FORMING PRESCHOOLERS’ ENVIRONMENTAL ATTITUDE:
LASTING EFFECTS OF EARLY CHILDHOOD ENVIRONMENTAL EDUCATION

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ABSTRACT

Since 1987, the Kerry Wood Nature Centre has run a nature preschool for three–five old children. This study shows the affect it had on the environmental attitudes of former participants, who were 10–12 years old at the time of this study. Interviews and questionnaires with former participants, their families, and a control group investigated:

- their current environmental attitude and behaviours; and
- from whence these attitudes and behaviours arose.

Past participants had a significantly greater connectedness-to-nature score than their peers did, even several years after leaving the program. The Nature Nursery program, along with other factors, made a measurable and persistent change in the attitude of these children. “Opportunity” in terms of location, parenting, companionship, and time emerged as being important in determining attitude. Children and parents overwhelmingly reported better feelings and behaviour after playing outside.

Recommendations to improve early childhood environmental education programs are included.
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CHAPTER 1 — INTRODUCTION

As the human population grows and as our demands on the earth’s resources increase, our planet’s ability to absorb or rebound from humanity’s activities diminishes. We are seeing the results of this in climate change, the loss of biodiversity resulting from the extinction of species, and ecosystem collapse. These all threaten the quality of life, and indeed the future viability, of humans and other species. More than ever, we need citizens with the awareness, knowledge, attitudes, and skills who are active (UNESCO, 1977, p. 1) in the stewardship of the natural world.

Part of the collection of the National Archives of Canada is housed in a leaky, flood-prone building (Beeby, 2008). The collection is largely inaccessible to the public; consequently, when the roof leaks or pipes burst (as has happened 83 times in the past 20 years), very few people actually care. The public does not know of the treasures stored there, and so there is little support for the proper conservation and storage of the documents. The natural environment is in a similar position: as fewer people have contact with nature (Nature.org, 2008; Pergams & Zaradic, 2008; Schmidt, 2008), fewer people are likely to care for it, or to make reasoned decisions about their interaction with it.

Environmental education (EE) should be a part of the lives of all people, and must start with preschool-age children (UNESCO, 1977, p. 27). What results might we expect from early childhood EE? Ruth Wilson says “helping young children grow in their understanding and appreciation of the natural world … has the potential of enhancing the human-earth relationship” (1994a, pp. 23-24). Positive early experiences with the natural environment have been identified repeatedly as being among the important factors associated with responsible environmental behaviour (Chawla, 2006; Palmer, Suggate,
Robottom, & Hart, 1999; Tanner, 1980; R. A. Wilson, 1997a). Many environmental leaders claim early exposure to nature was critical (Heerwagen & Orians, 2002, p. 55) to their becoming the leaders they now are. If we do not provide the opportunities for children to develop a love of nature now, who will be the advocates for nature in coming decades?

There are other benefits to exposing young children to nature through environmental education. Exposure to nature prevents biophobia. “If this natural attraction is not encouraged or given opportunities to flourish during the early years of life, the opposite, biophobia, may occur” (R. A. Wilson, 1997b, pp. "Biophilia and Biophobia" section, para. 1). Biophobia results in the tendency to “regard nature ‘objectively’ as nothing more than ‘resources’ to be used” (Orr, 1994, p. 131). Bogeholz (2006, p. 68) adds “…research in the 1990s suggested an important role of nature experience for the development of environmental values and attitudes, as well as influencing pro-environmental behaviours”.

We know that young children benefit cognitively, emotionally and socially from early childhood educational programs in general, hence the variety of early childhood enrichment programs that have evolved, including Head Start (Administration for Children and Families, 2007) in the United States. “Policy-makers nationwide are building on the consensus among researchers and business leaders alike that children who are nurtured from their earliest stages of development have the best chances of achieving life-long success” (Isaacs, 2008).

A commonly-held belief these days is that children—especially young children—need exposure to the natural environment in order to prevent so-called “nature deficit
Exposure to nature, Louv and others claim, has health and child development benefits, and that preventing so-called “nature deficit disorder” encourages children to develop positive attitudes towards the environment. The early childhood education (ECE) literature, however, lacks research findings about the effects of nature-focused ECE programs on children’s environmental attitudes. Environmental education programs (R. A. Wilson, 1996b) and research have traditionally focused more on children in grades K–12, rather than preschoolers. An example of this K–12 bias includes the *Survey of Environmental Education in the United States* (Heimlich, McKeown-Ice, Braus, Barringer-Smith, & Olivolo, 2004), which does not include early childhood environmental education. The North American Association for Environmental Education (NAAEE)’s National Project for Excellence in Environmental Education produced *Excellence in Environmental Education: Guidelines for Learning (K–12)* (2004). NAAEE and the Environmental Literacy Council (2000) published “Environmental Studies in the K–12 Classroom: A Teacher’s View”, again with very little mention of early childhood EE. While hardly a comprehensive overview of all literature in environmental education, these examples from prominent EE journals and organizations illustrate the broad trend: the focus of EE and EE research is on schoolchildren, not preschoolers. This research hopes to address part of this gap.

How will it do so? If the aim of environmental education is to instil “pro-environmental behaviour” as defined in Jensen (2002, p. 325), then “environmental educators should focus on attitudes when the goal is to achieve behaviour change” (Gotch & Hall, 2004, p. 157). As children grow older, we should be able to see if ECEE programs have a positive, persistent influence. Might programs such as the Kerry Wood
Nature Centre’s Nature Nursery—a nature-based preschool program for three to five year olds—achieve different outcomes than a regular playschool? The board and staff operating the Kerry Wood Nature Centre (KWNC), as well as the nature centre’s owner, The City of Red Deer (Alberta, Canada), and the parents who put their children into the KWNC’s programs, deserve to know what the programs offered actually achieve.

By following up several years after children have left the Nature Nursery program, we were able to see what this program accomplished in influencing these children’s attitudes towards nature. Their answers to the Connectedness to Nature Scale (CNS) survey (Mayer & Frantz, 2004) gave quantitative information about the environmental attitudes of the children, their peers, and their parents. The long-answer questions on the surveys, combined with interviews, allowed deeper probes into the possible impact of the program, as well as the role of nature in the lives of these children. This information will allow the KWNC to improve its programs, and could influence the City in some of its own program and land-use planning.

Research Question

This research sought to determine if Nature Nursery has a persistent effect on the attitudes of children. The following questions helped to frame this study.

1. Does the program shape children’s attitudes as made visible through the CNS test, over a period of years?

2. If there is a difference in the long-term attitudes towards the environment of participant and non-participant children, is it because of differences in the beliefs and
behaviours of the parents/family, or can the difference in the children be attributed to the program?

This research also presents what the participants and their parents remember about Nature Nursery. This will help the Kerry Wood Nature Centre design its programs to be more effective in the future. The prime focus of the work is not on memories, however. “Childhood amnesia” (Bauer, 2004) makes it difficult for children to remember, several years later, events from when they were three or four years old. In this work, I am more concerned with the current attitudes of past participants than with clear memories of past events.

What is Nature Nursery?

The Kerry Wood Nature Centre in Red Deer, Alberta is owned by The City of Red Deer and is operated on a fee-for-service contract by a not-for-profit charitable society. The KWNC interprets local natural history to 70–80,000 people each year. It provides school curriculum-based programs, badge programs for youth groups such as Wolf Cubs, Girl Guides and so on, as well as campground talks, guided nature walks, courses, large events, and eco-adventure field trips. The Nature Centre’s mandate is to serve all segments of the population, not just, for example, bird watchers, or schoolchildren. It must interpret all aspects of the local environment: palaeontology, mammals, birds, flowers, astronomy, geomorphology, ecology, etc. as well as promote environmental citizenship.

Amongst the approximately 800 events, classes and programs offered each year is Nature Nursery (NN), a long-running nature-focused preschool program for three to five
year old children led by a teacher-naturalist and an assistant. Three groups of up to 22 children attend two 2½-hour sessions per group each week from September to May. Children can enrol for as little as a month (eight classes) at a time, but most sign up for at least three to nine months, often for two or more years.

Structured like many other preschool programs, Nature Nursery’s children have free-choice play and exploration at a variety of activity centres, take part in art and music, have snacks and story time, etc. They work at gross and fine motor skill activities, creative and dramatic play, and socialize with other children. The difference between this and other programs is that all the Nature Nursery activities are nature-oriented. The stories are about the animals and other life in the natural world, as are the puppets and other toys. Snack might be “ants on a log” (cheese on a celery stick with raisins on it); crafts reflect the wildlife theme of the week. The children have playtime outdoors every day in a semi-natural area unless the temperature is below -20°C (-4°F), including wind-chill. There, they make quinzhees (hollowed-out snow piles, a bit like an igloo), look for flowers, bugs, or ground squirrels, play games (e.g. re-enact First Nations peoples’ buffalo hunts), and go for walks or snowshoe treks in the adjacent wildlife sanctuary.

Study Limitations and Delimitations

I delimited the study to children who still live in the Red Deer, Alberta area; are now in grades 4–6; who were in the program for at least several months (on the assumption that the program would have had a greater impact on these children than it might have on those enrolled for just a short time); and who, along with one of their parents/guardians, were willing to take part in either the questionnaire or the interview.
The peer (control) group was a grade 4–5 split class, and a grade 5 class, both in the Red Deer Catholic school system. The control classes were selected because of their Principal’s and teachers’ willingness to allow access to the students. If there is a difference in students’ connectedness-to-nature/environmental attitudes between Red Deer’s public and Catholic school systems, this might have affected the results.

It is possible that the school classes had a greater representation of children from lower socio-economic demographics than the Nature Nursery children did. This would be consistent with Wilson’s (1996b) finding, but this was not specifically measured for.

I interviewed the first five randomly selected families of qualified past participants who were willing to take part. I did not take the transcripts of the interviews back to the families for review and comment.

The study was limited by difficulties contacting many of the eligible past participants. Unfortunately, Nature Centre staff shredded much of the student contact information just prior to this study. Some families had moved and could not be contacted, reflecting the statistic that over 40% of Red Deer’s population has moved within the past five years (Statistics Canada, 2007). A few families were unwilling to take part in the research. Consequently, while all possible past participants (and a comparable number of control students) were surveyed, the number of survey participants was lower than anticipated.

While all families were asked to provide a parent or guardian to participate, in every case the families self-selected a mother. If the fathers had participated, the results might possibly have been different.
Not all respondents could be counted on to answer truthfully or with adequate thought or understanding. Modifying the Connectedness to Nature Scale (CNS) survey to the children’s level reduced its reliability, as Mayer and Frantz, the original authors, have not yet developed and validated a children’s version of the CNS (see Appendix A). In delivering the CNS survey to the control group of students, I found that some of the students—especially those with poorer reading skills—had difficulty understanding a few of the questions, especially the more philosophical questions. Pre-testing in order to modify my version of the children’s CNS questionnaire, arranging for more time to complete it, and/or providing adult help while the control students answered it (similar to how the past participants’ parents might have helped their own children answer the questions, without time classroom constraints) might have improved the ability of the less literate grade 4–5 control students to understand and reply to the CNS questionnaire.

Researcher’s Perspective

I am the Executive Director of the non-profit society operating the Kerry Wood Nature Centre. I hope that all of our programs have a positive impact on the environmental attitudes of our visitors and program participants. Discussing this research with my coworkers and others, the common thought is “of course the environmental attitude of past participants will be greater than that of non-participants”. While I was not the teacher in this preschool program, I still came at this research desiring higher CNS scores among the participants than non-participants. I hope I have structured the research to give a fair and honest assessment of the impact of this environmental preschool program, in spite of my bias.
I recognize that I have blank spots and blind spots. Gough (2002, p. 4) said “what we know enough to question but not answer, are blank spots”; and “what we don’t know well enough to ask about or even care about are our blind spots.” This study, I hope, will fill in one of my blank spots—what long-term effect does a nature preschool program have? My blind spots, however, remain as possible detriments to this research.
CHAPTER 2 — LITERATURE REVIEW

Introduction

In this chapter, I review some of the environmental education (EE) and early childhood education (ECE) literature, looking for connections between the effects of EE programs and the attitudes of the young children towards nature. I look at the theoretical knowledge and research relating to young children’s attitude towards the environment. A gap in the literature demonstrates the need for this research, and substantiates my choices about the topic and methodology.

