

The Influence of Participation in a Community Mapping Project  
on Grade Four Students' Environmental Worldviews

by

Susan Jagger

B.Ed., University of Victoria, 2001

B.Sc., University of Victoria, 1999

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### Abstract

This study examined if and how participation in a community mapping project influenced grade four students' environmental worldviews immediately after and three months after the culmination of the project. A mixed methods approach was used as students completed pre-test, post-test, and follow-up New Ecological Paradigm for Children scales and participated in post-test and follow-up interviews. Students' overall NEP scores were pro-environmental at each point in the study and the students' scores on the Rights of Nature factor improved significantly from the pre-test to the follow-up. Students' interview comments suggested improvements in environmental knowledge and attitude, understanding of humans' environmental impacts, and connection to place. The results of the study have implications for future research and environmental education curriculum and instruction.

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## Chapter 1: Introduction

Is the exploration of the natural world just a pleasant way to pass the golden hours of childhood or is there something deeper? I am sure there is something much deeper, something lasting and significant (Carson, 1956, 100).

### *Benefits of Time Spent in and with Nature*

Nature is beneficial to people. Here, and throughout this thesis, nature and natural spaces are defined as “vegetation in many forms including trees, residential landscaping, gardens, and even mowed areas” (Kaplan, 2001, p. 536). Along with plants, nature and natural spaces include animals, fungi, and other organisms as well as abiotic natural features such as rocks and water. Under this definition, nature exists in both rural and urban areas and is inclusive of humans.

People generally tend to prefer natural spaces over built environments of roads, buildings, fences, and sidewalks (Kaplan). Kaplan’s (2001) study of residents of low to medium rent housing communities revealed that adults are drawn to unmanaged woods over landscaped areas. Similarly, those living with views of nature from their homes tend to be more satisfied with their neighbourhoods and nature as a whole than those living without a natural view from home (Kaplan).

Views of and time spent in nature can have a restorative effect on people. Psychologically, exposure to nature improves mood and overall happiness and reduces feelings of fear, anger, aggression, and sadness after experiencing stressful situations (Hartig, Mang, & Evans, 1991; Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991). Physiologically, people who experience nature after stressful events tend to have a greater, faster, and more complete recovery of normal blood pressure and heart rate than

those who experience urban and crowded places after stress (Ulrich et al., 1991; van den Berg, Hartig, & Staats, 2007).

Nature can also help to improve attention and concentration. People with views from home of gardens and flowers report being more positive, focused, effective, and alert (Kaplan, 2001). Likewise, views of trees promote feelings of peace and less distraction (Kaplan). After experiencing stress, viewing natural scenes helps to improve concentration (van den Berg, Hartig, & Staats, 2007). Prolonged experience in nature also improves attention. After an extended wilderness backpacking trip, participants showed improved attentiveness over time as well as higher overall happiness and life satisfaction than those who took non-wilderness vacations or no vacation (Hartig, Mang, & Evans, 1991).

Nature not only benefits adults but also children. The presence of nearby nature can act as a buffer on the impact of stress on children's lives. Wells and Evans (2003) found that children living in rural areas with a high amount of nature nearby experienced less psychological distress than rural children living in areas with a lower amount of nature nearby. They also revealed that the influence of nearby nature on reducing stress was most profound for those children experiencing the most stress.

Experiences in nature can also help to improve children's cognitive functioning and their ability to focus their attention. Wells (2000) revealed that children who moved from "substandard rental apartments or houses" to "greener" settings tended to have considerably improved attention after the move. Those children who experienced the greatest increase in natural elements of their homes had the most improved ability to direct their attention. In a study of near-home nature and urban children's self-

discipline—their concentration, impulse inhibition, and delay of gratification—Faber Taylor, Kuo, and Sullivan (2002) found that girls who viewed nature from their homes had greater self-discipline than girls who did not have a view of nature from home. The same study found that a view of nature did not have a significant effect on boys' self-discipline.

Research has shown that activities in natural spaces can help to reduce attention-deficit symptoms—inattention and impulsivity—in children diagnosed with ADHD. Kuo and Faber Taylor (2004) found that children with ADHD that participated in “green outdoor activities” or activities in natural spaces showed significantly reduced ADHD symptoms. Similarly, Faber Taylor, Kuo, and Sullivan’s (2001) research suggests that “the ‘greener’ a child’s play area, the less severe his or her attention deficit symptoms” will be (p. 54).

### *Significant Life Experiences*

Along with providing people with physical, psychological, and physiological benefits, experiencing nature, particularly during childhood, is important in the formation of environmental values and the development of environmental citizenship. Tanner’s (1980) foundational study on significant life experiences identified the critical learning experiences and influences that lead to responsible environmental citizenship. Tanner showed that the dominant predictor in the lives of studied environmentalists was childhood experience in the outdoors. Likewise, the influence of parents, teachers, and other adults was also important. Tanner further identified reading nature and ecology-

related books and seeing natural spaces developed as influential on the development of informed environmental citizenship (Tanner, 1980).

Since this early research into significant life experiences, many studies have confirmed Tanner's findings regarding the influences on environmentalists' concern and action—time spent in natural spaces and the guidance of a parent, family member, or other adult have been the primary influences on the lives of environmentally active adults. Chawla (1999) studied the motivations of environmentalists to protect the environment and found that experiences in natural areas, the influence of family members, participation in environmental organizations, the experience of environmental loss, and education were highlighted by respondents as key influences. Chawla noted that these factors are present from early childhood to secondary school years but appear to be have the greatest impact during the childhood years. These themes were identified again in studies of significant experiences in the lives of environmental educators (Corcoran, 1999; Palmer, Suggate, Robottom, & Hart, 1999).

Not only have Tanner's findings been replicated in studies of committed environmentalists but they have also been identified in studies of the broader population. Wells and Lekies' (2006) study of randomly selected American adults found that childhood participation in "wild nature"—walking, playing, hiking, camping, hunting, or fishing in natural areas—had a significant and positive influence on environmental attitudes and actions. Those with childhood experiences in nature were more likely as adults to hold pro-environmental attitudes, such as valuing other species and natural spaces, and behaviours, such as recycling regularly and participating in environment-enhancing activities. Ewert, Place, and Sibthorp (2005) surveyed over 500 university

undergraduates and found that childhood experiences, particularly participation in outdoor activities, exposure to environmental issues through media, and experience of negative environmental events such as the development of a natural area, are related to adults' environmental beliefs.

These studies reveal common predictors of adult pro-environmental concern and behaviour: childhood experiences in natural spaces, the influence of family and other role models, books and other media, witnessing negative environmental impacts, and education. They do not however highlight a single experience or influence that leads to environmentally responsible citizenship. Instead, these factors appear to interact as individuals' environmental worldviews evolve over time.

#### *Pro-Environmental Values to Responsible Environmental Citizenship*

It is clear that experiences in natural settings can lay a foundation for the formation of children's values of nature. A particularly important stage in value development occurs between the ages of six and twelve. During this critical period of middle childhood, children develop the humanistic, symbolic, aesthetic, and cognitive components of values of nature (Kellert, 2002). Children become more comfortable in and appreciative of natural settings. Children begin to recognize animals as independent from their own interests, seeing the "different-ness and other-ness" (Shepard as cited in Kellert, 2002, p. 133) that exists between people and other species. It is also during this stage that children start to realize the rights of other, non-human lives. Above all, middle childhood is a time of exploration and expansion of interest in and understanding of the natural world (Kellert, 2002).

The development of pro-environmental values is a precursor to environmentally responsible citizenship, the goal of environmental education. By improving students' awareness of and heightening their sensitivity to the total environment and its issues, helping students to develop concern for and value of environmental quality and improvement, and developing students' skills to actively participate in environmental problem solving, environmental education can foster the growth of responsible environmental citizenship (Hungerford & Volk, 1990). Now, with global losses of "climate stability, resilience and productivity of natural systems, the beauty of the natural world, and biological diversity" (Orr, 2004, p. 7), it is essential that students are educated in a way "that prepares [them] for lives and livelihoods suited to a planet with a biosphere that operates by the laws of ecology" (Orr, 2004, p. 27).

#### *Teachers' Perceived Barriers to Environmental Education*

Despite this urgency, Orr (2004) argues that "we continue to educate the young for the most part as if there were no planetary emergency" (p. 2) with environmental experiences and environmental education often limited in the school-mandated curriculum. A number of barriers have been revealed in past studies of teacher attitudes and commitment toward leading environmental education programs. Ham and Sewing (1988) studied elementary school teachers' perceptions and feelings toward teaching environmental education, identifying four impediments to teachers implementing environmental education: 1) conceptual barriers; 2) logistical barriers; 3) educational barriers; and 4) attitudinal barriers.

Conceptual barriers exist because teachers are unclear of the goals of environmental education and where these goals fit into the curriculum. In practice, most teachers emphasize knowledge about the environment yet minimize the affective component of environmental education, which addresses values and emotions. This practice is in contrast to most teachers' perceived aims of environmental education: the development of students' attitudes or values (Cutter-Mackenzie & Smith, 2003). In the USA, Ham and Sewing (1988) confirmed that most American teachers thought environmental education should be covered within science or social studies—only one third of the teachers studied thought environmental education should be taught across all subject areas. In practice, nearly 80% of teachers placed environmental education in science and 60% included environmental education in social studies. Less than 10% of teachers actually included environmental education in all subject areas (Ham & Sewing, 1988). Cutter-Mackenzie and Smith's (2003) Australian study had similar findings as many teachers incorporated environmental education into science or social studies. These findings are not surprising as rather than consistently include environmental education across all subject areas, mandated curricula, including those of British Columbia, tend to situate environment-related outcomes within science or social studies (Ministry of Education, 2005, 2006).

