary. She said it was microscopic life (organisms)	* Problem solving
Another child	"Me and daddy went to the aquarium".	
	There were sharks they can get you. There is a whale there"	*Feedback
A	"They and enclosed in a tank. The white line is where you look at the sharks"	(Non-verbal)
Child discussing the aquarium	"Yeah they can" (get you) "There is door"	Sharks
	He then describes the diving suit.	
	"They had one google in the old days."	
A	Etu I am going to get you moving.	Old Diving Suit
	Way down inside his box lives a Teddy Bear.	Singing Song

Appendix 5

INTERVIEW QUESTIONS
TEACHERS
Interview One

1 What do you know about environmental education (Q3a)

2 Do you think it is important to include environmental education as part of the early childhood curriculum? (Q3b)

3 How do you see your role in implementing environmental education into the early childhood curriculum? (Q3)

4 Do you think the teaching of environmental education links with Te Whariki the early childhood curriculum? (Q3a)

5 What environmental education learning experiences and knowledge would you include as part of the early childhood curriculum? (Q3a)

6 What teaching strategies would you use to implement environmental ducation into the early childhood curriculum? (Q3b)

Interview Two

1 What do you know about environmental education (Q3a)

2 Do you think it is important to include environmental education as part of the early childhood curriculum? (Q3b)

3 How do you see your role in implementing environmental education into the early childhood curriculum? (Q3)

4 Do you think the teaching of environmental education links with Te Whariki the early childhood curriculum? (Q3a)

5 What environmental education learning experiences and knowledge did you include as part of the early childhood curriculum? (Q3a)

6. What teaching strategies did you use to implement environmental education into the early childhood curriculum? (Q3b)

TEACHER COMBINED FOCUS GROUP INTERVIEW:

Interview Three 29/11/04

1 What environmental learning happened for the children as a result of the creation of a community of learners in your centre/kindergarten?

2 How did you involve the families in your centre's/kindergarten's community of learners and environmental curriculum?

3 What teaching strategies did you use with your centre's/kindergarten's community of learners to develop knowledge about environmental education?

4 What environmental education learning has occurred for you through the research process and the creation of a community of learners?

5 What factors were helpful in the overall research process?

6 What factors were not helpful in the overall research process?

CHILDREN'S INTERVIEWS

Interview One

Photographs

Photos of the outside area of the early childhood centre

Photos of familiar natural environmental features in the local community

1 Can you tell me about this picture?

Verbal Prompt

Anything else you can see in the picture?

Interviews Two and Three

Learning Awareness Questions

(relating to the environmental education integrated curriculum)

1 Do you remember we did something special last week? (Interview two).
Do you remember what we did when I first came to your centre? (Interview three).

Verbal Prompt

Do you remember we (detail of learning experiences)? (Interview two).

Do you remember we (more specific information on the learning experiences)? (Interview three)..

Co-construction of Knowledge Questions

2 What did we do/learn about? (topic).

3 Why did we do that? (topic).

4 How did we go about finding out? (topic).

Interview Three

Introduction:

I have been coming to your centre/kindergarten for a long time and this will be the last time I'll be talking with you. Are you ready to have a turn to talk to me and use the tape recorder?

Explanation about the process:

As some time had elapsed since I last interviewed the children I showed them their original consent form. I asked for their assent (agreement) to take part. I have learned after a discussion with Martin Tolich that Ivan Snook says that as the parents have signed a consent form on behalf of the children, the children give their assent, so the consent form is therefore (in his view) an assent form.

Interview (cont)

I am going to ask you some questions now about what we have done together and what you have also done at your centre/kindergarten.

1 I have been on some trips with you. Can you tell me about what you have learned during those trips?

Verbal prompt

Do you remember that we went to the...?

2 Tell me what you know about sea creatures? Tell me what you know about bees? Tell me what you know about insects? Tell me what you know about birds?

3 What did you like learning about best?

4 Can you draw me a picture about what you have learned when we have finished?

5 What else do you know about the environment/ nature?

6 How have you learned about these? Who helped you?

Now would you like to draw me a picture about what you liked best?