What is Attitude?

When in the Nature Nursery program, the children were three to five years old. “Childhood Amnesia” (Bauer, 2004) is a factor here: It is not likely that 10- to 12-year-old children will or even can have many detailed memories from programs they attended during their preschool years, thus, the current study focuses on attitudes and not memories. An attitude is an “evaluative tendency regarding some feature of the environment and can typically be phrased in terms of like and dislike or favour and disfavour” (Miller & Levine, 1996, p. 70). Put another way, what a person believes, understands, and feels about something, as well as the person’s behaviour towards it, is the person’s attitude (Rogers, 2003, p. 177).

The Nature Nursery program assumes that having the right attitude (i.e. positive feelings towards the environment) encouraged and instilled at an early age, combined with knowledge from first-hand experience and eventually learning from other sources, will result in children being disposed to be environmentally conscious citizens later in
life. This assumption is borne out in other research: attitudes are relevant for understanding and predicting social behaviour (Ajzen, 2001, p. 48). This study seeks to confirm that that result is consistent with this early childhood environmental education (ECEE) program.

Attitudes have different components—cognitive (beliefs), affective (feelings and evaluations), and behaviours—how one acts towards or about the “attitude object” ("Attitudes and attitude change", 2001). Behaviour does not always conform to what a person believes or feels, however. Cognitive dissonance (Festinger, 1957)—having simultaneous conflicting thoughts or beliefs—might cause a person to act differently from how they feel, and can cause people to reject information because they do not want to believe it. Both cognitive dissonance (“the unpleasant emotional/motivational state that occurs when a person holds two contradictory cognitions”) and the similar cognitive discrepancy (“inconsistency between cognitions”) (Harmon-Jones, Harmon-Jones, Fearn, Sigelman, & Johnson, 2008, pp. 2, 12) have the potential to interfere with effective and unconflicted action. Since reducing cognitive dissonance/discrepancy enables effective and unconflicted action (Harmon-Jones et al., 2008), it behooves environmental educators to try to make sure that cognitive, affective and behavioural messages support each other so that children eventually are able to undertake effective actions towards the environment.

How much attitudes affect behaviour has long been controversial. In the past, some have claimed that attitude has only a modest impact, if any, on behaviour (Wicker, 1969) but Kim and Hunter’s meta-analysis (1993) demonstrates that “so long as the attitude is relevant to the behaviour observed, attitudes are highly correlated to
behaviours ($r = .86$) when taking measurement problems into account” (Miller & Levine, 1996, p. 262).

**Direct Experience with Nature at a Young Age Influences Environmental Attitudes**

Many authors who write about child development believe that children develop physically and psychologically in stages. Jean Piaget wrote that children learn by actively constructing knowledge through hands-on experience (1947, p. 70). Preschool children—those two to six years old—are in a stage when children develop their language skills and begin representing things with words and images. They do not yet use logical reasoning, have active imaginations, and—especially at the beginning of this stage—are egocentric. Adults can help children of this age learn by providing appropriate materials for the child to interact with, helping them construct an image of their universe within the limits of their schema (which are, according to Piaget, determined by maturity and certain previous experiences) (Bandura, 1977, p. 31).

Lev Vygotsky (1934) too felt that children learn through hands-on experience, and that timely and sensitive intervention by adults when a child is on the edge of learning a new task, i.e. when the child is in the “Zone of Proximal Development”, could help children learn new behaviours or activities. This technique is called “scaffolding” because it assumes that children build upon knowledge that they already have with new knowledge that adults can help the child learn. It is analogous to hanging new concepts on the framework of a pre-existing scaffold.

Vygotsky defined scaffolding instruction as the “role of teachers and others in supporting the learner’s development and providing support structures to get to that next
stage or level” (Raymond, 2000, p. 176). The learning here is directed by a teacher who models appropriate strategies for meeting particular purposes, guides and challenges students in their use of the strategies, and provides a meaningful and relevant context for using the strategies. Support, in the form of explicit teaching, occurs over time until students master the new strategies, and know how and when to use them.

Behaviourists such as B.F. Skinner developed a model in which “the individual’s behaviour (his or her ‘personality’) is determined by past or present events in the objective world of which he or she is a part” (Nye, 1986, p. 52). Behaviourists represent development as behaviour change, which is dependent on a combination of factors including the level and kind of stimulation, behavioural function, and the learning and genetic history of the organism (Nye, 1986, p. 51). The behavioural model focuses on prediction and control of the developmental process, something that an adult could do to direct the development—the behaviour and attitudes—of a child. “Environmental manipulation ... provides the key to improving human behaviour” (Nye, 1986, p. 53).

The child’s environment plays a role in his/her development.

Child development is a matter of building a set of behaviour patterns that change appropriately as the child becomes older. The process is largely controlled by parents, siblings, neighbours, teachers, peers, and others, that is, by the social environment that bears directly upon the growing child. (Carpenter, 1974, p. 189)

The Social Learning Theory (more recently referred to as the Social Cognitive Theory) strongly emphasizes that what people directly experience or observe influences their attitudes and behaviour (Bandura, 1977, p. 16). It “emphasizes the prominent roles played by vicarious, symbolic, and self-regulatory processes in psychological
functioning,” and adds that “both people and their environments are reciprocal determinants of each other” (Bandura, 1977, p. vii). People experience things, observe cause and effect, form notions about good, bad, right, wrong, desirable and undesirable, etc. often through the example or modelling of others, live or in the media (e.g. television). In other words, what people see and experience leads them to develop attitudes about the way things should be.

The American educational reformer and philosopher John Dewey promoted learning by doing. He stressed the importance of education not being the teaching of a finished product imposed from above and from outside, (“the methods of learning and behaving [of the older generations] are already foreign to the young. They are beyond the reach of the experience the young learners already possess”) but that the skills and knowledge which students learned be integrated fully into their lives (“…there is an intimate and necessary relation between the process of actual education and experience”) (Dewey, 1938, pp. 18-20).

These different models of child development all suggest a linkage between attitudes and experience. Attitudes develop as an offshoot of experience, so ECEE should expose children to the natural environment, and caring parents or educators must guide the children through modelling appropriate attitudes and behaviours.

Where does a child’s feeling towards the environment—the child’s attitude to nature—develop? Over the years, I have observed that most three- to five-year-old children have positive feelings towards the environment, often manifested in intense interest in animals and “nature” in general. This reflects the observations of Armitage (2007), Carson (1956), Cornell (1979), Davis and Elliott (2003), Louv (2005), and

Children need exposure to nature from an early age. The assumption that an environmentally-focussed preschool program such as Nature Nursery could play a role in creating the ecological identity and eventual attitudes and actions of the participants is supported by Thomashow (1995, p. 170), who wrote “…ecological identity is the epistemological glue for reflective environmental practice, integrating the formal education of professional training with the learning experiences of everyday life.” E.O. Wilson’s Biophilia hypothesis (1984) suggests that there is an instinctive bond between human beings and other living systems. Furthermore, familiarity with nature prevents biophobia, a culturally acquired aversion to, discomfort with, or even fear of, nature, possibly leading to the attitude that people should look at nature “…as nothing more than ‘resources’ to be used any way the favoured among the present generation see fit” (Orr, 1994, p. 131). Gardner adds “just as most ordinary children readily master language at an early age, so too are most children predisposed to explore the world of nature” (1999, p. 50).

A child’s family and social milieu undoubtedly account for much of the feeling and attitude towards the environment. For example, “museums are clearly part of a larger context constituting the families’ free-choice learning environments” (Falk & Dierking, 2000, p. 95). I believe that this would apply to activities in nature, too—another part of a
family’s “free-choice learning environment” that would influence a child’s developing attitudes.

This study is based on the understanding that “an ultimate aim of environmental education is to promote responsible environmental stewardship” (Knapp & Benton, 2006, p. 12). Does Nature Nursery create environmentally positive attitudes and behaviours among the participants? Studies in the UK, Australia and Canada all have shown that environmental educators and activists rate childhood exposure to nature as an important factor in their developing responsible attitudes towards the environment (Chawla, 1999; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; R. A. Wilson, 1996a). The literature is rife with stories of people who had a favourite patch of trees, or pond, or ditch alongside an abandoned rail line or canal, and of claims that it was because of that time in nature that these people are now working in the environmental movement (Kahn, 2002; Pyle, 1993).

The premise of this study is that children start with a positive attitude towards nature. The important thing to do is to sustain and reinforce this attitude so that it lasts later into the child’s life:

If I had influence with the good fairy who is supposed to preside over the christening of all children, I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life… If a child is to keep alive his inborn sense of wonder without any such gift from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in. (Carson, 1956, pp. 42-45)
Early thought about the formation of pro-environmental behaviour had a simple model: increased environmental knowledge led to a change in environmental attitude which led in turn to pro-environmental behaviour (Hungerford & Volk, 1990, p. 9). This model has been discredited, however. “Research into environmental behaviour, unfortunately, does not bear out the validity of these linear models for changing behaviour.” “… knowledge of ecology does not, in itself, produce environmental behaviour” (Hungerford & Volk, 1990, pp. 9, 11).

About Environmental Education and Early Childhood Education

Environmental education is neither the study of biology nor ecology, and it is not outdoor education (which can be the organized learning of anything, taking place outside), although it might contain elements of all these. It is generally understood that the ultimate goal of environmental education is to ensure that we have a healthy, sustainable world. To achieve this, environmental education seeks to “enhance a person’s understanding of the natural world and to impact positively on attitudes, values, and behaviours” and EE must develop an “environmentally literate and concerned citizenry who will relate to the natural world in a responsible and caring manner” (R. A. Wilson, 1994b, p. 5). While EE is often related to education within the formal education system, it also includes other efforts to get people of all ages to live sustainably (The Belgrade Charter, 1975).

Education programs to help prepare three to five year old children for school—traditional ECE programs—increased in number in the latter half of the 20th century. Many of these programs, such as Head Start in the United States (Administration for
Children and Families, 2007), were designed to provide various supports to disadvantaged children and their families to help the children “overcome the cognitive, social, emotional, and physical deficits that frequently accompany growing up in economically deprived homes” (Cotton & Conklin, 2001, "Introduction" section, para. 1 #252).

Research has shown the benefits of these programs in various ways. We know that good early childhood education programs have positive results, both for the children involved, and for society (Isaacs, 2008; Schweinhart, 1994). Popular media such as Newsweek Magazine (Quindlen, 2001) and Business Week (Farrell, 2006; Starr, 2002) sing the praises of ECE programs such as HighScope Perry Preschool Project in Ypsilanti, Michigan and the Abecedarian Project in North Carolina. Research from those two projects confirms the long-term value of ECE. The Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; FPG Child Development Institute of the University of North Carolina at Chapel Hill) provided 111 North Carolina at-risk infants, born between 1972 and 1977, with five years of high-quality childcare and then monitored the children until age 21. The study measured cognitive functioning, academic skills, educational attainment, employment, parenthood, and social adjustment. The Abecedarian Project found that the participating children had higher cognitive test scores due to enhanced language development, and higher academic achievement in both reading and mathematics. The participants were more likely to attend college, and had children at a later age. The project concluded that high quality, educational childcare from early infancy was therefore of utmost importance (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002).
Similarly, between 1962 and 1967, the High/Scope Perry Preschool Study (High/Scope Educational Research Foundation, 2008) provided three to four year old children with a high-quality preschool program and then tracked the children and a control group to age 40. The study found that “adults at age 40 who had the preschool program had higher earnings, were more likely to hold a job, had committed fewer crimes, and were more likely to have graduated from high school than adults who did not have preschool” (High/Scope Educational Research Foundation, 2008). While showing the value of high-quality ECE programs, neither of these studies provided environmental education to the children or measured the children’s environmental attitudes.

Why Early Childhood Environmental Education?