Teachers identify logistical barriers to teaching environmental education. These include constraints of preparation and curricular time, limited funding, and a lack of resources (Ham & Sewing, 1988; Kim & Fortner, 2006; Ko & Lee, 2003). Additional obstacles identified were class size, transportation issues, safety, and lack of local natural environments (Ham & Sewing, 1988; Kim & Fortner, 2006; Ko & Lee, 2003). These

perceived logistical barriers relate to identified conceptual blocks because environmental education is seen as an additional subject rather than embedded across all subject areas (Ham & Sewing). Local natural spaces are often overlooked as potential sites of environmental study (Ham & Sewing). An examination of teachers' perceptions of natural settings as appropriate sites for environmental education identified deep woods, rivers, ponds, and marshes as most suitable. However, teachers felt that these sites carried the greatest number of safety concerns and hazards. The same study revealed that teachers were also not enthusiastic about urban nature as a learning setting for environmental education (Simmons, 1998). These findings present a dilemma—environments that teachers perceive to be most suitable for environmental education are also seen as most hazardous yet they are not keen on using safer, nearby urban nature as a resource.

Teachers also report that they feel limited by their own perceived lack of knowledge about ecological systems (Ham & Sewing; Kim & Fortner). Despite contrary research findings, many teachers believe that a strong natural science background is necessary to teach environmental education (Ham & Sewing). Again, the placement of environmental education within the science curriculum perpetuates this impression (Ham & Sewing). The majority of teachers do not have pre-service or in-service training in environmental education (Cutter-Mackenzie & Smith, 2003). Lane and Wilke (1994) found that, along with believing that environmental education was not related to their taught subjects, teachers' lack of environmental education background was a primary reason for not teaching about the environment.

Finally, although teachers saw environmental education as an important part of the curriculum they only taught it occasionally. Lane and Wilke's (1994) study found that teachers spend less than thirty minutes per week teaching environmental education despite identifying that environmental education should be included in the curriculum. This study suggests that teachers' positive attitudes toward environmental education do not lead to a consistent effort to teach it.

In order for environmental education to be taught consistently and confidently in schools, teachers need a strategy for including environmental study in the curriculum that will not be a burden on planning and preparation time, includes experiential learning opportunities that are easy and affordable to access, does not require advanced ecological education, and is fundamentally meta-disciplinary. Community mapping projects have the potential to fill this obvious void.

#### *Community Mapping as a Potential Tool for Environmental Education*

Community mapping projects involve citizens in the creation of maps that communicate local knowledge, values, assets, and visions. The power in community mapping comes from the process of creating the map. By exchanging and reflecting upon ideas, stories, and understandings of place, mapmakers develop and strengthen their connections to their communities (Lydon, 2003; Common Ground, 1996).

Used in the environmental education curriculum, community mapping can engage students in learning about their local natural environments. Students can create or build upon their existing relationships with the land which could deepen their environmental concern and commitment. Community mapping draws from all subject areas and

therefore reflects the inextricability of environmental education from other disciplines.

Though community mapwork has the potential to be an invaluable activity in environmental education, there is no research on how participating in such an experience influences students' connections to the natural world and their environmental beliefs.

This study follows grade four students through their participation in a locally-based community mapping project. This research sought to reveal if and how participation in community mapping influences students' environmental worldviews. It also looks at how that influence is retained over time. Following a mixed methods design, this research measured students' initial environmental worldviews and compares them to their worldviews measured immediately and three months after the completion of the project. The study also used qualitative data gathered through interviews, student work samples, and informal discussions with students. In this way, this research sought to illustrate that "there is something much deeper, something lasting and significant" in experiencing nature in childhood.

## Chapter 2: Literature Review

### *An Alternative Worldview: The New Ecological Paradigm*

For over 400 years, a worldview placing humans above all other species has dominated Western culture and society. Stemming from the scientific revolution, European expansionism, and growing industrialization, the Dominant Western Worldview held an expectation of ongoing and never ending progress and saw nature as an endless resource for human consumption. The opportunities for humans were seen as endless (Catton, Jr., & Dunlap, 1980). In this worldview, the world was seen as a machine and it was believed that all phenomena could be understood if broken down into their component parts. Science, according to this paradigm, could be used to master nature (Capra, 1982).

Humans were seen as an exceptional species because we possess cultural heritage and abilities unlike other species. Over time, humans came to be seen by some as exempt from ecological principles and environmental limits because of this “exceptionality.” The result was the surfacing of a modified worldview or paradigm of Human Exemptionalism. This view again ignored the biophysical world, recognizing only social and cultural environments and their important contexts for human progress (Catton, Jr., & Dunlap).

During the 1960s and 1970s, another paradigm shift began to take place. The local and global impact of human “progress” had become obvious and “the significance of [these] crises is the indication they provide that an occasion for retooling has arrived” (Kuhn as cited in Catton, Jr., & Dunlap, p. 31). This shift to a New Ecological Paradigm

acknowledged the finite nature of global ecosystems (Dunlap, 1980). It recognized that while humans were exceptional they were only one part of an inextricably linked system of species (Catton, Jr., & Dunlap, 1980). The human being was simply a “plain member and citizen of the biotic community” (Leopold, 1966, p. 220).

The New Ecological Paradigm shares its roots with the deep ecology movement of the early 1970s. Many of its key ideas are paralleled in the early descriptions of the beliefs, attitudes, and life choices of deep ecology supporters. Both identified an awareness of the interrelatedness of ecosystems and individuals living within them. The New Ecological Paradigm and early deep ecology respect the ecological rights of all species to live and flourish. They also both celebrate the diversity and complexity of natural systems (Sessions, 1993). It is important to note however that the deep ecology movement was not free of problems (ie: what would consumers eat) and tensions, for example, what *sufficient justification* (Fox, 1994) of harmful actions against another would be. It must be reinforced that the New Ecological Paradigm does not mirror all points of the Deep Ecology Platform but rather shares some of its early themes.

Along with social and cultural influence, the New Ecological Paradigm realized the action, and reaction, of the biophysical environment on human lives and acknowledged the limits that it placed on humans. The New Ecological Paradigm confirmed limits to the growth of human societies and placed humans firmly within the governing boundaries of ecological principles and laws that regulate all species (Catton, Jr., & Dunlap). The shift required one to view and think about the world in terms of relationships, connections, and context and “against the grain of traditional Western science and education” (Capra, 2005, p. 20). Instead of focusing on what a system is

made of—its structure—Capra (2005) argues that the patterns and configurations exhibited by that system should be studied.

Adopting an ecological alternative to the dominant Western worldview has implications for education, in particular environmental education. Rather than focusing exclusively on objects of environmental education, such as endangered species and recycling programs, environmental education founded in an ecological worldview would instead focus on learning the relationships and inherent connectedness between people and environments. Unlike education *for* the environment which asserts a managerial and hierarchical role for humans, an ecological paradigm encourages people to live and learn *with* the environment (Gough, 1987). In fact, it might be even more fitting to place learning and living *within* the environment to further acknowledge and adopt our situation within the environment. Does the evolution of environmental education's theory and practice reflect this larger cultural shift toward ecocentrism?

#### *Environmental Education: A Definition and an Evolution*

Environmental education is not a new field of study; rather it has been a part of the curriculum, to widely varying degrees, for over 100 years. Despite its history, there continues to be inconsistency in its definition, goals, and objectives. The fundamental groundings of environmental education vary in breadth and depth. Weilbacher (1997) has even said that “[environmental educators] have little or no agreement as to what environmental education is, or when or how one does it” (p. 18).

Stapp provided one of the first definitions of environmental education in 1969. He stated that “environmental education is aimed at producing a citizenry that is

knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution” (p. 34). This initial defining statement focuses on three desired qualities in the individual: knowledge, awareness, and motivation to act. Stapp further outlined the four major objectives of environment education. First, individuals need to understand that they were part of a much larger system of “man [*sic*], culture, and the biophysical environment, and that man [*sic*] has the ability to alter the interrelationships of [that] system” (p. 34). Next, individuals need to understand the natural environment and its resources and their roles in modern society. Third, individuals should recognize the environmental problems facing humans, how they might be solved, and the responsibility of people to work toward environmental solutions. Finally, Stapp stated that environmental education should develop in its students concern for environmental quality, in turn motivating environmental problem solving (1969/1998).

Soon after Stapp’s initial definition, many variants surfaced. In 1970, Roth focused on the management aspect, defining *environmental management education* as one whose students are

1) knowledgeable of the interrelated biophysical and sociocultural environments of which man [*sic*] is a part; 2) aware of the associated environmental problems and management alternatives of use in solving the problems; and 3) motivated to work toward the maintenance and further development of diverse environments that are optimum for living (as cited in Disinger, 1983/1998).