INTERVIEW QUESTIONS
PARENTS
Interview One

1 What does environmental education mean to you?
2 What knowledge do you have about the natural environment?
3 Do you think it is important to have knowledge about the natural environment? Please elaborate.
4 Do you talk about the natural environment with your children?
5 How do you share your knowledge of the national environment with your children?
6 Do you recycle?

Interview Two

1. Did you talk to your child about their trip to the rocky shore/the park? What was discussed?

2. Have they talked to you about anything else to do with the environmental education programme? What was discussed?

Now that we have discussed the environmental education programme at your kindergarten I want to ask you some questions about caring for the environment.

1. What activities do you do as a family at the weekend?

2. What work experiences that involved caring for the environment have you been involved in?

3. What voluntary activities that focussed on caring for the environment have you been involved in?

4. Have you written a letter to the paper, or contacted the City Council or your local MP about anything to do with the environment?

5. Have you discussed anything about the environment with anyone in your neighbourhood?

6. In what ways is your community supportive in caring for the environment?

PARENT COMBINED FOCUS GROUP INTERVIEW:

Interview three 04/12/04

1. In phase two of the research your centre/kindergarten has created a community of learners to promote environmental education. What has been your involvement in this process?

2. In phase two of the research, your centre/Kindergarten has been planning for and supporting the children's environmental interests. What has been your involvement in this process?

3 How have you supported your child's environmental interests at home?

4 What learning has occurred for you through the research process and the creation of a community of learners?

5 What factors were helpful in the overall research process?

6 What factors were not helpful in the overall research process?

Appendix 6

Participant's interview keyword responses linked to research questions.

Research question: What constitutes the environmental education **knowledge** base of pre-school children?

Phase	One	Transition	Two
Interview	One	Two	Three
Centre: Childcare			
Group: Children			
Name			
Jacob	Flowers, beach.	Feeding birds, penguins, crab, kiwi, lobster.	Zoo, forest, birds, crocodiles, crayfish, sharks, sea snails, butterflies.
Nicholas	Trees, beach, butterflies, mud.	Bird's nest.	Farm ducklings, goat, donkey, turkeys, pigs, fish, diver, shark, bees, spiders
Benjamin	Tree, butterfly.	Withdrew.	Withdrew.
Jordan	Outside, garden, plants.	Bird, park, kiwi, dolphins. Park.	Ducks, sharks, crocodile, fish, kiwi, spiders, octopus.
Ashleigh	Tree, wood, butterfly.	Tape stopped.	Spiders, birds, chicken, rabbit, puppy.
Aaron	Sand.	Bird noise, park.	Bird, park.
Bethany		Joined research.	Chicken, duck, birds, kiwi.

Kindergarten children interviews are on the next page.

Participant's interview keyword responses linked to research questions.
Research question: What constitutes the environmental education **knowledge** base of pre-school children?

Phase	One	Transition	Two
Interview	One	Two	Three
Centre: Kindergarten			
Group: Children			
Name			
Greta	Trees, sand, birds.	Photos, bus, turtles, snails, sea slugs, shark.	Fish (feeding), starfish, snails, rocks, kiwi, sharks, worms, birds, snake, butterflies.
Louisa	Trees, grass, water, rocks.	Did not attend excursion.	Glow fishes, aquarium, flowers, honey, butterfly wings, fish, bus.
Georgia	Sand, grass, trees, water, pool (lake).	Starfish, shells, kiwi, pussy cat, bird, butterflies.	Honey, flowers, pollen, rocky shore.
Charlotte	Sand, trees, ducks, water.	Starfish, kiwi, crabs, birds, bees, rocky shore.	Sand, water, sea horse, sharks, worms, kiwi, bees, honey, fish, songs of the sea.
Kimberley	Trees, grass.	Crab, rocks, rocky shore, birds, seaweed, stones, worms.	Had gone to school.
Brooke	Trees, sand, water, ducks, lake, plants, rocks	Bus, fish, polar bear, fantails, birds, fish, eggs, water, crocodile, pictures (photos).	Diver, feeding fish, Queen bee, starfishes, rocks, clown fish, kiwi, worms/wormery.

Participant's interview keyword responses linked to research questions.

Research question: (a) What **knowledge** does the family contribute to children's environmental education, learning and **knowledge** base?

Research question: (b) In what ways does **participatory action research** methodology, and the creation of a **community of learners** concept, evolve to promote environmental education within the early childhood education setting?