Humans have lived in close association with nature for most of our evolutionary history, first as nomadic hunter-gatherers, and later as farmers and herders. Throughout this time, “outside” was the natural domain of children, sometimes on their own, and sometimes watching, helping, and learning from adults. With the rise of major urban centres, many people in the developed world have been divorced from regular contact with the natural world. Until recently, even in cities, children commonly played outdoors. Referring to today’s adults looking back to their own childhoods, Pyle wrote that most “... seem to have a ditch somewhere—or a creek, meadow, woodlot, or marsh ...” (1993, p. xvii). However, urbanization and the loss of places to play, combined with fear of “stranger danger” (Louv, 2007), electronic entertainment (the Internet, computer and video games, and television) and over-programming of children’s free time (sports,
dance, etc.) leave virtually no free time for many children to explore and interact with nature (Louv, 2005), either on their own or with a caring adult.

To offset the trend of children losing contact with nature, numerous programs were developed in the late 19th Century and throughout the 20th Century to introduce children to nature. Most, however, were for school-aged children. In North America, these included the Nature Study movement (Armitage, 2007), Boy Scouts and Girl Guides/Girl Scouts, and Junior Forest Wardens, among others. Thousands of summer camps, offering both residential and day programs, took children into natural areas. Similar programs developed to a greater or lesser extent on other continents. Starting in the 1980s, some urban nature centres began offering early childhood environmental education programs. Babes in the Woods, for example, started at the Springfield Conservation Nature Center in Springfield, MO ("Babes in the Woods", 1997), and served as an example for other nature centres to emulate. The John Janzen Nature Centre in Edmonton, Alberta began a Nature Nursery program in the early 1980s. Kerry Wood Nature Centre modelled one of its preschool programs, in part, on Babes in the Woods, and its own Nature Nursery program on the Edmonton example. These ECEE programs follow the philosophy of early childhood education where the focus is on “experiencing” rather than “teaching”. Children are exposed to and have the opportunity to develop empathy for nature (Sobel, 1995): they experience the natural environment, with a parent, teacher, or other caring adult, in a safe and enjoyable manner. These programs are built on the premise that experience is more important than book knowledge at this point in a child’s life. Once the interest is there, acquisition of facts can follow.
The field of early childhood environmental education is strong and appears to be growing. For example, Humber College in Ontario, Canada offers an Environmental Education certificate program for people planning on becoming ECE teachers ("Environmental Education Certificate", 2008), there is an Early Childhood Environmental Education Network in Australia, part of Early Childhood Australia ("Early Childhood Australia Inc. home page", 2008), and the journal of the National Association for the Education of Young Children in the United States publishes EE resources for ECE teachers to use (Lewin-Benham, 2006).

What now is needed is more research on the effectiveness or outcomes of ECEE. Do ECEE programs work (that is, do they instill lasting pro-environmental behaviours in children)? What sort of program has the greatest impact, and which programs are less effective? How can ECEE programs be supported or followed up on, in schools, the community, or later in children’s lives? This study is a step towards meeting part of this gap in knowledge.

Choice of Measurement Scale

*Connectedness to Nature Scale*

There are several sampling scales available to determine people’s environmental inclination. I reviewed various possible alternatives before deciding on the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004) as the appropriate instrument to measure the subjects’ attitude to nature. The authors’ claim that the CNS “… supports ecopsychologists’ contention that connection to nature is an important predictor of ecological behaviour and subjective well-being” (Mayer & Frantz, 2004, p.
was important to me, as the *Nature Nursery* program hopes to influence long-term environmental citizenship—i.e. pro-environmental behaviour—as well as provide an entertaining program to young children. CNS is a newer scale than some of the alternatives (e.g. New Ecological Paradigm 2000, Inclusion of Nature with Self 2001, Implicit Associations Test 1998, modified in 2004), and claims to build upon other instruments’ strengths while avoiding their weaknesses. I considered other testing instruments, but for various reasons did not feel that they were suitable for this study.

CNS originally was designed for and tested on adults. It measured individuals’ feelings of being emotionally connected to the natural world. Being connected to nature was described (Schultz, 2002, p. 67) as “the extent to which an individual includes nature within his/her cognitive representation of self” quoted by Mayer and Frantz (2004, p. 504). Aldo Leopold (1966), quoted in Mayer and Frantz (2004, p. 505) said that people “need to feel they are part of the broader natural world if they are to effectively address environmental issues.” Mayer and Frantz, and I, support Leopold’s contention that connectedness to nature leads to concern for nature. The CNS also has been shown to relate to “a biospheric value orientation, ecological behaviour, anticonsumerism, perspective taking, and identity as an environmentalist” (Mayer & Frantz, 2004, p. 512). This means that if people feel connected to nature, that they are a part of it, then they are less likely to harm it. Of course there are exceptions, as Mayer and Frantz point out (2004, p. 512), but the they feel that the connection between behaviour and connection to nature “does hold for most people and in a rather robust manner” (2004, p. 512).
New Ecological Paradigm

The New Ecological Paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Jones, 2000) is an update of the earlier New Environmental Paradigm (Dunlap & Van Liere, 1978). It tries to measure individuals’ beliefs regarding their relationship to the natural world. However, in part it measures cognitive beliefs, rather than emotional reactions to nature. In addition, it measures a person’s reaction to humanity as a whole, rather than the individual’s “personal relationship to nature” (Mayer & Frantz, 2004). However, the NEP does have the advantage of already having a children’s version of the test, (Manoli, Johnson, & Dunlap, 2005).

Inclusion of Nature in the Self (INS)

The INS (Schultz, 2002) measures the inclusion of nature in a person’s self-image. However, being a single-item measure, it cannot be assessed for reliability (Schultz, Shriver, Tabanico, & Khazian, 2004). Furthermore, since participants must be able to form an abstract image of their relation to nature (Mayer & Frantz, 2004), I did not believe it to be suitable for the children I wished to test.

Implicit Associations Test (IAT)

While the IAT (Greenwald, McGhee, & Schwartz, 1998) also is used to measure connectedness to nature (Schultz, 2002), it too appeared to be difficult to administer to the children I was testing.
Motivation Towards the Environment Scale (MTES)

The MTES (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998) relies too heavily on the level of people’s environmental knowledge (Mayer & Frantz, 2004). Children in Grades 4–6—my test group—could not yet be expected to have a high level of environmental knowledge. I was not testing for environmental knowledge, and furthermore, knowledge does not always ensure action (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998).

Summary

It is a common belief that young children like nature, that is, they have a positive attitude towards it, that childhood familiarity with nature results in people developing and/or sustaining these positive attitudes into the future, and that these attitudes will result in pro-environmental behaviours. Research seems to support this: ECE programs have a lasting effect on participants. Exposure to nature has had a lasting effect on environmental educators and activists. If the ECE literature can be applied to ECEE, then it is likely that the benefits of an ECEE program should persist, especially if there are other, ongoing reinforcements by parents, schools or other societal influences.

This research looks for a connection between ECE and ECEE. It seeks to answer the question: Can a nature-oriented preschool program help keep the positive attitude towards nature that children start with alive by the time the children are 10 to 12 years old?
CHAPTER 3 — RESEARCH METHODOLOGY

Research Design

There are various approaches to looking at data. Normative data—the results of the questionnaires used in this study, for example—give a picture of where a particular group of people stand at any one time on a certain issue. Quantitative research or QUAN, the preferred tool of the positivist or empiricist school, is one of the two traditional social science paradigms. This style of research is good at “analysing the relationships and regularities between selected factors” (Cohen, Manion, & Morrison, 2000, p. 7). The constructivist or phenomenological approach is the other main way of studying the world. This latter approach uses primarily qualitative research techniques—QUAL—(Tashakkori & Teddlie, 1998). The qualitative “view of social reality stresses the importance of the subjective experience of individuals in the creation of the social world” (Cohen et al., 2000, p. 7). The social sciences, including the education field, have “shifted towards QUAL from QUAN because of the difficulties of measuring what is educationally significant” if using QUAN only (Lather, 2004, p. 20). Information obtained by qualitative, interpretive methods “focuses on action, on behaviour-with-meaning … Actions are only meaningful to us in so far as we are able to ascertain the intentions of the actors” (Cohen et al., 2000, p. 23). Interpretive methods set out to understand individuals’ interpretations of their world.

Rather than tying oneself to either one or the other way of looking at the world, a more pragmatic approach is to use “… whatever philosophical and/or methodological
approach works for the particular research problem under study” (Tashakkori & Teddlie, 1998, p. 5).

The role of theory is to say how reality hangs together … or how it might be changed so as to be more effective … Researchers must set out to understand (individuals and) their interpretations of the world around them. Theory is emergent and must arise from particular situations; it should be “grounded” on data generated by the research … Theory should not precede research but should follow it. (Cohen, Manion, & Morrison, 2000, p. 23)

I used a mixed methods ex post facto study (Cohen, Manion, & Morrison, 2000; Diamond, 1999; Tashakkori & Teddlie, 1998). It seemed most appropriate to use mixed methods research techniques in this study, rather than purely qualitative or quantitative methods, as the QUAN data would provide the Connectedness to Nature Scale (Mayer & Frantz, 2004) scores, while the QUAL information could provide insight into the results. Quantitative results of the Connectedness to Nature Scale survey (Mayer & Frantz, 2004) were combined with qualitative research techniques and grounded theory (Charmaz, 2006; Glaser & Strauss, 1967). The former showed the subjects’ CNS scores; QUAL techniques were used to determine the current environmental attitude, interests, behaviours, and worldviews of past participants in the Kerry Wood Nature Centre’s Nature Nursery preschool program. It also sought to understand the impressions and opinions that the participant children and their families had of their experiences and of its value to them. The study sought to detect if the Nature Nursery program or family or other social influences potentially determined children’s environmental orientation.
Grounded theory (Charmaz, 2006; Glaser & Strauss, 1967) was used because the qualitative part of the study sought to understand people’s attitudes and actions and to see from whence their beliefs arose, rather than to describe the attitudes themselves. As data generated from both the interviews with several people and the long-answer questions on the questionnaire were being considered, I felt that grounded theory to be the most appropriate approach to data analysis. I could start with no preconceived ideas about what I would find, and let the results emerge from the responses.

The study is *ex post facto* as no “before” interviews or work with preschool age children, were done. The interviews and questionnaires were done after the fact, when the children were in the last years of elementary school.

Selecting Participants

The Kerry Wood Nature Centre had records showing which families registered for past preschool sessions. I intended to invite as many of these families from the 1999–2000 fall through spring sessions as possible to take part in the study, expecting to include at least thirty qualified families and children from one programming year. If unable to find at least thirty such families, I planned to expand the search to include children and families from other years. “The best laid schemes o’ mice an’ men / gang aft a-gley” (Burns, 1786, 1999), however, and a couple of weeks before I started the research, the Nature Centre staff shredded the old registration information to protect the participants’ privacy, and to free up file space. This necessitated some “detective work” and piecing together other bits of information to find appropriate program participants.
While never able to obtain my desired minimum of 30 qualified participants, I eventually obtained surveys from 27 Nature Nursery participants and 26 parents.

The children and families qualified to participate in the study were those who participated in the Nature Nursery program for at least three sessions (e.g. fall, winter, and spring) and who still lived in the Red Deer, Alberta area. I assumed that children enrolled for only a few months were less likely to have been impacted by the program.

Interview participants were selected by starting at the top of an alphabetical list of past participants and taking the first five families who agreed to participate (see Appendix B for the script for the telephone approach and request-to-participate). All families were asked to provide a parent or guardian, as well as the child, to participate. In every case, they self-selected a mother. As it happened, three girls, two boys, and their mothers took part. The participants in the interviews were offered a choice of where they wished to be interviewed; three families chose the Nature Centre, two preferred to be interviewed in their own homes. The interviews lasted approximately one hour. The interviews were recorded on both a cassette tape recorder and a digital voice recorder. Notes of the conversations also were made. All interviews then were transcribed into MS Word document files.

Three groups were surveyed: past-participant children, their parents, and a control group of peer students who had never taken part in Nature Nursery.

All qualified participants that could be located were invited to participate in completing the CNS questionnaire and related questions. While many more children had been in the program, missing records meant fewer people could be found to survey. A small number of children from outside the 1999–2000 year (e.g. siblings of this cohort,
who had also been in the program) were invited to participate in order to increase the sample size. Approximately 60–80 children per month are in the various Nature Nursery classes. Approximately 75% remain over the nine-month programming season annually, so the 27 children surveyed represent from 45% to 60% of all possible qualified participants from that period.