McInnis (1972) modified environmental education’s title as well, opting for *environmentalized education* that would allow for authentic learning experiences in environments optimizing “the learner’s potential capacities to function successfully as an intelligently integrating multi-sensory organism” (p. 53). Here, McInnis uses

“intelligence” to distinguish humans from other organisms. Brennan’s version characterized environmental education as one that fosters the acknowledgement of humans’ interdependence with all forms of life and their duty to conserve the environment’s ability to support such systems (as cited in Disinger, 1983/1998).

Humans play a central role in each of these early definitions of environmental education. Despite highlighting the interrelatedness of natural systems, each definition remained anthropocentric. Stapp’s initial attempt entitled humans with the position of problem solver and did not honestly acknowledge the part played by humans in creating environmental problems in the first place. Further, Stapp’s definition notes the reality of environmental issues faced by humans but fails to mention the impact of such issues on the other species that we share our environment with. Along with problem solving duties, humans also take on the role of managers of natural systems, implying an inherent hierarchy. Here, the biophysical environment is regarded as a resource to be used by humans as we are encouraged in the “further development of diverse environments that are optimum for living” (Roth, as cited in Disinger, 1983/1998). McInnis’ use of “intelligence” to set humans apart from other living things further perpetuates the created hierarchy. Finally, the ability of humans to alter relationships is acknowledged but the negative aspects of this characteristic are not honestly disclosed or even considered.

On April 22, 1970, the first Earth Day was held, signalling a widespread recognition of the deterioration of the environment and the need for humans to live more sustainably to maintain environmental health for present and future generations of living things. Awareness of environmental issues had been raised through the works of Rachel

Carson (1956, 1962), Aldo Leopold (1966), and others. This renewed momentum placed pro-action in front of wider audiences.

The first of the “founding documents” of environmental education was the Belgrade Charter, adopted by a United Nations conference in 1976 (North American Association for Environmental Education, 2004). The charter presented a goal statement for environmental education, declaring that

the goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (as cited in North American Association for Environmental Education, p. 1).

The following year, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the United Nations Environment Program (UNEP) organized and held the Tbilisi Intergovernmental Conference on Environmental Education. The resulting declaration built upon the earlier goals of the Belgrade Charter. The Tbilisi Declaration (1977) set out three broad goals for environmental education:

- 1) to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;
- 2) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;
- 3) to create new patterns of behaviour of individuals, groups, and society as a whole toward the environment (The Role, Objectives, and Characteristics of Environmental Education, II).

These goals extend beyond previous environmental educational goals by acknowledging the interdependence of systems. They also go beyond merely attaining knowledge about issues to include values and commitment to environmental health. These are not only required of individuals but of collective groups and societies. However, the Tbilisi Declaration continues to perpetuate the managerial role of humans as it seeks to prepare

humans to “protect and improve the environment” (as cited in North American Association for Environmental Education, p. 2).

The Tbilisi Declaration (1977) provided the primary principles for the proposals outlined in United Nations’ 1992 publication, Agenda 21. According to Agenda 21, both formal and informal education are critical in shifting people’s attitudes. If environmental education is to be effective, it must address the socio-economic world as well as the physical and biological environment. Agenda 21 also stated that environmental education should be integrated into all disciplines. It goes further to state that “schools should involve schoolchildren in local and regional studies on environmental health... and in relevant activities linking these studies with services and research in national parks, wildlife reserves, [and] ecological heritage sites” (United Nations Sustainable Development, n.d., ch. 36.5e).

Together, the Belgrade Charter, the Tbilisi Declaration, and Agenda 21 have shaped how environmental education is now approached and have grounded the definition of environmental and ecological literacy. Currently, the ultimate goal of environmental education is to influence students’ long-term behaviour toward nature and encourage responsible environmental citizenship (Hungerford & Volk, 1990). In their much cited 1990 paper, Hungerford and Volk translate Tbilisi’s objectives into a definition of an environmentally responsible citizen. Such an individual will possess an awareness of and sensitivity to the whole environment and its problems and issues. They will similarly have a fundamental understanding of the environment and its problems and issues. An environmentally responsible citizen will hold feelings of environmental concern and will be inspired to actively work toward improving and maintaining

environmental well being. They will have the skills to identify and resolve problems and issues in the environment and will work at all levels toward solving them (Hungerford & Volk, 1990). These fundamental principles of environmental education are similarly expressed in the British Columbia Ministry of Education's 2007 *Environmental Learning and Experience* document for teachers. Given its widespread acceptance across environmental education research, Hungerford and Volk's definition of environmentally responsible citizenship is used in this thesis.

The developing goals and objectives in environmental education do support the adoption of the New Ecological Paradigm but it is important to consider whether or not and to what degree these theoretical modifications are translating to positive changes in students' environmental knowledge, attitudes, and behaviours. Are students recognizing their place within the nested set of systems that make up the global ecosystem? Are students making decisions and taking actions that support sustainable relationships within these systems?

#### *Research on the Immediate Influence of Environmental Education Programs*

Studies on environmental education programs and the impact that they have on students' knowledge, attitudes, and behaviour highlight the challenge of developing environmental education programs that improve both students' understanding of and attitudes toward the environment.

Armstrong and Impara (1991) considered the influence of the eight week in-class *NatureScope* program on American fifth and seventh grade students. Compared to a control group, participants in the program only showed significantly higher scores on one

out of four tests of topic knowledge: improvements were in students' knowledge of the herpetology unit whereas their knowledge of the desert, weather, and endangered species components did not significantly change. No significant differences were found between the control and treatment groups' attitude scores.

Children's perceptions of biodiversity were considered by Lindemann-Matthies (2002) in an examination of the influence of the *Nature on the Way to School* program, a program that taught students about the plants and animals they passed as they walked to and from school. Participation in the program significantly increased the number and diversity of species recognized by 8-16 year old students. Similarly, by increasing the length of attendance in the program, students' recognition of biodiversity was further improved. If Weilbacher (1993) was correct in stating that "individuals will only miss a species if they know it and have developed a relationship with it", Lindemann-Matthies' results suggest that programs that focus on local biodiversity will enhance students' personal connection to the environment.

In a study of the cognitive and attitudinal influence of a locally-based conservation program on 11-13 year old students, Dimopoulos, Paraskevopoulos, and Pantis (2008) showed that students significantly improved their low pre-test conservation knowledge scores after participating in a 15 activity conservation education program. Additionally, the students' attitudes were highly positive to begin with and did not increase significantly. The researchers assumed that students' positive attitudes were reinforced and strengthened as a result of the conservation program.

Eagles and Demare (1999) studied factors influencing Canadian sixth grade students' environmental attitudes. Using Kellert's (1985) environmental attitude

categories, they found that students' concern for the right and wrong treatment of the environment (moralistic attitude) and the environment as an interrelated system (ecologicistic attitude) was positively related to reading about and watching films and television on environmental topics and talking about the environment with their families. Eagles and Demare also examined the change in students' attitudes after attending a week long residential *Sunship Earth* program, an environmental education program where experiential learning opportunities are provided to develop broad understanding of ecological systems and promote pro-environmental attitudes in students. They found that participation in the program did not produce any measurable differences in students' concern for the environment.

Haluza-Delay (2001) examined how urban Canadian teenagers perceived nature after returning home from a 12-day outdoor adventure trip. He discovered that the participants viewed nature as undisturbed—without people or development—and with a sense of freedom. However, the students expressed that nature did not exist in their own communities and did not feel motivated to care for their local environments, suggesting that environmental education programs situated apart from students' local environments may be counterproductive.

In a study of American high school students taking part in an urban ecology field study program, Barnett et al. (2006) found that participation in the program positively affected students' sense of environmental stewardship, particularly among boys. They saw that students were taking ownership of "their" field site and thinking about it pro-actively. These results again relate to Weilbacher's (1993) comment about the value of forming relationships in the natural world that focus on the students' local environment.

These studies highlight the value of longer term environmental education programs that focus on authentic experiences situated in local and familiar natural spaces in affecting students' environmental knowledge, attitudes, and behaviour. They also bring into question if and how environmental education programs can have positive lasting effects on students' environmental beliefs.

*Research on the Lasting Influence of Environmental Education Programs*

Rather than simply evaluate the immediate effects of environmental education, it is critical to look at the long-term influence of environmental education programs on students' developing environmental worldviews. A literature search for articles on the long-term impact of environmental education programs on elementary students' knowledge, attitudes, and behaviour produced very limited results. A 1993 review of 34 environmental education studies attempting to change students' environmental knowledge, attitudes, and behaviour found only nine studies that considered the lasting impact of educational interventions. Of these, the delays in follow-up study varied from two weeks to two years (Leeming, Dwyer, Porter, & Cobern, 1993).

Only one of the follow-up studies examined by Leeming, Dwyer, Porter, and Cobern looked at elementary aged students: Jaus' 1984 study of the short and long-term effects of a two hour in-class environmental education program on third grade students' environmental attitudes. Two classes were given pre-test attitude questionnaires. One of the classes was presented with environmental education lecture material on pollution, recycling, and conservation; the other served as a control group and had no environmental education lectures. Three days after the intervention, both classes

completed the post-test questionnaire. The experimental class scored 30% higher than their peers. Most surprising was the two year follow-up questionnaire administered to the students in fifth grade. It revealed that the experimental group continued to show more positive environmental attitudes than the control group (Jaus, 1984).