Phase	One (a)	Transition (a)	Two (b)
Interview	One (a)	Two (a)	Three (b) (Combined)
Centre: Childcare			
Group: Parents			
Name			
Eve	Recycling plus learn/talk with children, gardening, conservation.	Recycling plus learn/talk with children. Weekend activities. Community involvement. Discussion with neighbours.	Recycling plus learn/talk with children. Gardening. Excursions. Wormery.
Alice	Recycling plus learn/talk with children, gardening, environment.	Recycling plus learn/talk with children. Weekend activities. Work experience. Community involvement. Discussion with neighbours.	Bird interest. Involvement. New learning. Teacher contribution. Home-centre links.
Grace	Recycling plus learn/talk with children, gardening, environment.	Recycling plus learn/talk with children. Weekend activities. Work experience. Community involvement. Wrote letter/contacted Council. Discussion with neighbours.	Awareness of learning. Environmental issues.
Jane	Recycling plus learn/talk with children, environment.	Recycling plus learn/talk with children. Weekend family. Work experience. Discussion with neighbours.	

Continued on next page

Childcare parent interview continued

Nicola	Recycling plus learn/talk with children, environment, conservation.	Withdrew from research.	
Denise	Unable to attend.	Unable to attend.	
Kathleen	Unable to attend	Recycling plus learn/talk with children. Weekend activities. Work experience. Written a letter. Discussion with neighbours	

Participant's interview keyword responses linked to research questions. The two research questions a and b are the same as for the Childcare parents above.

Phase	One (a)	Transition (a)	Two (b)
Interview	One (a)	Two (a)	Three (Combined) (b)
Centre: Kindergarten			
Group: Parents			
Name			
Carol	Clean green/tidy kiwi, Learn/talk with children, nature, keep it simple.	Recycling plus learn/talk with children. Family activities. Discussions with neighbours.	Recycling plus learn/talk with children. Gardening. Excursions.
Angela	Clean green/tidy kiwi, learn/talk with children, nature, keep it simple.	Recycling plus learn/talk with children. Family activities. Discussions with neighbours.	Wormery. Bird interest. Involvement.
Christine	Recycling, learn/talk with children, nature, keep it simple.	Recycling plus learn/talk with children. Family activities. Discussion with neighbours.	New learning. Teacher contribution. Home-centre links. Awareness of learning.
Janet	Recycling, learn/talk with children, nature, keep it simple.	Recycling plus learn/talk with children. Family activities. Work experience. Community involvement. Contacted Council. Discussion with neighbours.	Environmental issues.
Marilyn	Recycling, learn/talk with children, nature, keep it simple.	Recycling plus learn/talk with children. Family activities.	
Kathryn	Recycling, learn/talk with children, nature, keep it simple, environmental	Withdrew from research.	

Participant's interview keyword responses linked to research questions.

Research question: (a) How do **teachers** perceive **their role** in the implementation of environmental education into the early childhood curriculum?

Research question: (b) What **contribution** do early childhood teachers make to children's environmental learning and **knowledge** base?

Phase	One (a)	Transition (a)	Two (b)
Interview	One (a)	Two (a)	Three (b)
Centre: Childcare			
Group: Teachers			
Name			
Diana Jill Pania Jenny Elizabeth Kate Kylie Sally	Using immediate environment. Children's interests. Caring attitudes. Curriculum/ *Te Whāriki.* Education *about*, *in* and *for* the environment. Learning experiences teacher initiated/child initiated. Working collaboratively. Excursions. Resources. Natural resources. Environmental knowledge. Using teaching strategies.	Teaching learning co-construction. Children's interests. Emergent curriculum. Integrated curriculum. Growth in children's knowledge. Real life experiences. Learning experiences, child initiated/teacher initiated. Curriculum/ *Te Whāriki.* Holistic approach. Resources. Excursions. Knowledge. Teaching strategies.	Change in attitudes. Caring attitudes. Projects. Books. Parent involvement. Parental contribution. Following children's interests. Enduring interests. Children's theories of the world. Excursions. Communication with parents. Team approach. Environmental awareness.

Participants interview keyword responses linked to research.