These children had to have a parent complete the survey as well. Fewer parents than children replied because one family had siblings in the program. The surveys were mailed, with a letter of invitation-to-participate and explanation (see Appendix C), to qualified families. The letter of introduction gave potential participants the option of responding on paper with a stamped, self-addressed envelope, or on-line by means of Survey Monkey, a commercial web-based survey instrument. The paper and web-based surveys had identical questions.

In an effort to increase the rate of participation, those who did not respond to the letter were telephoned to once again request their participation. In some cases, this worked; people were generally cooperative and interested. A few were too busy; only one refused outright. In one unfortunate case, the child had died a few weeks before the family was contacted.

A school in the Red Deer Catholic School District provided two classes of students in one school to serve as a control group. One was a grade 4–5 split with 19 children; the other was a grade 5 class with 17 students. After the survey was completed, these classes each were thanked by being given a free interpreter-led program at the Kerry Wood Nature Centre.
Qualitative Interviews

Interview styles vary. Formats range from structured interviews “useful for when the researcher is aware of what she does not know” and can therefore ask questions to get the answers, to unstructured interviews best suited for when “the researcher is not aware of what she does not know, and relies on the respondents to tell her” (Cohen, Manion, & Morrison, 2000, p. 270). The semi-structured interview format is especially useful for working with children (Diamond, 1999, pp. 87-88). The semi-structured interview offers … topics and questions to the interviewee, but are carefully designed to elicit the interviewee’s ideas and opinions on the topic of interest, as opposed to leading the interviewee toward preconceived choices. They rely on the interviewer following up with probes to get in-depth information on topics of interest. (Zorn, 2004)

As the “topics of interest” already were known, it was hoped that talking in a casual, conversational setting would draw out details and understandings from the participants through prompts and follow-up questions. The semi-structured format, therefore, seemed to be the most appropriate research method in this case.

The author, with the assistance of the Nature Nursery preschool teacher, conducted the interviews. The preschool program teacher did most of the talking in each interview; done to put the participants at ease due to the children’s and parent’s familiarity with them. I took notes, monitored the audio recording equipment, and prompted and probed deeper through questions when necessary. The first family interviewed was considered the pilot or field test of the interview questions and format, but as no problems were encountered, the interview was not revised. The first interview therefore was included with the other interviews in the study. After these five interviews,
it appeared that no new information was forthcoming, and so no further interviews were conducted: “The criteria more often identified for determining appropriate sample size in qualitative studies is sampling to the point of redundancy, or the point at which continued inquiry reveals no new data” (Meloy, 2002, p. 158). There was recording equipment failure in one interview, but the written notes and discussion with the co-interviewer provided adequate detail for the interview. No follow-up interviews were necessary to clarify points of confusion.

Qualitative Written Questions

Twenty-seven past participants, now in grades 4–6, answered a questionnaire that included several long-answer questions complementing the Connectedness to Nature Scale questions (see Appendix D) such as:

- Do you think that you play outside more or less than others in your class?
  
  Please tell me about why you think this.

- What are your three favourite things to do?

- Where are your favourite places to play?

- After you have been playing outside a lot, how do you feel? Do you feel or act differently if you have to stay inside most of the time?

Twenty-six parents replied to a similar but adult-oriented questionnaire (see Appendix D). The two control classes also answered the written qualitative questions. There were no control-group parents.

The recorded interviews and long-answer responses were analysed. The responses were not complicated, and so required little formal coding. Responses for the NN
participant were transcribed, and then sorted into similar categories such as indoors or outdoors, around the house or in a sports facility or natural area, etc. After doing this again for peers, and then parents, the categories were adjusted to be uniform across the groups. The responses were re-assembled and tabulated.

Quantitative Surveys

While my original intent was to conduct probability sampling of both the participant and control groups (Trochim, 2006) in order to be able to generalize the results to a larger population, I eventually had to include virtually every eligible person whom I could access.

Quantitative surveys of former participants and their parents, as well as the classes of non-participant peers, allowed a comparison of current environmental attitudes through the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004). I used print and online surveys (see Appendix D) to determine if there was any difference in the attitude towards the environment, using CNS scores, of past participants and their parents, and between past participants and the general population as represented by the control groups. Apart from the additional long-answer qualitative questions, the original wording of the Connectedness to Nature Scale was used for parents of past Nature Nursery participants. After confirming with the authors that there was not yet a comparable children’s CNS scale (personal communication, April 11, 2007—see Appendix A), the existing CNS’s language was modified for use with children with the assistance of a retired elementary school teacher, as the New Ecological Paradigm for Children’s language was simplified (Manoli, Johnson, & Dunlap, 2005).
The control students completed a paper survey during class time, under their teacher’s and the author’s supervision. All students except one in those classes voluntarily participated: one child chose not to participate. A few of the students had low reading and writing skills and had difficulty understanding and/or completing the survey questions, resulting in some answers being skipped or answered in a less-than-thoughtful manner. Class-access time limitations, and a desire not to skew the results by working differently with some of the control group than with others, meant that I did not work with these children to help them completely fill out the questionnaire. The answers on the questionnaires were used as submitted, with the following exception: In spite of direction to the students to NOT write their names on the questionnaires to preserve confidentiality, several students did so—perhaps out of habit. This turned out to be advantageous, as in two cases, I was able to have the teacher clarify ambiguous answers by going back to the appropriate students.

Data Analysis

The CNS test involved answering a 14 question survey, with answers ranging from 1 (strongly disagree) to 5 (strongly agree). A “5” for most questions indicated a strong connection to nature, but Question 4 (I often feel disconnected from nature), Question 12 (When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature) and Question 14 (My personal welfare is independent of the welfare of the nature world) had to be reverse-scored to yield consistent results. After adjusting the three reverse-ranked questions, the total score for each survey was
averaged, to give the individual’s CNS result. (See Appendix A, correspondence with C. Frantz.)

I compared the two sets of data for each hypothesis with t-tests using a standard $\alpha = 0.05$. I sought a correlation between the children’s scores and those of their parents with Microsoft Excel. A high correlation would indicate that there is little likelihood that Nature Nursery created the child’s environmental attitude on its own.

Null hypothesis $H_{01}$: there is no difference in mean CNS scores between children participating in Nature Nursery and those not participating. Alternative hypothesis $H_{11}$: children who participated in Nature Nursery would have higher CNS scores than their parents or those children who did not.

Null hypothesis $H_{02}$: There is no significant difference between children’s and parents’ CNS scores. Alternative hypothesis $H_{12}$: There is a significant difference between children’s and parents’ CNS scores.

The data from the five child and parent interviews, as well as the long-answer questions, was transcribed. The results from each long-answer question were assembled and grouped by similarity of response. For example, in answer to “where do you prefer to play,” the answers first were divided to indoors vs. outdoors, and then to location (in my yard, at a sports facility, in my house, etc.). After doing the control group students, when looking at the results from past participants, it was necessary to adjust some categories to provide comparable results. To further facilitate comparison, the answers were presented both numerically (e.g. 16 responses) and by percent of total (e.g. 53%), by control, participant and parent. The other questions were treated in the same manner.
The interviews were analysed similarly: the transcripts were analysed in a similar manner to qualitative questions from the questionnaire. The answers were transcribed, and then sorted and grouped. The first review of the transcripts yielded 15 groups of comments, predetermined in part by the interview questions themselves, but in some cases grounded in the comments of the interviewees. A marketing question of interest only to the Kerry Wood Nature Centre, and not related to the subject of this thesis, was dropped at that time. There were some obvious overlaps and similarities of answer between some groups of comments, so these were amalgamated, reducing the number of groups to four, each with with sub-categories.

Validity and Reliability

Reliability is a “synonym for consistency and replicability over time… and over groups of respondents” (Cohen, Manion, & Morrison, 2000, p. 117). Validity of qualitative data is addressed through the “honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation, and the disinterestedness of the researcher” (Cohen et al. 2000, p. 105). Quantitative data validity is achieved through “careful sampling, appropriate instrumentation, and appropriate statistical treatments of the data” (Cohen et al. 2000, p. 105). Reliability is a “necessary precondition of validity” (Cohen et al. 2000, p. 105).

Quantitative

To ensure construct validity, (in this case, is my view of a person’s environmental attitude valid?), I used a standardized, validated measure—the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004). This is known to be valid for adults; I modified it
for use with children, so the results for the children may be less valid than for those of the adults.

All questionnaires were identical, presented in the same manner to each control class and in same manner to each NN participant & parent, whether on paper or online. Each respondent in the control classes was given the same amount of time to complete the questionnaire, with the same level of support by the teacher and the author, when needed. All possible participants and their parents were surveyed; a representative group of peers was selected from the broader community. These results should be able to be generalized to Nature Nursery families and to the Red Deer community as a whole; this would be more certain with more participants and with “control” classes from a wider range of schools and neighbourhoods, or even other cities.

I could not tell if people were answering the CNS questions honestly; some answers on a few questionnaires seemed dubious. The CNS survey was designed so that not all “5” answers indicated a high CNS score (there were some reverse-scored questions.) As I was not concerned with individual answers, just overall CNS score, it didn’t matter if one answer was accurate or not. I had to trust that inconsistencies would balance themselves out between groups. I had no way of testing for this.

**Qualitative**

External validity of qualitative data is threatened (Cohen et al. 2000, p. 105) by, among other things:

- selection effects (selected constructs are only relevant to a certain group);
history effects (situations have been arrived at by unique circumstances and are not comparable).

The qualitative data in this research was derived from questionnaires and interviews. Everyone in the research answered the former, while the latter were conducted with children who had been in a certain ECEE program several years previously, and their parents. Hence, the selection and history effects mentioned above limit the external validity of the results. This is mitigated by the convergent validity (i.e. two different instruments result in same answers) of the research. Both interviews and questionnaires yield similar results.

The interview questions were valid: an initial interview was conducted to serve as a “pilot.” I was prepared to modify the questions if complications arose; this turned out not to be necessary so the first interview, too, was included in the results. An advantage of the semi-formal interview technique is that I was able to ask for clarification in interviews when an answer was unclear to me. The written and online questions were not conducive to clarification, due to their anonymous nature, but in a few cases I was able to have a control group teacher check back with students who gave unclear answers and—contrary to instructions—wrote their names on their papers anyway. As all interviews and questionnaires done within a short period, there was no concern about data being gathered inconsistently.

By using grounded theory methodology, I was able to “evolve” the interviews to investigate information or trends as they appeared: there was no need to maintain identical questions (or methods of asking questions) from interview to interview. I interviewed to the point of redundancy—to the point at which no new information was
forthcoming. I did not go back to interviewees with transcripts or summary results for them to review; doing so would have increased the reliability of the data.

Triangulation was achieved through use of both interviews and qualitative long-answer questions on the questionnaires. This provided a built-in cross-check on the data.
CHAPTER 4 — RESULTS

This chapter presents the results of the data collection and analysis for the study of the long-term impact of a nature-oriented preschool program on children. First, the quantitative results of questionnaires collected from past participants, their parents, and the control group students are presented. Then, the results of the qualitative long-answer survey questions, open-ended interviews, and detailed descriptions of the themes extracted from the interviews and questions are provided.

Quantitative Research Results

My first null hypothesis (H₀₁, see Table 1) is that there is no difference between the Connectedness-to Nature Scale (CNS) scores of former participants in Nature Nursery (NN) compared to their non-participant peers. The alternate hypothesis is that participants had a higher CNS score than the control (peer) group of children.

I also looked to see if there were differences between the CNS scores of the children who were in the NN program and their parents. The second null (H₀₂) hypothesis is that participants as a group had a CNS score equal to that of the group of parents; the alternate hypothesis is that participants had a higher CNS score than the group of parents.
Null and Alternate Hypotheses

<table>
<thead>
<tr>
<th>Topic</th>
<th>Null ($H_0$)</th>
<th>Alternate ($H_1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS score (participant vs. control)</td>
<td>$H_0$: Mean CNS score$<em>{Participant}$ = Mean CNS score$</em>{Control}$</td>
<td>$H_1$: Mean CNS score$<em>{Participant}$ &gt; Mean CNS score$</em>{Control}$</td>
</tr>
<tr>
<td>CNS score (participant vs. parent)</td>
<td>$H_0$: Mean CNS score$<em>{Participant}$ = Mean CNS score$</em>{Parent}$</td>
<td>$H_1$: Mean CNS score$<em>{Participant}$ &gt; Mean CNS score$</em>{Parent}$</td>
</tr>
</tbody>
</table>

Table 1: Null and Alternate Hypotheses

**$F$-Test**

In the first stage of the analysis, a one-sided $F$-test from Excel was used to see if there was a significant difference between the variances of the past-participant children and their parents.