Given the small sample size (49 students) and multitude of outside influences (teachers, instruction in third, fourth, and fifth grades, family values), it is not possible to exclusively attribute students' positive environmental attitudes to the environmental instruction provided. It is unlikely that a two hour environmental education program had such a lasting influence on students' attitudes toward the environment. The statements given on the questionnaire were leading and could encourage a positive response from students. Though a control group was used, these weaknesses bring Jaus' results into question.

Ryan (1991) looked at the impact of a conservation program on Canadian grade five students' attitudes toward the environment. The study included over 500 students, 84% of whom took part in the one day conservation program and 40 who visited the local conservation area with their families. Students completed questionnaires one year after the program: one for students who had visited the conservation area and taken part in the program and one for students who had not. Ryan found that between sample groups there were some differences in the students' ability to discuss site specific scenarios but that there was little difference in students' grasp of abstract conservational concepts.

Ryan's study failed to include a pre-test and immediate post-test questionnaire. Therefore students' prior knowledge and immediate post-conservation program understanding and attitudes were not factored into the results. Without these measures, it

is impossible to reliably make connections between the conservation program and changes in student attitudes. Teachers of the school groups were provided with a kit of activities to be used before and after the field trip. These activities could have led to the slight differences measured in the students' understanding of the site. Also, during the year after taking part in the conservation program, students could have been exposed to many variables that would affect their attitudes such as other environmental education activities, related studies in other disciplines, and the influence of family members.

Bogner (1998) examined the influence of one- and five-day outdoor ecology programs in a national park on 11-13 year old students' environmental knowledge, attitudes, and behaviours. The study involved about 700 rural students who completed a pre-test questionnaire before their visit to the park and a post-test one month after the park experience. Bogner also gave a further follow-up survey to a subsample of students six months later. The results showed that even before the field trip, students showed environmental sensitivity and more of a willingness to act than others. Students' knowledge and Human-Altered Nature subscale improved significantly in both programs but other scales did not change significantly. In the five-day program, students' reported behaviour and verbal commitment to plan and take pro-environmental action improved. The improvements from both the one- and five-day programs persisted in those students given a six month post-test (Bogner, 1998).

The results from Bogner's study indicated that participation in longer term environmental education programs may be more effective in creating pro-environmental changes in students' knowledge, attitudes, and behaviours. However, the students were experiencing a different natural environment set apart from their local ecosystems.

Questions from the survey also set the national park and “natural areas” apart from other areas. Did students recognize the importance of respecting and valuing all natural areas, including those very different from national parks?

Dettmann-Easler and Pease’s 1999 study looked at the efficacy of six different residential environmental education programs in the development of students’ positive attitudes toward wildlife, “the most universal symbol for the environment” (Introduction, ¶ 7). The programs were attended by entire fifth and sixth grade classes, included at least one overnight stay, and involved environmental education programming. Students in the experimental group completed related in-class work before and after attending the residential program. Students completed questionnaires at three intervals: a pre-test at least three weeks before the visit, a post-test within one week of their return from the centre, and a follow-up two to three months after the visit. Students were also interviewed two to three months after the visit. The results indicated that in the short-term students who took part in the residential programs had improved their attitudes toward animals more than the control group students who had no environmental education or only one-day field trips. Within the control group, there was an improvement in attitude between pre- and post-tests. In the longer-term results, students in the experimental group tended to retain their improved attitudes. Student interviews revealed that students enjoyed the camps but did not report changes in their own attitudes (Dettmann-Easler & Pease, 1999).

This study reinforces the need for long term experiences in environmental education. It does not however clarify the role of pre- and post-experience in-class activities in maintaining positively changed attitudes. Had the control group taken part in program-related work before and after their environmental education programs, would

their attitude scores be nearer or equal to those of the experimental group? It is also interesting to note the discrepancy between students' interview comments and their questionnaire results: students stated that their attitudes had not changed but their answers on the questionnaire indicate otherwise.

Kruse and Card (2004) examined the influence of a conservation education youth summer camp on campers' environmental knowledge, attitude, and behaviours. Campers aged 10-18 years completed a survey before, immediately after, and one month after attending the summer camp. The younger campers displayed lower knowledge, attitude, and behaviour scores. Kruse and Card found that the campers' knowledge increased from pre-test to post-test then decreased to the delayed post-test though still above pre-test levels. Similar results were found for attitude scores. Campers' behaviour scores were inconsistent: apart from the oldest campers, scores for behaviour decreased in the delayed post-test and in two groups scores fell below the pre-test scores.

Kruse and Card's study took place at one site—a zoo—and therefore it is not possible to transfer their research findings to other situations. However, the short-term observed improvements in knowledge, attitude, and behaviour do reflect the value of authentic, first-hand experiences in environmental education. The decreased post-test scores indicate the need for continued follow-up work after the environmental education program. This of course would be challenging to do in a summer camp setting but would be a logical progression to follow in the classroom.

In response to a lack of research into long-term recollections of residential environmental education, Knapp and Benton (2006) considered students' episodic and semantic memories of a residential education program one year after the experience.

They used a phenomenological method as they interviewed ten rural fifth grade students who had attended a five day program at Yellowstone National Park. The students also took part in related pre- and post-experience activities at school. Identifying memories as remembering (episodic recalled experiences or information from a specific event) or knowing (semantic, conceptual knowledge about the world), Knapp and Benton found that students' memories were strongly influenced by activities that they were actively involved in at the park. They revealed that all interviewed students retained some degree of program-specific content and felt mostly positive emotions about the experience. Knapp and Benton concluded that to strengthen episodic memory and in turn improve semantic understanding environmental education programs should include repeated exposure to concepts and topics that are relevant and meaningful, and active involvement of students.

Knapp and Benton's work is encouraging as it identifies that students do hold memories of past environmental education experiences and at least some degree of conceptual knowledge. It does not however make a distinction between the impact of pre- and post-experience activities in this retention. The sample group of students, albeit from a rural area, studied an environment far from, and likely biologically and geographically quite different from, their home environments. Did this distinct difference contribute to the retention of student knowledge? Were the students able to transfer their conceptual understandings from one natural space to another different natural setting? Further, Knapp and Benton did not look at students' pro-environmental attitudes or behaviours in the follow-up interviews.

Farmer, Knapp, and Benton's (2007) phenomenological study examined the long term impact of a one-day environmental education field trip to Great Smoky Mountains National Park on a class of thirty urban grade four students. At the park, students participated in a mountain visit, group discussions, and hands-on experiences. One year after the field trip, students took part in open-ended, unstructured interviews based on what they remembered from the visit to the park. The interviews revealed that many students retained environmental content knowledge and showed an increase in pro-environmental attitude. Many students specifically referenced activities from the park experience. The researchers concluded that the environmental education field trip had secured long term environmental knowledge and pro-environmental attitudes in its participants.

Farmer, Knapp, and Benton's results are encouraging but, as they note, their study was small in scope and therefore its findings cannot be validly applied to larger populations. Their study failed to consider the immediate influence of the field trip. Related activities completed once students returned to school may have led to the development and retention of knowledge and encouragement of pro-environmental attitudes. Similarly, the study failed to identify the students' initial environmental knowledge and attitude. It is also quite exceptional for a one day environmental program to have such an impact on students' knowledge and attitudes when many longer term programs have failed to influence students' knowledge and attitudes significantly (Bogner, 1998; Leeming, Dwyer, Porter, & Cobern, 1993). In their interviews students shared that forests needed to be preserved and protected and that pollution needed to be reduced; these related to particular activities completed on the field trip. Were students

able to successfully transfer their understanding of these concepts from the national park setting to their own local urban ecosystems?

Stern, Powell, and Ardoin (2008) looked at the influences of three- and five-day residential environmental education experiences on four measures: 1) connection with nature; 2) environmental stewardship; 3) interest in learning and discovery; and 4) knowledge and awareness of the program site and biological diversity. Of 300 students attending the residential program, 183 students completed each of the pre-experience, immediate post-experience, and three month follow-up surveys. Teachers were also surveyed regarding the degree of pre-experience preparation their students completed before attending the program. Comparison of pre- and immediate post-experience scores showed that significant improvements in all measures over the short-term. That said long-term gains were only significant in stewardship and awareness; student interest in learning and discovery and their connection with nature faded over time. The five-day programs contributed to greater and longer lasting changes in students. Stern, Powell, and Ardoin also found that greater teacher involvement in program instruction enhanced student outcomes (2008).

As with other studies, this research draws attention to the value of increased program length in environmental education and its impact on students. It also illuminates the role of teachers in creating positive change in their students—actively engaged teachers appear to encourage a greater pro-environmental shift in their students than teachers who are not engaged in instruction.

*Directions for Future Environmental Education Programming and Research*

Aside from phenomenological research done by Knapp and Benton (2006) and Farmer, Knapp, and Benton (2007), the reviewed studies of long term effects of environmental education utilize quantitative surveys and questionnaires. Dettmann-Easler and Pease (1999) used qualitative interview data to support their questionnaire results, revealing an inconsistency in students' changed attitudes. It would be illuminating for further research into the lingering influence of environmental education programs to employ a mixed methods approach so that broad patterns can be recognized through quantitative measures and can be checked and more deeply explored with qualitative information gathered from individual participants.

These studies into the longer term, lasting influences of environmental education programs indicate that extended periods of instruction produce a more significant impact on students' developing environmental knowledge, attitude, and behaviour. They also suggest that related school activities before and after an environmental education program can help to maintain students' improved knowledge, attitude, and behaviour over time. Further, programs that are set within natural environments tend to have a much greater impact on students than those that are done in-class. Active teacher participation and interest in environmental education activities seems to further enhance students' environmental understanding and awareness. Ideally environmental education programming should bring all of these considerations together in its curriculum.