Research question: (a) How do **teachers** perceive **their role** in the implementation of environmental education into the early childhood curriculum?

Research question: (b) What **contribution** do early childhood teachers make to children's environmental learning and **knowledge** base?

Phase	One (a)	Transition (a)	Two (b)
Interview	One (a)	Two (a)	Three (b)
Centre: Kindergarten			
Group: Teachers			
Name			
Henrietta Megan +Sophie *Mary Lou	Immediate environment. Awareness of wider world. Caring attitudes. Children's interests. Setting the scene. A sense of wonder. Curriculum/ *Te Whāriki.* Current interests. Resources. Natural resources. Teaching strategies.	Enthusiasm. Integrated curriculum. Resources. Emergent curriculum. Holistic approach. Children's interests. Reinforcing concepts. Spontaneity. Community knowledge. Recycling. Caring attitudes. Current interests. Teaching strategies.	Awareness of children's learning. Resources. Human resources. Home-centre link. Having time. Greater use of teaching strategies.

+ not involved in interview two
*not involved in interview one

Birds

On the 11 of May 2004 a little birds' nest was brought in for the children to look at. The children discussed what it was for and how we could make on, . .. thought we might need some eggs thought flour then we all had a closer look at the birds nest and decided that we didn't need flour or eggs, we needed cotton, hay, and twigs. During the morning mat time we read a book called "When the morepork calls - the night world of ruru New Zealand's native owl by Andrew Crowe and Peter Cambell. Through this discussion the "Children were developing working theories about the living world and how to care for it" (Ministry of Education, 1996, p90)

This lead onto further learning experiences with the children looking for materials in the outside play area then a small walk to the beach allowed the children to explore further in the natural environment for more materials which may help

make the birds nest. Te whaariki states that "Children develop an understanding of the nature of properties of natural materials" (Ministry of Education, 1996, p 90) this included hay, sticks, stones, shells, wool, and dried plants.

The children then had a turn at placing their natural materials into their own bird's nest, which develops an appreciation of the ways in which they can make contributions.

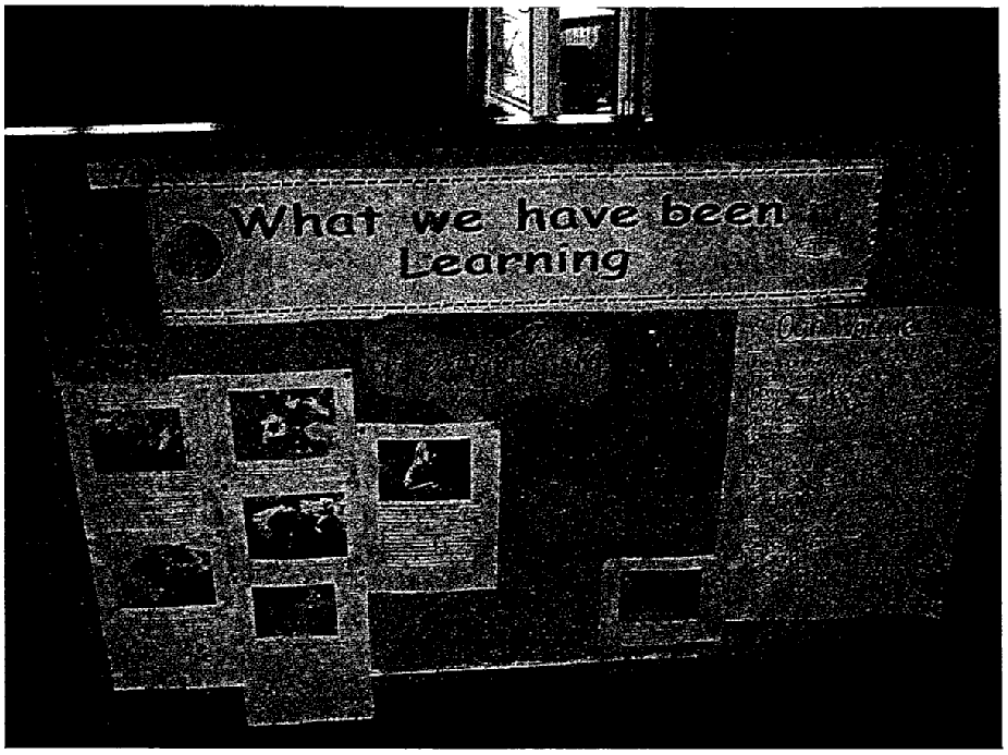
On the 12 of May 2004 found a soft toy bird and sat it in the nest he then initiated making eggs for the bird to sit on. decided that he would use cardboard to make the eggs said in his words " I am going to draw an oblong shape and cut it out like easter eggs"