$F$-tests are used to compare two variances. That is, one tests the null hypothesis against the alternate hypothesis. The $F$-value is calculated as the ratio of the two variances. If the variances of two normally distributed populations are equal, then they are of comparable origin. Put another way: in comparing two independent samples of size $N_1$ and $N_2$, the $F$ Test provides a measure of the probability that they have the same variance.

<table>
<thead>
<tr>
<th>$F$-Test Two-Sample for Variances (parents/children)</th>
<th>$F$-Test Two-Sample for Variances (children/control)</th>
</tr>
</thead>
</table>
| $\begin{array}{lll}
\text{Mean} & 4.0 & 3.79 \\
\text{Variance} & 0.3 & 0.19 \\
\text{Observations} & 27 & 25 \\
\text{Degrees of freedom} & 26 & 24 \\
\text{$F$} & 1.3 & \\
\text{P($F$<=$f$) one-tail} & 0.3 & \\
\text{$F_{Critical}$ one-tail} & 2.0 & \\
\end{array}$ | $\begin{array}{lll}
\text{Mean} & 4.0 & 3.6 \\
\text{Variance} & 0.3 & 0.2 \\
\text{Observations} & 27 & 33 \\
\text{Degrees of freedom} & 26 & 32 \\
\text{$F$} & 1.0 & \\
\text{P($F$<=$f$) one-tail} & 0.5 & \\
\text{$F_{Critical}$ one-tail} & 1.9 & \\
\end{array}$ |

Table 2: $F$-Test Results
Table 2 shows that for both $F$-tests, $F$ is less than $F_{\text{Critical}}$ for a one-tailed test, so the null hypothesis that both sample variances are equal is supported. Therefore, the t-test for equal variances can be used to compare the CNS scores.

$t$-Tests

As the variances are similar, I compared the mean CNS scores of the control children, the participant children, and the parents by means of the t-test for equal variances. This was followed by comparing the answers to each of the 14 CNS questions. The subjects were grouped based on whether they were children who had been in the *Nature Nursery* program, their parents, or the control classes of children. Once the groups were identified and established, their CNS scores were described by the use of mean and standard deviation (see Table 3).

Three of the CNS questions (numbers 4, 12, and 14) are reversed in order to ensure consistent results, with Strong Agreement indicating a lesser indication of connectedness to nature (Franz, personal communication, October 24, 2007—see Appendix A). The scores for those questions were reversed before the results were calculated, to be consistent with the other questions.

<table>
<thead>
<tr>
<th>Column</th>
<th>n</th>
<th>Mean CNS Score</th>
<th>Total CNS Score</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>27</td>
<td>4.0</td>
<td>55.3</td>
<td>0.5</td>
<td>0.10</td>
</tr>
<tr>
<td>Parents</td>
<td>25</td>
<td>3.8</td>
<td>53.1</td>
<td>0.4</td>
<td>0.09</td>
</tr>
<tr>
<td>Control</td>
<td>33</td>
<td>3.6</td>
<td>50.4</td>
<td>0.5</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Table 3: Summary Statistics

The $t$-test is used to test hypotheses about the mean for small samples. The $t$ distribution is symmetric; it resembles the normal distribution and tends toward normal as the sample size increases. In a $t$-test one either assumes that the variances are equal in
both samples, or one makes corrections for unequal variances. In this case, the $F$-test showed the variances to be equal in both samples. The $t$-test used the Mean CNS Score numbers from Table 3 – i.e. 3.95, 3.79, and 3.60.

Looking at the CNS scores of the participant children and their parents, because $t_{(stat)}(df=50)=1.20$, $p<.05$, is less than $t_{(crit)}=2.01$ (see Table 4), one must accept the null hypothesis that there is no significant difference between the children and their parents’ scores. Therefore, the children and their parents are taken as not having significantly different connectedness-to-nature scores.

<table>
<thead>
<tr>
<th>t-Test: Two-Sample Assuming Equal Variances (children/parent)</th>
<th>Participants</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.95</td>
<td>3.79</td>
</tr>
<tr>
<td>Variance</td>
<td>0.25</td>
<td>0.19</td>
</tr>
<tr>
<td>Observations</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>Pooled Variance</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>1.20</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.68</td>
<td></td>
</tr>
</tbody>
</table>

The $t$ Stat is less than $t$ Critical, so the null hypothesis that the children and parents are not different cannot be rejected at the alpha=0.05.

Table 4 : t-Test - Participant Children vs. Parents

When comparing the participants and the control students, because $t_{(stat)}(df=58)=2.71$, $p<.05$, is greater than $t_{(crit)}=2.00$ (see Table 5), one must reject the null hypothesis that there is no significant difference between the two groups of children. Therefore, the children and their peers are taken as having significantly different connectedness-to-nature scores.
**t-Test: Two-Sample Assuming Equal Variances (children/control)**

<table>
<thead>
<tr>
<th></th>
<th>Participants</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.95</td>
<td>3.60</td>
</tr>
<tr>
<td>Variance</td>
<td>0.25</td>
<td>0.24</td>
</tr>
<tr>
<td>Observations</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>Pooled Variance</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>2.71</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.67</td>
<td></td>
</tr>
</tbody>
</table>

The t Stat is greater than t Critical, so the null hypothesis that the children and control are different is rejected at the alpha=0.05

Table 5: t-Test – Participant Children vs. Control

**Correlation Tests**

I looked for relationships using of Microsoft Excel correlation tests to see if there was a relationship in the CNS scores between those that participated in the *Nature Nursery* program and their parents. There is a weak negative relationship (-0.14) between the children’s and parents’ CNS scores (see Table 6).

<table>
<thead>
<tr>
<th></th>
<th>NN Children</th>
<th>Parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>NN Children</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td>-0.14</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 6: NN Children & Parent Correlation

**Responses to Individual Connectedness to Nature Scale Questions**

Table 7 summarizes the answers given by the control and participant children, as well as by the parents of the participant children, to each of the CNS questions. Each has the question that was given to the adults—the same question that the original authors of
the CNS study used—as well as the simplified-language question that was asked of the two groups of children.

<table>
<thead>
<tr>
<th>Question</th>
<th>Control</th>
<th>Participant</th>
<th>Parent</th>
</tr>
</thead>
</table>
| 1        | (Children): I feel that I am an important part of the natural world.  
(Adults): I often feel a sense of oneness with the natural world around me | 3.7 | 4.0, | 3.9 |
| 2        | (Children): I think of nature as a community to which I belong.  
(Adults): I think of the natural world as a community to which I belong. | 3.8 | 4.2, | 4.4 |
| 3        | (Children): I recognize and respect the integrity or “rightness” of other living things.  
(Adults): I recognize and appreciate the intelligence of other living organisms | 4.3 | 4.5, | 4.4 |
| 4        | (Children): I often feel separated from nature.  
(Adults): I often feel disconnected from nature | 3.4 | 3.8, | 4.2 |
| 5        | (Children): When I think of my life, I imagine myself to be part of the circle of life.  
(Adults): When I think of my life, I imagine myself to be part of a larger cyclical process of living. | 3.4 | 3.9, | 3.9 |
| 6        | (Children): I often feel a strong connection with animals and plants.  
(Adults): I often feel a kinship with animals and plants. | 3.3 | 4.3, | 3.8 |
| 7        | (Children): I feel as though I belong to the Earth as much as it belongs to me.  
(Adults): I feel as though I belong to the Earth as equally as it belongs to me. | 4.0 | 3.8, | 3.8 |
| 8        | (Children): I understand how my actions affect the world of nature.  
(Adults): I have a deep understanding of how my actions affect the natural world. | 4.3 | 4.8, | 4.3 |
| 9        | (Children): I often feel part of nature and the world of other living things.  
(Adults): I often feel part of the web of life. | 3.6 | 4.1, | 3.8 |
| 10       | (Children): I feel that all living things on Earth—human and nonhuman—share a common bond.  
(Adults): I feel that all inhabitants of Earth, human, and nonhuman, share a common “life force”. | 3.7 | 4.2, | 4.0 |
| 11       | (Children): Like a tree can be part of a forest, I feel I can be part of the world of nature.  
(Adults): Like a tree can be part of a forest, I | 3.7 | 4.2, | 3.8 |
feel embedded within the broader natural world.

12 (Children): When I think of my place on Earth, I consider people to be the most important things in nature. (Adults): When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

13 (Children): I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees. (Adults): I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

14 (Children): What happens to me is separate from what happens to the rest of the natural world. (Adults): My personal welfare is independent of the welfare of the natural world.

Table 7: Responses to CNS questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Qualitative Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>When I think of my place on Earth, I consider people to be the most important things in nature. (Children): When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature. (Adults): When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.</td>
</tr>
<tr>
<td>13</td>
<td>I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees. (Children): I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees. (Adults): I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.</td>
</tr>
<tr>
<td>14</td>
<td>What happens to me is separate from what happens to the rest of the natural world. (Children): What happens to me is separate from what happens to the rest of the natural world. (Adults): My personal welfare is independent of the welfare of the natural world.</td>
</tr>
</tbody>
</table>

Qualitative Results

Four qualitative questions were added to the Connectedness to Nature Scale (CNS) survey which were answered by the past participant children, their parents, and the control children (see Appendix D). These were answered anonymously on either the paper-based or the on-line questionnaires. The respondents could answer as much or as little as they wished, and in some cases skipped the question. The questions, and the results, follow.

**Control Students**

Question 1: “Do you (or your child/children) play outside more or less than your (their) classmates?”

Table 8 shows that in all cases, roughly half the children or parents felt that they played outside more than their peers did. A larger percentage of the control kids felt they
played outside less; participants and their parents were more likely than the control kids to say “about the same.”

<table>
<thead>
<tr>
<th>Answer</th>
<th>Control</th>
<th>% of responses</th>
<th>Participants</th>
<th>% of responses</th>
<th>Parents</th>
<th>% of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>More</td>
<td>16</td>
<td>53.3%</td>
<td>11</td>
<td>45.8%</td>
<td>11</td>
<td>47.8%</td>
</tr>
<tr>
<td>About the same</td>
<td>3</td>
<td>10%</td>
<td>7</td>
<td>29.2%</td>
<td>10</td>
<td>43.5%</td>
</tr>
<tr>
<td>Less</td>
<td>11</td>
<td>36.6%</td>
<td>6</td>
<td>25%</td>
<td>2</td>
<td>8.7%</td>
</tr>
</tbody>
</table>

Table 8: Play outside more or less than classmates?

The reasons for the above responses are shown in Tables 8, 9, and 10. Of the control group children who played outside more, the same number rated having access to a natural area to play and generally being active as their main reasons. Almost as many identified sports of some sort as why they spend more time outside than their peers.

Fewer past participants and parents answered this question. The children provided little detail except one who said that most of his or her friends played more video games than s/he did. The parent explanations for why their children played outside more than their peers did, varied widely.