Much of the research reviewed considers the influence of residential environmental education programs and those taking place in distant national parks; these are natural areas quite different from those in the home communities of participating

students. By taking students to “high quality” natural spaces, are they learning that these are the areas to be valued and preserved and that ecosystems closer to home are not as important? It is essential that environmental education programs allow students to recognize the importance of biological diversity and health regardless of location. Environmental education’s goal is to promote responsible environmental citizenship in its students and such citizenship requires “an awareness and sensitivity to the total environment” (Hungerford & Volk, 1990, p. 9) not only those that are “high quality” natural spaces. Responsible environmental citizenship extends into adulthood and therefore it is critical that students retain and build upon what they have gained through environmental education curriculum and instruction. For this reason, further research should consider the long term effects of environmental education instruction that is set in local spaces. Community mapping is an approach to environmental education that is locally-based, can be long-term, and has the potential to enact lasting positive change in its students’ environmental worldviews.

#### *Community Mapping: Defining and Describing*

Mapping is a way that people make sense of the world and of their place within it. Beyond traditional topographic representations of location, maps can also communicate ideologies of place and space through their varied signs, symbols, and forms. They can show political, social, and religious structures, to name but a few (Harley, 2001). One form, the community map, reflects the shared spaces, knowledge, and values of local residents.

Community mapping is typically defined by the project goals it seeks to attain. Perkins (2008) defined community mapping as “local mapping, produced collaboratively, by local people and often incorporating alternative local knowledge” (p. 154). Based on shared lived experience, it centres on those features that people value and the visions that they hold for the future of the community. Community mapping is mapping *by* the community, not *for* or *of* it. “It requires people to dig into the past, to walk their local territories and streets, and to talk to their neighbours” (Lydon, 2003, p. 22).

Community mapping work has been used to identify and communicate supportive resources and services in the community to its citizens. Projects have been used to recognize community resources and services that support children’s development, their distribution, and their usage (Connor, 2001). Community mapping projects have been used as a professional development tool for secondary school life skills teachers that follow a contextualized teaching and learning approach, allowing them to recognize and share transitional community resources of potential use to their students (Tindle, Leconte, Buchanan, & Taymans, 2005). Community mapping has also been used as a post-secondary teaching tool with human ecology graduate students looking at community nutrition and nutrition services within the community (Robinson, Vineyard, & Reagor, 2004).

All of these applications of community mapping seek to inform humans of local services and resources that are personally beneficial. These projects do not specifically define a community as a collective of biotic and abiotic members—Leopold’s (1966) community as “soils, waters, plants, and animals, or collectively, the land” (p. 219)—and often do not embrace these components in their maps. Instead these community maps

tend to focus on built resources such as health care facilities, libraries, and community centres that contribute primarily to the well being of humans.

One example of community mapwork that does embrace the inclusion of the natural world in community is the Parish Map Project (Common Ground, 1996). Originally organized by Common Ground in the United Kingdom, the project was a means for people to come together and share what they cherished in their localities: wildlife, history, landmarks, people, festivals, and stories. Parish maps have been created in a variety of forms and use a multitude of materials: textiles, paint, song, sculpture, written word, drama, film, and photography (Clifford & King, 1996). Maps could also show connections to place through created postcards, shared anecdotes of situated experiences, renaming colours of paint chips, and rewording of general terms to place-specific names (Hurren, 2008). Not only did these inclusive maps reflect those community features that were of importance to citizens but the actual process of creating the maps was a tool for empowerment, giving residents a voice in their community.

Parker (2006) and Perkins (2007) further discuss the potential of community maps to put power back into the hands of the mapmakers. Historically mapping has been a tool of the affluent and powerful; community mapping opens up cartographic expression to a broad population including women, children, minority groups, and other marginalized populations. The contributions of all citizens are valued, considered, and included in community maps. As noted by Lydon (2003), community mapping “is the antithesis of expert-led discourse and development as everyone’s views matter and can only enhance the map” (p. 12). Community mapping has the potential to stimulate social and procedural change through increased awareness and knowledge of local concerns and

issues (Parker). Most community mapping work does in fact seek to encourage change and the maps themselves are used in the process (Perkins, 2007). Positive changes have been successfully accomplished following mapping work securing conservation areas in Thailand, restoring an abandoned stream park in Victoria, BC, and creating a more sustainable community in Portland, Oregon (Parker, 2006). Similarly, First Nations communities have used community maps to help sustain traditional knowledge and ways of life (Lydon, 2003).

Lydon's 2003 paper, *Community Mapping: the Recovery (and Discovery) of our Common Ground*, discussed the value of community mapping in discovering shared spaces and experiences and noted the importance of children in the mapping process. She stated that the inclusion of children in community mapping is critical because they see places in different ways. "They come at [the project] so totally unbiased. They will tell you things as they see it and they are also so egocentrically oriented. They don't have the biases of a geocentric world" (p. 19). Lydon noted that some projects by Common Ground in Victoria, BC, Canada have been collaborative efforts with elementary school students and youth and community groups. She also points out that community mapping work can connect to all components of the K-12 curriculum: science, social studies, language arts, mathematics, fine arts, physical education, information and communications technology, and health and career education.

#### *Community Mapping as a Potential Pedagogical Tool*

As noted, community mapwork is relevant to all areas of the prescribed curriculum. It can form the foundation of curricular work or can complement existing

curricular themes and outcomes. Community mapping can allow teachers to make deep, meaningful, and relevant cross-curricular connections and enable students to realize the interrelatedness of disciplines. Doing map work in the community can give students an opportunity to apply what they have learned in the classroom to authentic experiences beyond the school. Through community mapping, students also share their own unique knowledge of their communities, their understanding of community members, and their experiences in their community. All students can contribute and all of their contributions are valued and add to the map's importance.

Community mapping projects are practical. As the mapping is situated in the local community, the cost of projects is minimal. Unlike field trips and longer stay visits further afield, transportation costs are small if any at all. Likewise, the cost of supplies to create the maps is flexible. Depending on the medium used for the maps, teachers can usually find all of the materials required within the school's art supplies and students' regular school supply list.

Despite the contributions of children to mapping, the past project work done by students, and the potential for wider usage of community mapping in the curriculum, there has been a lack of research on if and how participation in community mapping projects influences children's perceptions. Does community mapping change the way that children see their communities? Do children develop a sense of ownership and stewardship of place? How does community mapping influence the way children see the world—their worldview?

This study sought to reveal if and how participation in a community mapping project influenced grade four students' environmental worldview. Drawing from the

strengths of past research, this study developed as a long-term project: students worked on the mapping over the course of three months. The mapping was centred on a local provincial park that students were familiar with and whose flora and fauna were not unlike those seen throughout the community. Students completed a quantitative scale measuring their environmental worldview prior to the mapping project, immediately after completing the project, and three and a half months after completing the project. Students also participated in group interviews within one week of completing the project and again three and a half months after completing the project. Together, the quantitative and qualitative data indicated and illuminated any changes in students' environmental worldview over time.

## Chapter 3: Research Methodology

### *Defining Mixed Methods Research*

Mixed methods research brings together quantitative and qualitative data collection and analysis as it seeks to answer a research question. Johnson and Onwuegbuzie (2004) define mixed methods research as “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p. 17). Qualitative practices and quantitative measures are woven together in a complementary way that aims to provide the researcher with a comprehensive view of a situation (Patton, 1990). The use of multiple approaches to answer a research question does not limit the research but rather expands it and allows it to be complementary and inclusive (Johnson and Onwuegbuzie). Mixed methods research builds upon the strengths of both quantitative and qualitative methods by allowing the researcher to see broad trends and changes through quantitative measures while providing the depth of understanding that comes with actual qualitative observations of and dialogue with those being studied (Creswell, 2008). Often consideration of both quantitative and qualitative data can lead to a deeper and richer understanding of the research problem than can be provided by either quantitative or qualitative data. Likewise more interesting questions for future research can be revealed when quantitative and qualitative methods work in complement with each other (Gall, Gall, and Borg, 2007).

This study employs a mixed methods research design as it seeks to determine if and how participation in a community mapping project influences students’ developing

environmental worldviews. As there is no research on the efficacy of community mapping projects in environmental education curriculum and instruction, it is important to reveal a broad picture of how community mapping projects can influence students' environmental worldview. This is done using a quantitative scale measuring children's environmental worldview. Qualitative data gathered from interviews, samples of student work, and observations adds support to quantitative data by providing deeper and more place-specific information about the students' experience at the park and their developing understanding of the park environment. Using mixed methods in a new area of research also helps to highlight further research questions to be examined through quantitative, qualitative, or mixed methods approaches.

Mixed methods research is grounded in the pragmatic worldview: a philosophy that “arises out of actions, situations, and consequences rather than antecedent conditions” (Creswell, 2009, p. 10). Instead of focusing on a specific method of data collection and analysis, the mixed methods researcher concentrates on the research question itself and applies a variety of methods to best discover its answers thus endorsing eclecticism and pluralism. Pragmatism acknowledges the presence and significance of the natural, physical, social, and psychological worlds that we inhabit and recognizes that knowledge is built and based on the interacting realities of those worlds. The historical separation between the subject and the object is replaced with a naturalistic and process-oriented interaction between the organism and the environment. Pragmatism further recognizes that organisms are always changing and adapting to new situations and environments. Similarly, truths, understandings, and knowledge are also tentative and dynamic (Johnson and Onwuegbuzie, 2004).