decided that he would make 10 eggs and he persevered until he had finished he spent about 20 minutes involved in this learning experience. . . . displayed that he has the ability to make decision choose his own materials, and set his own problems.

Where to from here:

The teachers of staff will pursue to nurture the children's curiosity about the natural environment and continue to support the children's development of working theories about the living world and the knowledge of how to care for it.

Appendix 8: What we have been learning



Term 3.2004.

16th September,2004. 1.

WORMERY.

IT WAS EXCITING TO LEARN THAT AND HER MUM HAD SET UP A WORMERY AT HOME.

THEY PURCHASED THE CONTAINER FROM THE WAREHOUSE AND WENT TO THE WORM FARM AT PAKI PAKI TO PURCHASE THE MIX AND THE WORMS. SAID THAT THEY WERE TIGER WORMS.

EARTHWORMS ARE USEFUL IN THE GARDEN. THEY MIX UP THE SOIL AS THEY MAKE THEIR BURROWS. THEY PULL DEAD LEAVES INTO THE SOIL TOO. THIS MAKES THE SOIL RICHER. WORMERIES MAKE WONDERFUL COMPOST FOR THE GARDEN.

2.

16-9-04

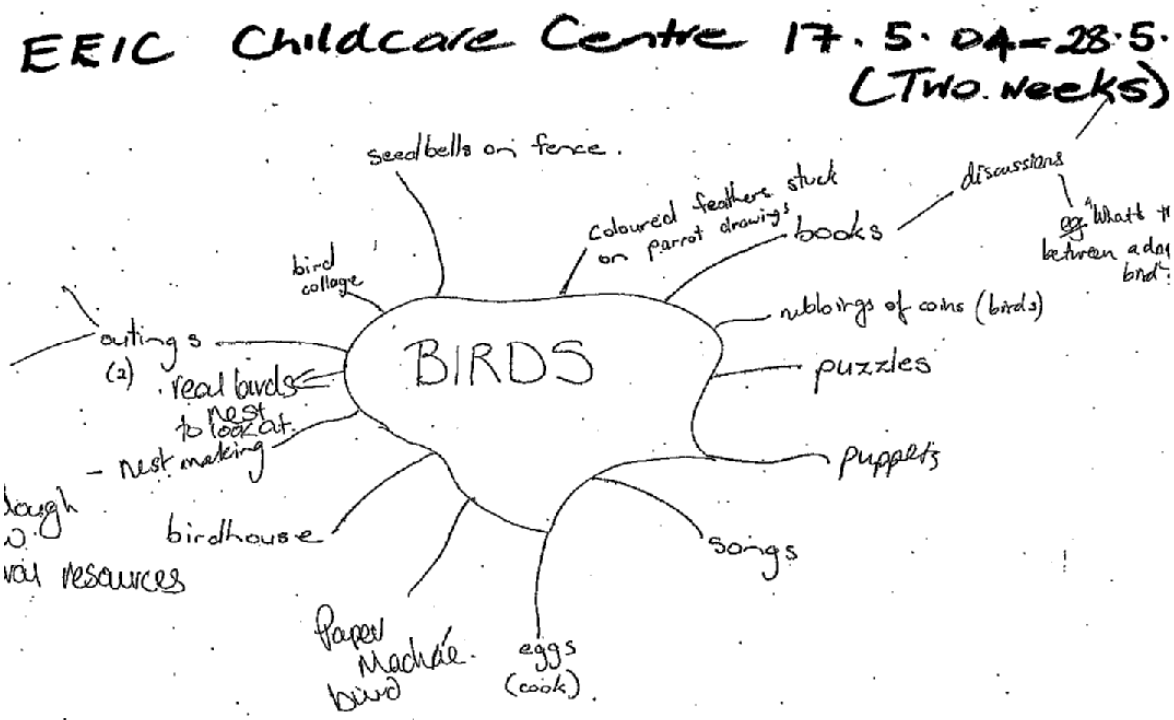
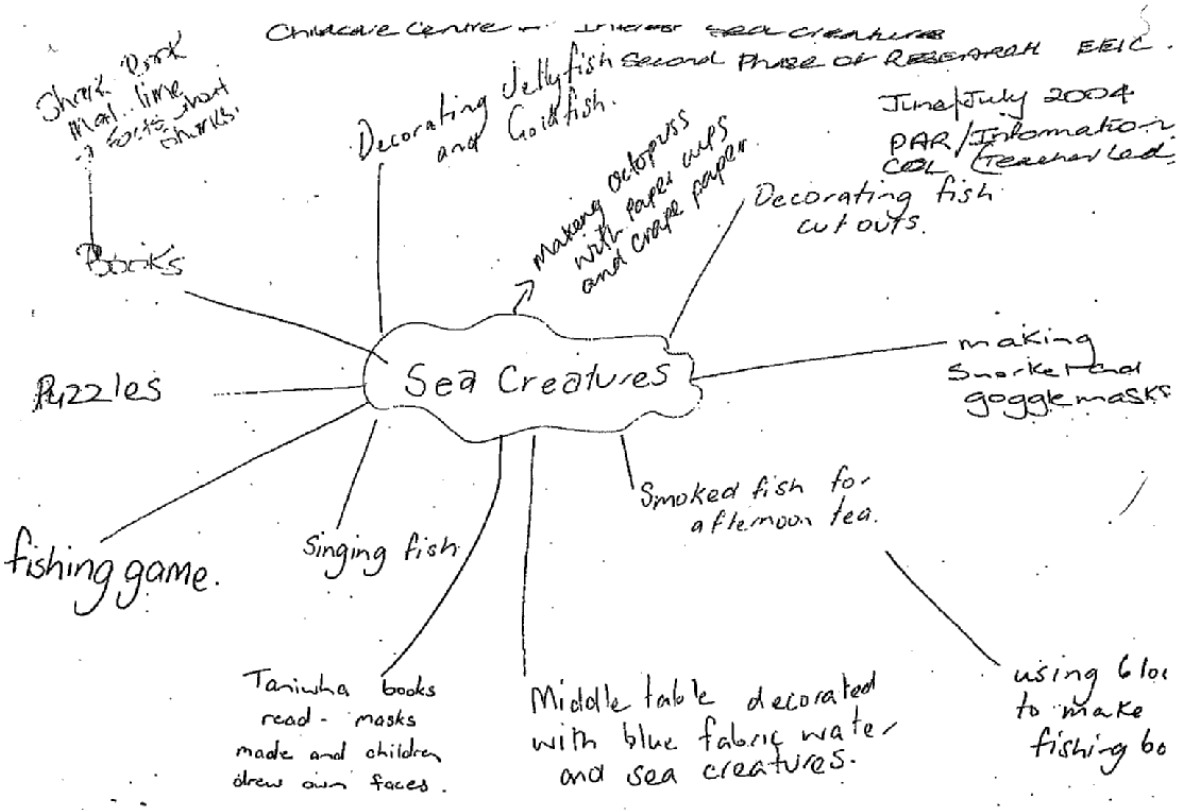
IT'S REALLY GREAT THAT YOU AND YOUR MUM HAVE SET UP YOUR OWN WORMERY. KEI TE PAI

IT WAS A GOOD IDEA FOR US TO LEND YOU OUR DIGITAL CAMERA SO THAT YOU COULD TAKE THESE PHOTOS TO SHOW US.

IF YOU LOOK CLOSELY YOU WILL SEE THE WORMS.

LEARNING OUTCOME: EXPLORATION, GOAL 4.
CHILDREN WILL DEVELOP A RELATIONSHIP WITH THE NATURAL ENVIRONMENT AND A KNOWLEDGE OF THEIR OWN PLACE IN THE ENVIRONMENT. ALSO THE WORKING THEORIES ABOUT THE LIVING WORLD AND HOW TO CARE FOR IT.

Appendix 10: Curriculum web: Birds



Appendix 11: Curriculum web: sea creatures