<table>
<thead>
<tr>
<th>Reason for response</th>
<th>Control</th>
<th>% of responses</th>
<th>Participant</th>
<th>% of responses</th>
<th>Parent</th>
<th>% of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because of parent pressure</td>
<td>1</td>
<td>5.2%</td>
<td></td>
<td>1</td>
<td>7.7%</td>
<td></td>
</tr>
<tr>
<td>Because I’m active, misc. play, or unspecified</td>
<td>6</td>
<td>31.6%</td>
<td>2</td>
<td>18.2%</td>
<td>1</td>
<td>7.7%</td>
</tr>
<tr>
<td>Sports</td>
<td>5</td>
<td>26.3%</td>
<td></td>
<td>1</td>
<td>7.7%</td>
<td></td>
</tr>
<tr>
<td>Love outdoors</td>
<td>1</td>
<td>5.2%</td>
<td></td>
<td>1</td>
<td>7.7%</td>
<td></td>
</tr>
<tr>
<td>Have access to or live on</td>
<td>6</td>
<td>31.6%</td>
<td></td>
<td>1</td>
<td>7.7%</td>
<td></td>
</tr>
</tbody>
</table>
natural area/farm

Don’t play as many video games as friends

$\begin{array}{|c|c|c|c|}
\hline
\text{Reason for response} & \text{Control} & \text{Participant} & \text{Parent} \\
\hline
\text{About the same, or don’t know how much friends play outside} & 3 & 9.1 & 4 & 36.4 & 4 & 30.8 \\
\hline
\end{array}$

Table 9: Why I play outside more than my classmates

Responses to “About the Same” (Table 9)

Little detail was provided as to why people answered this way. Three of the 33 control group children that answered said that they played about the same amount outdoors as their friends, or that they didn’t know how much others played outside. Four of the 11 past participants who answered, and four of the ten parents, said the same thing about their children. One parent added, “participates mainly in year-long indoor sports.”

Responses to “Play outside less than peers” (Table 10)

The largest group of control children cited housework or schoolwork as keeping them indoors; where they live, computer/television, and other unspecified reasons made up the next groups of reasons, and “no time”, a dislike of the outdoors and non-involvement in sports made up the balance of reasons.
### Reasons for “Why I play outside less than my classmates”

<table>
<thead>
<tr>
<th>Reason for response</th>
<th>Control</th>
<th></th>
<th>Parent</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of responses</td>
<td>% of responses</td>
<td># of responses</td>
<td>% of responses</td>
</tr>
<tr>
<td>School &amp; house work</td>
<td>4</td>
<td>28.6</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>No time</td>
<td>1</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where I live</td>
<td>2</td>
<td>14.3</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>Computer/TV/video games</td>
<td>2</td>
<td>14.3</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>Dislike outdoors</td>
<td>1</td>
<td>7.1</td>
<td>2</td>
<td>7.7</td>
</tr>
<tr>
<td>Unspecified</td>
<td>2</td>
<td>14.3</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>Others play sports, but I don’t</td>
<td>1</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No one to play with</td>
<td>1</td>
<td>7.1</td>
<td>1</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Table 11: Why I play outside less than my classmates

Neither parents nor participant children provided many answers to this question. One parent said her child was afraid of insects and was sun-sensitive; another said “no friends nearby,” and the third response was “I have to encourage him very strongly to go outside and play. His little brother … loves playing outside lots! Why do I think this? Video games, TV, X-box.” The three former Nature Nursery children who felt that they played less outside than their peers wrote “I dislike the insects,” “I don’t like bugs and don’t like heat,” and “I have to do projects and practice piano.”

Question 2: What are your favourite things to do?

Each child was asked to identify his or her three favourite activities. Some gave more answers, others, fewer. “Sports” was the most popular activity for all three groups. The next most popular activities for the control group were electronic entertainment, spending time with friends and family, and playing outside. Two children preferred to sleep more than anything! See Table 11 for the complete list of preferred activities.
### Responses for “Favourite things to do”

<table>
<thead>
<tr>
<th>Pass-time</th>
<th>Control # of responses</th>
<th>Control % of responses</th>
<th>Participant # of responses</th>
<th>Participant % of responses</th>
<th>Parent # of responses</th>
<th>Parent % of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports</td>
<td>31</td>
<td>31</td>
<td>22</td>
<td>28.2</td>
<td>17</td>
<td>20.1</td>
</tr>
<tr>
<td>TV/Video/computer</td>
<td>19</td>
<td>19</td>
<td>6</td>
<td>7.7</td>
<td>11</td>
<td>13.6</td>
</tr>
<tr>
<td>Friends &amp; family</td>
<td>11</td>
<td>11</td>
<td>5</td>
<td>6.4</td>
<td>8</td>
<td>9.9</td>
</tr>
<tr>
<td>Play outside</td>
<td>10</td>
<td>10</td>
<td>3</td>
<td>3.9</td>
<td>7</td>
<td>8.6</td>
</tr>
<tr>
<td>Pets</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6.4</td>
<td>6</td>
<td>7.4</td>
</tr>
<tr>
<td>Vacation/Camp/backpack</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>12.8</td>
<td>10</td>
<td>12.3</td>
</tr>
<tr>
<td>Eat</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Housework/cook/bake</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gardening/yard work</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1.3</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Sleep</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>School &amp; Homework</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bike/Walk</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>12.8</td>
<td>9</td>
<td>11.1</td>
</tr>
<tr>
<td>Read</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>7.7</td>
<td>4</td>
<td>4.9</td>
</tr>
<tr>
<td>Keep active/busy</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Crafts</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>11.5</td>
<td>6</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Table 12: Favourite Things to Do

The parents also placed electronic entertainment as a very popular activity, but vacationing and various outdoor activities were highly ranked. The past participants had a slightly different view of their preferences than their parents: they claimed to prefer outdoor activities and arts & crafts to video games.

Question 3: Where are your favourite places to play? (Table 12)

Parents ranked “outdoors” as their children’s preferred place to play in nearly three quarters of the responses. This dropped to two thirds of the participant children, and fifty-eight percent of the control group.
Table 13: Preferred play spaces: Outside

<table>
<thead>
<tr>
<th>Location</th>
<th>Control # of responses</th>
<th>Control % of responses</th>
<th>Participants # of responses</th>
<th>Participants % of responses</th>
<th>Parents # of responses</th>
<th>Parents % of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside (unspecified)</td>
<td>11</td>
<td>16.4</td>
<td>6</td>
<td>9.5</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>In nature away from home (forest, fields, mountains, ravines, wilderness)</td>
<td>5</td>
<td>7.5</td>
<td>9</td>
<td>14.3</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Driveway, outdoor sport places, soccer field, trampoline</td>
<td>5</td>
<td>7.5</td>
<td>5</td>
<td>7.9</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>In the park &amp; playground</td>
<td>5</td>
<td>7.5</td>
<td>9</td>
<td>14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In my playhouse, in my back yard</td>
<td>11</td>
<td>16.4</td>
<td>8</td>
<td>12.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beach, camping</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At cabin, farm, ranch</td>
<td>1</td>
<td>1.5</td>
<td>3</td>
<td>4.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total preferred Outside</td>
<td>39</td>
<td>58.2%</td>
<td>42</td>
<td>66.7%</td>
<td>37</td>
<td>74%</td>
</tr>
</tbody>
</table>

This pattern was reversed for indoor play spaces. The control children were 1.26 times more likely to prefer to play indoors than the past program participants. Participant children preferred to play in various places outside to indoors by a ratio of 2:1 (see Table 14 and Figure 24). Natural and semi-natural areas (22.3%) outweighed “hardened” outdoor environments (e.g. driveways, sports playing fields). Indoors, “in a house” was slightly more popular than a sport/recreation place. Parents strongly believed that their children preferred to play outside, by a ratio of almost two and a half to one (37:15). More specifically, they said that their children preferred unstructured play “outside” (e.g. in a yard or a park) to organized places outside (e.g. sports fields).
Preferred places to play—Inside

<table>
<thead>
<tr>
<th>Location</th>
<th>Control</th>
<th></th>
<th>Participants</th>
<th></th>
<th>Parents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of responses</td>
<td>% of responses</td>
<td># of responses</td>
<td>% of responses</td>
<td># of responses</td>
<td>% of responses</td>
</tr>
<tr>
<td>Inside (unspecified)</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1.6</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Arena, hockey rink, pool (indoor sports)</td>
<td>5</td>
<td>7.5</td>
<td>8</td>
<td>12.7</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>My house, my room, in the basement, friend’s house</td>
<td>17</td>
<td>25.4</td>
<td>11</td>
<td>17.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer, TV, arcade</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total preferred inside</td>
<td>28</td>
<td>41.8%</td>
<td>21</td>
<td>33.3%</td>
<td>13</td>
<td>26%</td>
</tr>
</tbody>
</table>

Table 14: Preferred play spaces: Indoors

Question 4: How do you feel after playing outside? Do you feel different if you mostly have to stay inside?

There was a strong response to this question, especially by the parents; the results are summarized in Table 14. The children generally made very positive comments about how they felt or behaved after playing outdoors, and/or very negative remarks about how they felt after spending time indoors.

How do you (or your children) feel after playing outside?

<table>
<thead>
<tr>
<th>Location</th>
<th>Control</th>
<th></th>
<th>Participants</th>
<th></th>
<th>Parents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>No Difference Neutral or Do Not Know</td>
<td>Positive</td>
<td>Negative</td>
<td>No Difference Neutral or Do Not Know</td>
</tr>
<tr>
<td>Outside</td>
<td>35.6%</td>
<td>10.2%</td>
<td>35.6%</td>
<td>40%</td>
<td>5%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Inside</td>
<td>0%</td>
<td>18.6%</td>
<td>0%</td>
<td>5%</td>
<td>37.5%</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Table 15: How I feel after playing outside
Typical answers from both groups of children included comments like feeling “great”, “happy”, and “refreshed” after playing outside, and “bored”, “tired”, and “lazy” when the children had to spend too much time indoors. However, as shown in Table 14, more than a third of the control group claimed “no difference” in how they feel after being indoors or outdoors. More than 10% of the control children expressed negative feelings about being outside, usually about physical discomfort (“hot”, “blind from the sun”, exhausted”). The overwhelming majority of the parents (almost 90%) feel that their children’s behaviour or attitude is better after playing outside. “More relaxed”, “less tension, frustration”, “play better with siblings after playing outside”, “less agitated”, and “more energy” are typical responses. One parent said “can’t take too much sun & burn easily” as a negative about being outside; another, “video games seemed to be a good balance for the physical exhaustion” was taken as a positive for spending some time indoors.

Additional Question for Parents:

In addition to the questions about the CNS and their children’s play habits and behaviours, the parents also were asked two other things. The first was if they would recommend the program to others, and 100% responded that they would.

The second question was why they originally enrolled their children in the program. The parents’ answers overwhelmingly (63%) show the nature/outdoor component of the program as being key in their choice of this activity (see Table 15). Some of the parents indicated in their long-answer responses that the program matched their family’s lifestyles, while others stated that “nature” was something they wanted for
their children but felt unable to provide on their own—hence their selection of *Nature Nursery* to fill the gap.

<table>
<thead>
<tr>
<th>Why did parents enrol their children in <em>Nature Nursery</em>?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answer</strong></td>
</tr>
<tr>
<td>Program’s nature focus</td>
</tr>
<tr>
<td>Outdoor component of program</td>
</tr>
<tr>
<td>Because of the program (unspecified)</td>
</tr>
<tr>
<td>Complements family’s lifestyle</td>
</tr>
<tr>
<td>Socialize with other children</td>
</tr>
<tr>
<td>Recommended by others/past experience</td>
</tr>
</tbody>
</table>

Table 16: Why enroll in Nature Nursery?

**Interviews**

Five past participant children and their mothers also were interviewed. These approximately one-hour interviews were recorded, transcribed, and analysed. The answers were eventually divided into the following categories and sub-categories.

1. Child’s environmental attitude
   a. recycling and composting habits
   b. hypothetical reactions to snakes and ladybugs
   c. preferences in hypothetical activities
2. Questions relating to outdoor time
   a. effect of outdoor play
   b. opportunities to be outside
   c. time outside compared to peers
3. Questions relating to parents and family
   a. parents attitudes towards nature
   b. what parents taught about nature
   c. family recreation
4. Questions more specific to *Nature Nursery*
   
a. Why the parents chose this program

b. Satisfaction with the program

c. Changes in the child or family because of the program

d. Child’s memories of the program

e. Unstructured time

A synopsis of the results related to the four major themes that emerged from the interviews is presented in the following paragraphs.

*Child’s Environmental Attitude*

The five children were asked a range of questions to determine some of their current environmental attitudes. In general, they would prefer to do outdoor instead of indoor activities, had generally favourable feelings towards common local wildlife (with the exception of mixed reactions to garter snakes), and engaged in age-appropriate environmentally-friendly behaviours (e.g. basic recycling).