### *Concurrent Triangulation Mixed Methods Design*

This study employed a concurrent triangulation mixed methods design.

Triangulation helps the researcher to more fully realize the depth and complex nature of human behaviour and interaction and provides the researcher with confidence that data are not merely results of the employed means of gathering data. Often, though not always feasible in research projects, more methods used will allow for greater confidence in the analysis of data. Likewise, confidence can be further improved when very different methods of data collection supply the same result (Cohen, Manion, and Morrison, 2000). Triangulation strengthens the research as the strength of one form counteracts the weaknesses of the opposite form. Similarly, by having multiple points of check for validity, the research is less likely to be vulnerable to error due to the weaknesses of one method (Patton, 1990).

Rather than having an initial quantitative or qualitative phase followed by its complement as with sequential designs, a concurrent triangulation approach has the researcher collecting quantitative and qualitative data at the same time. The collected data is then analyzed and compared to reveal convergences, differences, or a combination of the two (Creswell, 2009). Equal weighting is given to quantitative (QUAN) and qualitative (QUAL) data (Creswell, 2008). This concurrent time order and equal emphasis was followed in this research project as similarities and differences in quantitative and qualitative data were sought. Concurrent triangulation (QUAN + QUAL) is visually represented in Figure 3.1.

Concurrent triangulation is useful as it is familiar to most researchers and can reveal data that are validated and substantiated. Its data collection period is much shorter

than for sequential triangulation design thus making this approach feasible for smaller-scale research projects. There remain however a number of challenges in using concurrent triangulation. Much effort and expertise are necessary to meaningfully examine a research question using two different, concurrent methods. It can also be problematic to compare different forms of data analyses and the researcher may be challenged to describe divergences in results (Creswell, 2009).

		Time Order Decision	
		Concurrent	Sequential
Paradigm Emphasis Decision	Equal Status	QUAL + QUAN	QUAL → QUAN QUAN → QUAL
	Dominant Status	QUAL + quan QUAN + qual	QUAL → quan qual → QUAN QUAN → qual quan → QUAL

*Note.* "qual" stands for qualitative, "quan" stands for quantitative, "+" stands for concurrent, "→" stands for sequential, capital letters denote high priority or weight, and lower case letters denote lower priority or weight.<sup>11</sup>

Figure 3.1. Mixed method design matrix (Johnson and Onwuegbuzie, 2004, p. 22).

### *Experimental Design*

This study used a quantitative *experimental design* together with a qualitative *ethnographic case study* to reveal if and how participation in a community mapping project influenced students' environmental worldview over the course of a school year. Experimental methods are used to study the effect of a treatment or intervention (independent variable) on an outcome (dependent variable) (Creswell, 2009). In this study, the treatment was participation in the mapping project and the outcomes were

students' developing environmental worldviews. Unlike most experimental designs, this study did not employ a control group. For this reason, it would be classified as a *quasi-experimental design*. This type of design has researchers considering a single group and providing a treatment or intervention to that group (Creswell, 2009); in this study, one class of students was studied. Within *quasi-experimental design*, this study followed a modified *one-group pre-test-post-test design*. Typically, the *one-group pre-test-post-test design* includes a pre-test followed by a treatment and a post-test (Creswell, 2009). This study however employed a pre-test, treatment, post-test, and follow-up post-test (Figure 3.2). This allowed for the lingering influences, if any, of the community mapping project to be illuminated and measured.

O1----- X----- O2----- O3

Group A

Where O is a measurement recorded on an instrument (NEP Scale)

X is an exposure of the group to an experimental variable (mapping project)

*Figure 3.2. Modified One-Group Pre-Test-Post-Test Design (Creswell, 2009).*

In order to more deeply understand any changes in students' environmental worldview that may be revealed in the experimental design, an ethnographic case study was also done.

#### *Ethnographic Case Study*

Ethnographic research seeks to articulate, analyze, and make meaning from the behaviours, beliefs, and language that develop over time within a culture-sharing group.

Here, “culture” is the central concern of the research and is identified as the collective rituals and structures that relate to human beliefs and actions (Creswell, 2008; Patton, 1990).

Educational ethnography evolved from cultural anthropology. Early anthropologists investigated “primitive cultures” detached from the “civilized” Western world by spending extended periods of time observing them. Despite long periods of observation, anthropologists did not “go native” or engage fully in the studied culture. By maintaining some distance, they believed that their work remained objective (Creswell, 2008).

Over time, the focal point of ethnography narrowed from the examination of entire cultures to the study of specific cases within a cultural group. Early educational anthropology defined those individual cases as students, groups within classes, entire classes, schools, and school districts as it examined the impact of educational decision making and changing curricular content. Now, anthropologists and educational anthropologists have specified means for focusing on cases, making observations, analyzing data and communicating research findings (Creswell, 2008).

Within ethnographic research, case studies investigate an individual, event, or activity, a specific case, within a cultural perspective. The case can be studied in a number of ways: “analytically or holistically, entirely by repeated measures or hermeneutically, organically or culturally, and by mixed methods” (Stake, 2000, p. 435). It might focus on a shared pattern of a group or might be an in-depth study of a particular case that does not identify any cultural themes.

*Identifying Myself in the Research*

Critical to ethnographic inquiry is researcher reflexivity—acknowledgement and discussion of the researcher’s role in the study. I bring to the study a background in elementary education and biology, strong views about environmental protection and sustainability, a concern for the development of pro-environmental values in students, a deep personal connection to Sandy Beach Provincial Park<sup>1</sup>, the site being mapped, and my own sense of wonder in the natural world.

As a teacher as well as a researcher, I not only observe the students as a source of data but I am also involved as an educator actively shaping and guiding students’ learning experiences. In my own teaching I include authentic learning experiences—experiences where students are learning from genuine artefacts and within real settings—in the curriculum whenever possible; these are similarly focal in the mapping project. Although I am not the students’ classroom teacher, I still held a role of power as I was an adult in the class and the students knew that I too was a teacher. This study challenged me to balance my role as a researcher with my instincts as a teacher.

My educational background in biological and environmental studies has helped to secure and deepen my environmental beliefs. I see myself as an equal member in nested environmental systems and recognize the resonant reactions in the environment to my own actions. For this reason, I try to make choices that will lessen my negative impact on other members of the environment.

Throughout my teaching career, I have held a deepening concern about my students’ apparent lack of connection to their local natural environments. I recognized

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<sup>1</sup>Pseudonyms are used throughout this thesis to identify the school, city, park, students, and sponsor teacher to protect the anonymity of research participants.

this strongly while teaching in London, UK, and then again upon my return to Canadian classrooms. I was troubled by this disconnect and lack of time that my students spent in natural spaces. I also worried how this could affect my students' developing environmental citizenship.

Sandy Beach Provincial Park holds many special memories for me. I spent many summers and school breaks on the beach and in the campground of the park. I have countless special memories from my time spent there, both as a child and now as an adult. I value the park as a place to relax and reflect and also reconnect myself to the natural world.

Bringing all of these to the research introduces bias into my study. As they get to know me, students will realize my own beliefs, concerns, and things that I value. This could influence their contributions to the research if students share what they believe I want to hear rather than what they personally think. In my data analysis, this bias will also be evident as themes that I identify will at least partially reflect my own interests and concerns.

To minimize the effect of my bias on the validity of my research, I shared my results and impressions of them with my project's sponsor teacher and with my thesis supervisor. This checking ensured that my interpretations were shared by others, both involved in the research and outside of the project. I also used students' comments verbatim from my interview transcripts in data analysis ensuring that the students' voice was taken in context and was truthfully represented.

### *Participants and Recruitment*

The students were recruited from Seaside Elementary School, a medium-sized elementary school of about 330 students in kindergarten through grade five. The school is located in Seaside, a small coastal British Columbian city with a population over 10,000 (Statistics Canada, 2006). The students are from a predominantly middle class population but the school does have an informal breakfast program for families needing support.

Geographically, the school is located near to coastal forests and ocean beaches. The beach is about two kilometres away from the school. The school faces an open grassy farm field and a small wooded lot. Both of these areas are fenced. Residential areas border the school yard on both sides. A nearby mountain range can be seen from some classroom windows. Deer are commonly seen in the farm field and black bears have been seen, albeit rarely, in the area.

All of the participating students were enrolled in Ms. C.'s grade four class. The class had 26 students: 15 girls and 11 boys. Overall, the class was of average ability.

On the first day of school, I took some time to distribute the consent forms to the students and read my letter to them aloud (see Appendix A). This allowed students with varying reading levels to access all of the information. The consent form supplied information about me and the study, what participation in the study would involve, how anonymity would be assured, and contact details for me, my thesis supervisor, and the Human Research Ethics Board at the University of Victoria. It also specified that if, at any time, the student did not wish to participate in the study, he or she had the right to withdraw at any point up until my thesis was submitted. After reading each paragraph of the letter, I paraphrased the main ideas and asked if the students had any questions. When

we finished going through the form, the students were able to sign the forms if they agreed to take part and all of the students put their forms facedown into one envelope. This ensured that their peers would not be able to see whether or not they had agreed to participate.

On the same day, the parents' consent form was sent home with the students' daily homework package (see Appendix B). Part of the students' assigned homework for that day was to talk about the project with their parents. The parents' form was similar in layout to the students' forms and communicated information about me, the project, what participation in the project would entail, and telephone and e-mail contact details for me, my thesis supervisor, and the Human Research Ethics Board at the University of Victoria. The letter also stated that, at any time up until my thesis was submitted, parents were free to withdraw consent for their child to take part in the study. I answered questions from some parents in person over the following few days when they dropped off and picked up their children from school. All of the parents' consent forms were returned within three days.

Two students did not have consent to participate in the data collection portion of the community mapping project. One student did not give her consent and another did not have parental consent to participate. Therefore, 24 students—13 girls and 11 boys—agreed to take part in the study's data collection.

### *Location*

This study centred on a mapping project of Sandy Beach Provincial Park, about five kilometres from Seaside Elementary School. I was interested in working on mapping

the park for a number of reasons. Sandy Beach Provincial Park is an ideal location for locally-based environmental education. It is home to many different ecosystems: forest, sandy beach, rocky beach, intertidal zone, grasslands, and wetlands. On field trips, students are able to easily observe these different environments, the transitions between them, and the flora and fauna that inhabit each. Access to the park from the school was relatively easy which made field trips simple to plan. Most importantly, Sandy Beach Provincial Park is a popular park with local residents. The students would likely have past experiences at Sandy Beach and would then be able to refer back to, and add to, their prior knowledge of the park.

#### *Working with Ms. C.*

Ms. C. is dedicated to providing her students with regular authentic learning opportunities that stretch beyond the four walls of the classroom. She is also committed to teaching an honest and rich environmental education curriculum. Like myself, Ms. C. holds a special place in her heart for Sandy Beach. She worked at the park as a naturalist for a few seasons and has a wealth of knowledge about the park, its habitats, and its history.

#### *Mapping with Grade Four Students*

Sobel (1998) stated that there exist three sensitive periods, much like those described by learning theorists and developmental psychologists, within which children are predisposed to bond with nature in specific ways. Between the ages of three and seven years, Sobel (1999) claims that, as children start to explore the natural world apart

from their homes, they feel empathy and a natural connection to other living things. At this stage in early childhood, children should be encouraged to move and act like those living things that they are drawn to. The second phase in bonding with nature occurs between ages seven and eleven. This stage involves active exploration of natural spaces: following trails, investigating rivers and ponds, building forts, and gardening. It is a period of discovery and personal construction of knowledge about the environment. Finally, from ages eleven to fourteen and older, adolescents enter a phase of social action. Here, with the foundation built in previous stages, adolescents can act on local environmental issues and realize their potential to create positive change in their communities and beyond (Sobel, 1999). I hoped for the mapping project and its place-based explorations to develop and strengthen connections that students had with the natural environment and therefore was keen to work with children within Sobel's second phase of bonding with nature. Ms. C. teaches grade four and five and for the year of my study, she was assigned with a grade four class. This age group fit well within Sobel's second stage of bonding with nature.

Leading a grade four class in this type of mapping activity was supported by learning outcomes across the British Columbia Ministry of Education's Integrated Resource Packages. We loosely focused our project planning using the provincial grade four science curriculum's life science outcomes, in particular those within the "Habitats and Communities" unit. These outcomes expected students to:

- compare the structures and behaviours of local animals and plants in different habitats and communities
- analyse simple food chains
- demonstrate an awareness of the Aboriginal concept of respect for the environment

- determine how personal choices and actions have environmental consequences (Ministry of Education, 2005, p. 87).

Given the cross-curricular nature of our study, we also drew from the grade four social studies, language arts, and fine arts learning outcomes. It was important to me that, while engaging students in cross-curricular environmental education, our mapping project also fulfilled Ms. C's legal responsibilities to teach the Ministry of Education's prescribed learning outcomes. Ms. C. and I both felt as well that it was important to honour First Nations knowledge and wisdom in our project, a key objective of the British Columbia curriculum and the *Environmental Learning and Experience* document (Ministry of Education, 2005, 2006, 2007). It was advantageous to work with this grade four class on the community mapping project as they had done basic mapping work in the third grade. Also, social studies in the third grade centres on the theme of "Communities: Past and Present" and therefore the students had a foundational knowledge of what a community is and what its components are (Ministry of Education, 2006). Our project would build upon this knowledge as we explored in depth one part of the local natural community.

#### *Overview of the Community Mapping Project*

The mapping project that Ms. C and I led focused on a number of aspects of Sandy Beach Provincial Park: 1) the local history of the park; 2) the natural history and ecosystems of the park; 3) First Nations connections to and uses of the park; and 4) personal connections to and special places at the park. It combined field trips to the park and visitors to the classroom with a variety of mapping activities.

We began our project by introducing the students to what mapping was, what maps could communicate, and what information might be included on maps. We

encouraged the students to use their senses to carefully make observations of the places that they experienced. After creating some maps of familiar places at school and home, the students then began to create maps of features at Sandy Beach Provincial Park that included photography, story telling, illustrations, poetry writing, and sculpture. These maps were thematically linked to our field trips to the park, focusing on the natural history of the park and the students' experiences and observations there.

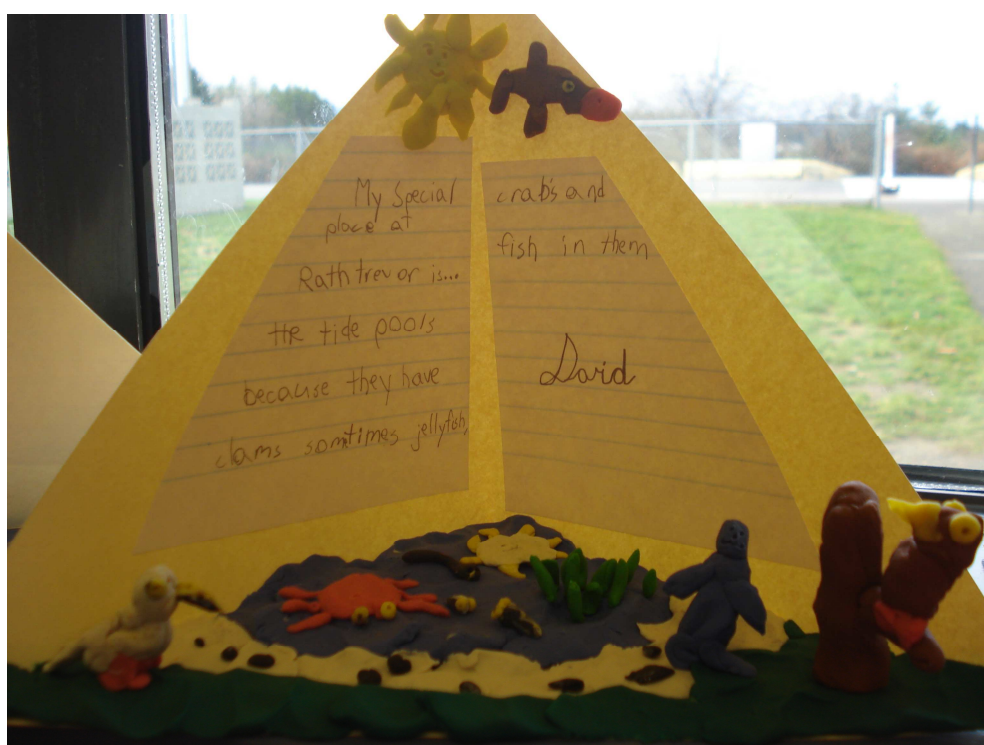


Figure 3.3. Special place sculpture.

Our major mapping activities were the construction of an emergent bulletin board map of Sandy Beach Provincial Park (Sobel, 1998), sculptures of special places (see Figure 3.3), and a class book that compiled the students' letters written to someone who has not been to the park. These letters were modelled after Sheryl McFarlane's book *Jessie's Island* (1992). As with most student-created works in the elementary classroom, the

book of letters was kept in the class' library after the end of the project. Similarly, a book of photographs taken during the course of the project was also kept in the classroom for students to look back upon and the bulletin board map was kept up in the hallway outside of the classroom.

### *The Importance of Multiple Visits to Sandy Beach*

We chose to take the students on three visits to the park: one in early September, a second in late September, and a final visit in early November. These timings allowed us to take advantage of the good weather in September and also to allow students to observe some of the seasonal changes occurring in the park. Our first visit at the beginning of September was an introduction to the park for the students. This enabled all students, even those who had never been to the park before, to have some previous experience at Sandy Beach before we began our deeper explorations of place. I was conscious of novelty effects on field trips and wanted to ensure that the students felt settled and aware of their surroundings before we ventured on more focused visits to the park. Past studies have shown that learning performance of students familiar with the field trip location is considerably higher than that of students that are not acquainted with the site (Anderson & Lucas, 1997; Falk et al., Balling & Falk, Martin et al., Falk & Balling, and Falk as cited in Orion & Hofstein, 1991). Therefore, our initial visit would likely alleviate some of the novelty of learning outside of the classroom and allow for the students to be more focused in their study. Our second and third visits to Sandy Beach were centred on flora, fauna, and habitats and special places respectively.