*Questions Relating to Outdoor Time*

Parents’ and children’s reactions to outdoor play time were overwhelmingly positive. They said that outdoor play leads to positive mood, behaviour and more creative play. Typical comments include:

When the kids are outside, they are happier, they get tired (so they’ll go to sleep at bedtime), and they aren’t fighting with each other. When they watch TV, they say they’re bored. (Outside) they have much more fun playing. (Unlike when watching TV,) they don’t want to stop.
They’re forced to use their imaginations more. This weekend, they found forts in the trees. They took all their chairs in there, and they made a bathroom, and they had a fire, and they had escape hatches …

They’re not fighting” and “less restless. I don’t hear that ‘I’m bored’!

The effect of “opportunity” (time and location) appeared here. Children with the opportunity played outside more. The randomly-selected families had a range of opportunities for the children to be in a natural area. Some (“We live right on the ravine”) lived on acreages and hobby farms; others lived in houses in the city. Time was more of an issue for accessing nature for one family than location. Both parents worked; the children had to go to a sitter’s house after school and were heavily involved in sports and so “had no time”. They reported “between her swimming and her brother’s hockey, it’s rare that we play outside in the winter.” Another comment indicated that “he plays outside more than his friends in town, the same as his other friends who also live on a farm.”

Questions Relating to Parents and Family

For the most part, the children are not able to say much that their parents taught them about nature. Nevertheless, family influence was evident, although not overwhelming. Some parents expressed tremendous enthusiasm for nature as indicated by “It’s something I’ve done since I was a kid, so it’s very natural for our family to do it”. Others were more reserved about parts of the natural world: “My Dad kills snakes. He’s afraid of them.” So too was this boy! Time spent with family in nature, for example, “fishing and camping with Dad,” “Grandpa knows a lot about plants”, and the choices of
family recreation (in descending order of frequency: biking, walking/exploring, camping/picnicking, beach-time, and gardening/yard work, all in competition with competitive sports) appeared to influence the children’s attitudes towards nature.

Questions More Specific to Nature Nursery

Just as parents’ attitudes towards nature varied, so too did the reasons they chose Nature Nursery for their children. The reasons ranged from a continuation of the family’s pre-existing activities and beliefs, to compensating for things the family recognizes are important but are unable to provide themselves, and looking for the children to bring learnings back to the family. Representative quotes about why they sent their children to Nature Nursery include:

- “I wanted a nature-based preschool because I don’t know a lot of stuff about nature, things I couldn’t teach them.”
- “I was outside of my comfort zone. Maybe to make up for some of my shortcomings.”
- “The program met my goals. I grew up on a farm. Outdoors is a part of our family’s life.” “… because it brought an awareness to (her children) that they would then bring to us. I mean, like, we knew this stuff, but we’re not thinking to teach it to our children on a daily basis. … I don’t have snakes, and … owl pellets to dissect. You know what I mean? It was important to me for them to see and experience and know. And stuff I talk about still. And the freedom of it, and the creativity that was allowed …”
Satisfaction with the Program

Based on the written questionnaires and the interviews, all (100%) of the parents were happy that they had enrolled their child(ren) in *Nature Nursery*, and felt it met their goals. This was reflected in the interviews.

Question: Are you glad your child was in Nature Nursery?

- Answer: “Oh yes, definitely! … I still recommend (the program) to others. I recommended it the other day, actually.”

- Answer: “It is (a program) to be recommended (spoken very emphatically)!”

- Answer: “Yes, because (various reasons: it was good for her, many facets to it, etc…)”

Changes in the Child or Family Because of the Program

Some mothers did not see any changes at all.

- “It was just a part of her environment (before). She wasn’t afraid of it.”

- “No because we were always very involved with the outdoors anyway.”

Other mothers noted positive changes to the child or the family because of the program.

“IT made her not so afraid of insects and stuff and now she’s more curious. She likes to be in the outdoors because she’s not afraid of it.” “Insects creeped her out big-time. … Afterwards, she was more curious.”

“No aggression towards animals, unlike her friends” (e.g. caterpillars).

“He gained respect.”
Some felt the children carried their interest and knowledge back to the family.

“I (the mother) wore those crazy things (snowshoes) on my feet! We
learned to cut apart pop-can plastic rings to prevent animals from getting
them stuck on their heads, and we enjoyed nature together.”

“It made us more aware and try to be more accountable to things.”
(During family bike rides) “she would actually get us to come down and
go on walks through (the nature centre) … and tell us where you went …”

One girl believed *Nature Nursery* had made a difference to her. “Lots of my
friends just play outside on slides and stuff. My sisters and me and my friends play house
and pick berries and stuff in the backyard.” Another goes out “maybe five times a
summer” to catch butterflies, and goes out a lot to just “walk around” and look at things,
rather than actively play a sport or game. Snakes were not scary to her, but still had a
definite “ick” factor to them.

*Child’s Memories of the Program*

Only one of the children had many memories of the program. Most had only
occasional recollections and impressions; some might have been false memories because
of prompting during the interview; others might have come up as things the children
think they should have learned in a nature playschool, even though we do not remember
ever actually specifically teaching them (e.g. such as “saving the land for nature is
good”).
Unstructured Time

As the interviews progressed concurrently with my literature review, I became interested in the role of unstructured time to explore nature on children. Two of the parents were asked if Nature Nursery provided enough time for the children to engage in unstructured exploration. Both replied that the balance was good, but their answers concentrated on the overall program and the indoor time, rather than the outdoor aspect that Louv (2005) referred to.

“Nature Nursery wasn’t too structured. There is a good healthy balance, and you need that as well, because you have different kids from different families with different personalities. Some will need more structure.”

“There was always the free play aspect of it. The only structured things were snack time and circle time. The rest was choice.”

Summary

The children had few clear memories of Nature Nursery, but exhibited good attitudes and behaviours towards the environment, and liked and responded well to playing outdoors. Most believed that they played outdoors the same as or more than their peers. This was often the result of the opportunity (where they lived, or having the time) to do so. Family had a big influence on the children’s attitudes, by the parents’ beliefs and actions, and by choice in family recreation. Families chose this environmentally focussed preschool program for a variety of reasons, and in retrospect, all were happy with Nature Nursery and felt it met their goals. Some saw no changes in their children because of Nature Nursery; others attributed positive changes to the program. Some even
felt that the children brought attitudes and actions back with them that influenced the family.
Chapter 5 – DISCUSSION

In this chapter, I summarize and discuss the results of the research, in terms of both knowledge in the field of early childhood environmental education (ECEE) and in its practice. I draw some conclusions about the value of ECEE in general and Nature Nursery in particular, present recommendations for The City of Red Deer, the Kerry Wood Nature Centre, and for parents of young children. I also suggest topics for future research.

Through quantitative questionnaires with 25 Nature Nursery parents, 27 “graduates” of the program now in grades four to six, and 33 non-NN peer children, I determined the degree of connectedness-to-nature of each group. Qualitative questions on the questionnaires showed where the children liked to play, what they liked doing best, and the effects of indoor and outdoor play on their moods and behaviour. Interviews with five former Nature Nursery children and their mothers explored the environmental attitudes of the children and looked at the families and memories of the Nature Nursery program for possible connections.

The literature shows that early childhood education (ECE) programs have a lasting effect on participants. Early experiences in nature have been shown to have a lasting, positive effect on many environmental educators and activists. My interpretation of the writings of child development researchers and educators—Vygotsky, Skinner, Bandura, Dewey, and others—explains this by showing that attitudes develop from experience, especially in the company of a mentor (parent, teacher, adult friend). As Rachael Carson wrote,
If a child is to keep alive his inborn sense of wonder … he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in. (1956, p. 45)

This research shows that the attitudes formed by early childhood environmental education (ECEE) program seem to persist, especially if supported by family or other social influences. Five to seven years after moving on from Nature Nursery to kindergarten and then to elementary school, there was a statistically significant difference between children who had taken the Nature Nursery program and their peers who had not done so. Nature Nursery children had a stronger connection to the environment than did their peers.

Statistically, I could not detect a significant difference between the past-participant children’s CNS scores and those of their parents. This could mean that “green” parents (families with a positive attitude towards and involvement in the environment) put their children in “green” programs, and so Nature Nursery might not have been the sole factor responsible for the difference in participants’ attitudes compared to their peers. It is possible that family and other environmental factors determined the attitudes. However, interviews with the parents indicated that in at least some cases, the families were (and are) not nature-oriented. Parents were asked why they originally enrolled their child in Nature Nursery. While this was first conceived as more of a marketing question for the use of the Kerry Wood Nature Centre, the answers offer some insights into the similarity between the parent and child CNS scores. Parents’ answers overwhelmingly show the nature/outdoor component of the program as being key in the parents’ choice of this program. Some of the parents indicated in their
interviews and long-answer responses that the program matched their family’s lifestyles, while others stated that “nature” was something they wanted for their children but felt unable to provide on their own—hence their selection of Nature Nursery to fill the gap. The statistics show that there is not a strong difference between parents and their children’s CNS scores, suggesting that the children’s attitudes are not solely a product of their parent’s connectedness to nature.

Children often bring their learnings and beliefs back to their families. This showed in some of the interviews: the children’s experiences influenced their families. They took their parents to the places the Nature Nursery teacher had taken them, and they parroted the lessons she taught them. It is possible, therefore, that some of the parents’ current environmental attitudes (as reflected in their CNS scores) came from their children, not just the other way around.

Attitudes can be formed at a young age. For them to persist, cognitive discrepancy must be reduced. I strongly suspect that many factors determine a child’s attitude towards, or connectedness to, nature. Nature Nursery would have been an early influence in shaping these children’s environmental attitudes. Families, schools, and other life experiences would continue to shape children’s environmental attitudes, positively or negatively. The Nature Nursery program, along with other factors, made a measurable difference in the environmental attitudes of at least in some of the studied children. If or when it was not the sole or key shaper of environmental attitude, according to the interviews, Nature Nursery reinforced some families’ environmental attitudes.

In the interviews and qualitative long-answer survey questions, “opportunity” emerged as a potentially important factor in shaping children’s environmental attitude:
• Opportunity in terms of physical location: does the child have a place to play outside? Urbanization converts natural areas to housing. Is there a park, farm, acreage, campground, or beach conveniently accessible? When children respond that they don’t play outside because they live in an apartment, or that they have nowhere to play, then an opportunity is lacking.

• Opportunity in terms of time: over-programming of children’s free time (sports, dance, etc.) leaving virtually no free time for many children to explore and interact with nature. Is the child left with a sitter because the parents are always working? Is the child in so many sports, dance, music, and other activities that s/he can never just go play, lie under a tree and watch an ant, and be a kid?

• Opportunity in terms of companionship: is the child given the opportunity to be in nature alone, with other children, or with an adult?

• Opportunity in terms of parenting: parents must sometimes overrule their own fear of “stranger danger” (Louv, 2007). They must be willing to look past the “electronic babysitter” and stand up to the child’s too-frequent choice of electronic entertainment (the Internet, computer and video games, and television) and other indoor pastimes, and simply say “go play outside!”

Recommendations

Attitudes develop as an offshoot of experience, so ECEE should expose children to the natural environment, and caring parents or educators must guide the children by modelling appropriate attitudes and behaviours, and providing opportunity and experiences outside.
In the future, *Nature Nursery* should make a concerted effort to educate the parents of enrolled children so that they are aware of their role in forming future environmentally connected citizens.

The parents who want to support their children’s future connection to nature must be aware of appropriate behaviours to model, of the opportunities that exist in their neighbourhoods for children to play outside, and of the importance to the child of having both companionship/role modelling and solitary (reflective) time in nature. Parents need to recognize that they do not have to be authorities or experts in everything. Names and detailed knowledge are less important than experiences to young children.

I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to know as to feel. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused — a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love — then we wish for knowledge about the subject of our emotional response. Once found, it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate. (Carson, 1956, p. 45)

As children age, parents need to know where to turn for more information. When virtually all parents and children report that the children feel and behave better after playing outdoors, this should be the easiest and cheapest recommendation to make: turn off the TV and go outside to play.
The City of Red Deer—indeed, all municipalities—should ensure that there are natural areas readily accessible for all children. Groomed sports fields and manicured parks have their place, but so too do bits of rough meadow, untouched ravines, and groves of trees. Schoolyards too should have natural features available to the children, not just swing sets, sports fields, and paved play areas.

Possible Explanations for the Results

Several factors might have influenced the results of this study. These include:

- Some studies show whatever academic advantage a Head Start or other preschool program confers on a child can be muted or lost by the end of elementary school. However, integrated ECE programs (the Abecedarian project, for example) do appear to have life-long effects. This program was not concentrating on “academic” or fact-and-knowledge areas; perhaps the areas that *Nature Nursery* concentrated on, combined with other social factors, resulted in NN having a similar residual impact as the integrated ECE programs.

- There appeared to be some difficulty with some of the control children understanding the CNS questions. The language might have been too advanced, or the questions could have been too philosophical for some of them. The former *Nature Nursery* participants might have had a parent to help explain the questions; the control groups had less opportunity to ask questions/seek explanation and only a set amount of time to complete the questionnaire.
• There might have been a difference between schools. The control children were from a single Catholic school. Students from the public school system, or from schools in different parts of the city might have had different results.

• Might there have been a difference between male/female parents answering the interviews? (Only mothers were involved this time.)

• Larger sample sizes would have allowed the results to be more precise and broadly applicable.

• While it would have been interesting to have parents of the control group respond, too, it was not practical. Neither was it really necessary, because the first question this thesis addressed was to see if there was a difference between control children and past participants. As there was a difference, the second area I looked at was how past participants differed from their parents in terms of the CNS. This study was not looking at the role of parents overall.

Possible Areas of Future Study

Several additional questions arose during this research. These include:

• Future research could look deeper into the role of family/environment on children’s attitudes to the environment.

• Is there a difference in the CNS scores between children in the public and Catholic school systems in Red Deer, Alberta? If so, what in the teaching environment causes this?

• Is there a difference in the CNS scores in different parts of the city? If so, why, and what can be done to boost lower-scoring schools?
• What are the CNS scores of parents in the general Red Deer population? Is there a difference in the score between Nature Nursery parents and peer parents?

Summary

If environmental education seeks to “save the world” by instilling pro-environmental behaviour (Jensen, 2002), then EE programs should start at a young age and continue throughout life. The programs must provide experience in nature, to help children develop a love for and comfort in nature, not just provide hard facts and knowledge in a classroom or television program removed from the real world. We know that simply providing more knowledge to people and raising awareness about the environmental impact of their actions does not necessarily lead to the people taking actions that are more appropriate to help the environment.

Falk and Dierking (2000) wrote that free-choice learning—learning based on physical, socio-cultural, & personal contexts—builds on multiple influences. Were there opportunities to play in nature? Did an adult help or mentor the child in nature? Has the child (or eventually, the adult) had positive experiences in natural or wild places? I feel that it is unrealistic to expect a few months in a preschool program or a school visit to a nature centre or park to be a life-altering experience. Positive attitudes towards the environment need to build over time, experience upon experience.

Was Nature Nursery the factor that resulted in children finishing elementary school having greater Connectedness-to-Nature Scale scores than their peers? Possibly, but more likely, it was one of many factors. It probably provided a scaffold upon which later experiences were hung. It provided opportunity—time and place—in nature. It
provided a caring adult to mentor children. It probably had some lasting effect, but the rest of the child’s environment doubtless played a role, too. If people feel connected to nature, that they are a part of it, then they are less likely to harm it. *Nature Nursery* helped to connect the children; the rest was up to their families and schools.
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http://www.nature.org/tncscience/misc/art23800.html?src=new


APPENDIX A

Correspondence with C. McPherson Frantz

From: Cindy Frantz
To: Jim Robertson
Cc: Dr. Ruth Wilson; Steve Mayer
Sent: Wednesday, October 24, 2007 7:50 AM
Subject: Re: Connectedness to Nature

Hi Jim,

Yes, you are correct that those 3 items (and no others) should be reverse scored before averaging all the items together.

I would be VERY interested to see the modified version you developed. We are currently working on a version for 10–18 year olds (and those with limited reading ability), and seeing the approach you took might give us some ideas. Can you send it to me? We will happily acknowledge your contribution should we adapt any of your items.

Cindy

Cindy McPherson Frantz
Department of Psychology
Oberlin College
Oberlin, OH 44074

On Oct 23, 2007, at 2:41 PM, Jim Robertson wrote:

Hello again!

I'm a student at Royal Roads University in Victoria, BC in the Master of Arts in Environmental Education & Communication program. Ruth Wilson is my thesis supervisor. I am looking to see if there is a long-term effect of our nature centre's preschool program on the children who participate in it. I was in contact with you in April, asking if you had a Grade 4-6 children's version of the Connectedness to Nature Scale. As you didn't, I modified it with the help of a retired elementary teacher, and conducted the test with control groups and past participants.

As I am about to compile and analyze the results, I would like to know how you weighted the individual questions to determine someone's connectedness to nature. The respondents have to answer each question from 1 (strongly disagree) to 5 (strongly agree), but not all answers rated "5" seem to indicate a strong connection with nature! Number 4 (I often feel disconnected from nature), number 12 (When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature) and
number 14 (my personal welfare is independent of the welfare of the nature world) seem to need reverse rating to lead a rating of connectedness to nature. Is this correct? Have I missed any others that you reverse-ranked? And, did you then simply add up the scores to achieve a total rating, or were you more interested in individual answers? Thanks very much for your help once again!

Jim Robertson
Red Deer, Alberta

----- Original Message ----- 
From: Cindy Frantz 
To: Jim Robertson 
Cc: Steve Mayer 
Sent: Wednesday, April 11, 2007 5:48 AM 
Subject: Re: Connectedness to Nature --- for children?

Hi Jim,
It sounds like you have a fabulous opportunity to do some really meaningful evaluation. Unfortunately, there is not yet a children's version of the scale. (It is on our to-do list, though.) One approach you might consider is using an adapted version of the single item Inclusion of Other in the Self (Aron & Aron, 199?). It's a series of pairs of circles, that range from not touching at all to nearly completely overlapping. I think it's simple enough that a child could use it. I'm attaching a version we've used. My memory is that the correlation between this measure and our scale was not as high as one would like, but I'd have to dig through some old data to verify this. Let me know if that would be helpful to you.

Good luck with your research, and do let me know if I can answer any further questions.

Cindy
APPENDIX B

Telephone Contact Form

Telephone Contact—Introduction

Hello, my name is Jim Robertson. I manage the Kerry Wood Nature Centre, and also am a student at Royal Roads University in Victoria in the Master of Arts in Environmental Education and Communication program.

As your child was a student in the Nature Nursery program at the Nature Centre a few years ago, I hope that you would be willing to take part in a research study that I am conducting.

I want to determine if participating in Nature Nursery makes any long-term differences in children’s environmental attitudes. I hope to be able to interview you and your child. It should take no more than one hour, at a time and place of your choice. I will ask you a series of open-ended questions about your family’s environmental attitude and actions, with similar questions to your son/daughter, to try to see if Nature Nursery made any difference in his/her life over the long term. I do not expect to ask any sensitive or tricky questions, and there are no right or wrong answers. The interview will be recorded, but the recordings will never be made public. The original recording will be kept locked in a cabinet, and all personally-identifiable information will be stripped from the working transcript. Your name will never be published or otherwise released. The original tapes will be destroyed two years after the thesis is published.

I cannot anticipate any harm that would come to you or your child through participating, but if you can think of any, I will work with you to prevent it.

I am available to answer questions now or if you think of some before or during
the interview. If you would like to speak to someone at the university to check in confidence on who I am or what I am doing, contact Dr. Rick Kool, the Academic Lead in the Environmental Education and Communication program, at Royal Roads University.

I do not foresee commercial applications from this research. I will use the interview results in my Master’s thesis, and possibly in articles submitted to professional journals in the future. The results might also help the Kerry Wood Nature Centre improve its *Nature Nursery* program.

Are you interested in participating?
APPENDIX C

Introduction Letter Requesting Participation

Date

Dear __________.

My name is Jim Robertson. I manage the Kerry Wood Nature Centre, and also am a student at Royal Roads University in Victoria in the Master of Arts in Environmental Education and Communication program.

As your child was a student in the Nature Nursery program at the Nature Centre a few years ago, I hope that you would be willing to take part in a research study that I am conducting.

I want to determine if participating in Nature Nursery makes any long-term differences in children’s environmental attitudes. I hope to be able to interview you and your child. It should take no more than one hour, at a time and place of your choice. I will ask you a series of open-ended questions about your family’s environmental attitude and actions, with similar questions to your son/daughter, to try to see if Nature Nursery made any difference in his/her life over the long term. I do not expect to ask any sensitive or tricky questions, and there are no right or wrong answers. The interview will be recorded, but the recordings will never be made public. The original recording will be kept locked in a cabinet, and all personally-identifiable information will be stripped from the working transcript. Your name will never be published or otherwise released. The original tapes will be destroyed two years after the thesis is published.

I cannot anticipate any harm that would come to you or your child through
participating, but if you can think of any, I will work with you to prevent it. By participating, if you permit, your child’s name will be entered in a draw for a new bicycle. In addition, your family will be offered a free program at the Kerry Wood Nature Centre in the coming 12 months. This might include a private show in the new planetarium, or a birthday party, free admission to the Best of the Banff Mountain Film Festival, or whatever else you select. In addition, your child’s name will be entered in a draw for a gift certificate for a bicycle.

I am available to answer questions now or if you think of some before or during the interview. If you would like to speak to someone at the university to check in confidence on who I am or what I am doing, contact Dr. Rick Kool, the Academic Lead in the Environmental Education and Communication program, at Royal Roads University.

I do not foresee commercial applications from this research. I will use the interview results in my Master’s thesis, and possibly in articles submitted to professional journals in the future. The results might also help the Kerry Wood Nature Centre improve its Nature Nursery program.

Are you interested in participating? Please contact me at ….. If I haven’t heard from you by May 5th, I will phone you.

Thank you in advance for your participation!

Yours truly,

Jim Robertson

Manager
APPENDIX D

Survey Questions

Children’s Survey Questions

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly as you can what you feel right now.

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<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
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<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Neutral</td>
<td>Strongly Agree</td>
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</table>

1. I feel that I am an important part of the natural world.
2. I think of nature as a community to which I belong.
3. I recognize and respect the integrity or "rightness" of other living things.
4. I often feel separated from nature.
5. When I think of my life, I imagine myself to be part of the circle of life.
6. I often feel a strong connection with animals and plants.
7. I feel as though I belong to the Earth as much as it belongs to me.
8. I understand how my actions affect the world of nature.
9. I often feel part of nature and the world of other living things.
10. I feel that all living things on Earth - human and nonhuman - share a common bond.
11. Like a tree can be part of a forest, I feel I can be part of the world of nature.
12. When I think of my place on Earth, I consider people to be the most important things in nature.
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
14. What happens to me is separate from what happens to the rest of the natural world.

Do you think that you play outside more or less than others in your class? Please tell me about why you think this.

What are your three favourite things to do?

Where are your favourite places to play?

After you have been playing outside a lot, how do you feel? Do you feel or act differently if you have to stay inside most of the time?

Were you ever in the Nature Nursery playschool program at the Kerry Wood Nature Centre?
Adult Survey Questions

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

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</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Disagree</td>
<td>Neutral</td>
<td>Strongly Agree</td>
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</tr>
<tr>
<td>2</td>
<td>Strongly Disagree</td>
<td>Neutral</td>
<td>Strongly Agree</td>
<td></td>
</tr>
</tbody>
</table>

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1. I often feel a sense of oneness with the natural world around me.
2. I think of the natural world as a community to which I belong.
3. I recognize and appreciate the intelligence of other living organisms.
4. I often feel disconnected from nature.
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
6. I often feel a kinship with animals and plants.
7. I feel as though I belong to the Earth as equally as it belongs to me.
8. I have a deep understanding of how my actions affect the natural world.
9. I often feel part of the web of life.
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.
11. Like a tree can be part of a forest, I feel embedded within the broader natural world.
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
14. My personal welfare is independent of the welfare of the natural world.

What do you think your Nature Nursery children’s three favourite things to do are?

Do you think they play outside more or less than their classmates and friends? Why do you think this?

Where are their favourite places to play?

After they have been playing outside, is their behaviour or health any different from when they have been inside most of the time? Explain your answer.