### *Digital Photography in the Mapping Project*

Both Ms. C and I were keen to use digital photography in our project. Having the students take digital photographs at the park would enable them to record their observations and collect samples without disrupting the natural ecosystems at Sandy Beach. It is also illegal to remove living or dead plants or animals from British Columbia's provincial parks. Noted by Berson (2004), using digital photography in curricular studies can motivate students as they enjoy working with images, particularly those that they have captured themselves. Having students take the photographs themselves would also give them a sense of ownership over the photos and a hand in our construction of knowledge. Digital photography encourages students to stop and closely observe their surroundings. Furthermore, having photographs of our experiences at the park would allow for easier recall of our time spent there and would provide a resource for future mapping and class activities.

### *Quantitative Data Collection*

#### *The New Ecological Paradigm Scale for Children*

I chose to use the adapted New Ecological Paradigm (NEP) Scale for Children (see Appendix C) to measure the students' environmental attitudes and beliefs (Manoli, Johnson, & Dunlap, 2007). I found the scale to be useful for a number of reasons. To begin with, I wanted to use a scale that had already been thoroughly tested and validated for use with this age group rather than create my own measure of assessing students' environmental worldview. This would eliminate the need for me to complete an

extensive and time-consuming testing and validation process of my own on the scale.

The NEP Scale is not specific to my study and therefore the results could, in theory, be compared to those from other studies. That said the number of participants does limit the application of my results to other situations.

Over the course of three years, Manoli, Johnson, and Dunlap modified the New Ecological Paradigm (NEP) Scale for adults (Dunlap, Van Liere, Mertig, & Jones, 2000) for use with upper elementary school students. During this time, Manoli, Johnson, and Dunlap reduced the number of items from the original NEP, modified vocabulary to better suit upper elementary students, and added a *Do Not Understand* option. The final NEP Scale for Children consists of ten items that encompass three factors (Rights of Nature, Eco-Crisis, and Human Exemptionalism), uses a five point Likert-type scoring system, and is suitable for use with children aged 10-12 years (Manoli, Johnson, & Dunlap). I modified the scale for use in my research by using *Not Sure* in place of *Do Not Understand*. This category includes those students that do not understand the statement as well as those who are not sure if they agree or disagree and to what extent. I also used *Really agree* and *Really disagree* instead of *Strongly agree* and *Strongly disagree* to further simplify the scale and conform more closely to elementary school students' language.

The NEP Scale for Children does not have an extensive list of items for students to work through. The scale uses ten items to gain an understanding of children's environmental worldview. Given that the students were only just starting grade four when I first visited them and administered the pretest NEP Scale, I thought that the length best suited their attention span, particularly during the first week of school.

Completing the scale was not tedious and students did not rush their responses simply to complete the scale.

The language used in the NEP Scale is suited to intermediate grade students. I thought that most students would be able to understand each of the statements without assistance from their teacher or another adult. Likewise, it is quite clear how to record responses to each item: students check the box that best corresponds with their opinion for each statement. In order to test my assumption, I gave the NEP Scale to a sample group of grade four students in the spring of 2007. All of these children found the scale clear and easy to understand and did not require my help to comprehend the statements.

I was drawn to the presence of the three factors measured within the NEP Scale: Rights of Nature, Eco-Crisis, and Human Exemptionalism. I appreciated how these factors could allow for a deeper, clarified picture to be withdrawn from student responses and predicted that these values could help to shape curricular directions for future environmental education activities and programs.

Finally, I appreciated the straightforward nature of the statistical analysis of student data collected by the scale. The scale's use of a basic Likert scale enabled the students' responses to be easily compiled using SPSS (Statistical Package for the Social Sciences).

Two environmental attitude scales for children that I considered but rejected were the Children's Environmental Attitude and Knowledge Scale (CHEAKS) and the Children's Attitude toward the Environment Scale (CATES) (Leeming, Dwyer, & Bracken, 1995; Mussler & Malkus, 1994). These scales were similarly designed for use with elementary students with CHEAKS claiming to be suitable for grades one to seven

and CATES directed toward students aged 8-12 years (about grades three to seven).

These scales were also divided into different domains and used Likert scoring, allowing for ease of scoring and interpretation. Similarities aside, I found many flaws with both CHEAKS and CATES.

Both CHEAKS and CATES are lengthy instruments. CHEAKS consists of two sub-scales: Attitude and Knowledge. The Attitude component has 36 items and the Knowledge sub-scale has a further 30 items for students to work through (Leeming, Dwyer, & Bracken, 1995). Likewise, though not quite as extensive, CATES includes 25 items that represent belief, affect or behaviour (Mussler & Malkus, 1994). I thought that scales of such size, particularly CHEAKS, would be much too large to expect a class of beginning grade four students to complete without becoming bored and failing to put much thought or effort into their responses.

I found the language in CHEAKS, and to a lesser degree CATES, to be too advanced for use with students in early fourth grade. For example, challenging vocabulary in the knowledge section of CHEAKS included 'aquifers', 'methane', 'silver nitrate', and 'perpetual' and 'extinct' were used in CATES (Leeming, Dwyer, & Bracken, 1995; Mussler & Malkus, 1994). I imagined that even upper intermediate students would have difficulty in defining some or all of these terms. The scale noted that the items could be read aloud to students, addressing differences in reading level across the group. This did not however factor in differences in students' reading comprehension levels. Teachers likely would be inclined to help students, quietly on an individual basis or aloud to the whole class, to understand the meaning of difficult words. This could lead to differing understanding of items and questions posed, in turn leading to responses that might not

represent the actual opinions and feelings of the students, hence the validity of the responses would be called into question.

The wording of the statements in both CHEAKS and CATES is similarly problematic. Many of the statements are leading and the “right” answer is quite evident. For example, one pair of statements from CATES is “Some kids think we should throw away things when we’re done with them but other kids think we should recycle things” (Mussler & Malkus, 1994). Here, students are asked to indicate which child they are a lot or a little like. The majority of students understand that recycling is important and could very well give the “right” answer rather than the honest one. Also, older students will be able to see what view the scale is considering and could quite easily answer accordingly.

Finally, some of the questions asked in the knowledge section of CHEAKS do not have a clear correct answer. One such multiple choice question is

Killing animals like wolves that eat others: A) is necessary and should be done; B) may increase the number of other animals; C) does not affect other animals in the area; D) may decrease the number of other animals; E) will help protect the environment (Leeming, Dwyer, and Bracken, 1995, Appendix, Knowledge, 23).

In this example, Leeming, Dwyer, and Bracken (1995) indicate that the correct answer is B where the increase is likely in the number of animals preyed upon by wolves. This does not consider increases in other animal populations resulting from the loss of wolves in the ecosystem.

### *Administering the NEP Scale*

The students completed the NEP Scale three times: a pre-test in early September before starting the mapping project, a post-test in early December right after completing

the mapping project, and a follow-up post-test in late March, three and a half months after completing the mapping project. The scales were completed by the students during class time. Before distributing the NEP Scales to the students, I assured them that their responses to the statements did not count toward their class assessment in any way. I instructed them to check the box after each statement that corresponded with their opinion: *really agree*, *agree*, *not sure*, *disagree*, or *really disagree*. I asked them to answer the questions honestly and reminded them that there were no “right” answers. In order to reduce the chance of influence from peers, I asked the students not to talk while we worked through the NEP Scale and to also turn their papers face down once they had completed each item. Students were asked to raise their hand if they had a question or were unsure of something.

In order to accommodate the varied reading levels of the students, I read aloud each statement to the class. Next, I read aloud each of the possible responses, waiting for each student to mark their response and turn over their paper before going on to the next statement. For the first few statements, there were some questions but as we carried on, the students understood what they had to do for each statement. Ms. C. circulated through the classroom answering individual students’ questions while I administered the scale. For the pre-test NEP Scale, those students who did not have consent to participate completed the scale but then I did not include their results in my data analysis. When we had completed all of the items on the scale, I collected all of the papers, face down, and put them into an envelope so that the students could not see the responses given by their peers. In all, the scale took between 10-20 minutes to administer with the longest amount of time taken for the scale written in September.

### *Qualitative Data Collection*

#### *Group Interviews*

Along with the NEP Scales, the 24 students who gave consent to participate in the study's data collection also took part in small group interviews. These were held during class time when the students were completing activities that could be left and returned to easily. I chose to interview the students in groups of three for a few reasons. Though the students grew to know me very well over the course of our community mapping project, I felt that most of the students would be much more comfortable in an interview situation that included their peers. Research has suggested that group interviews allow children to be more relaxed and behave as they normally would with their peers (Eder and Fingerson, 2002). I chose three students per group because I wanted to ensure that each student felt that they were an equal part in the process and that none of the students would be overshadowed by their peers. I have found in my classroom teaching that groups of three are ideal because each student maintains their voice but also does not feel pressured in discussions. Interviewing three students together also allowed me to reduce my transcription time to a more manageable level.

I chose to follow a semi-structured format in my interviews and prepared a list of seven questions (see Appendix D) that I used as an interview guide (Patton, 1990). I limited the number of set questions to ask so that I could keep my interview times to a manageable level and to also allow time for students to elaborate on ideas and guide the direction of the interviews. My planned questions were written to loosely align with concepts from the quantitative NEP Scale while highlighting the students' actual experiences and understanding of Sandy Beach Provincial Park. I tested the clarity of my

questions in written form with a sample group of grade four students in the spring of 2007. All of these children understood the questions and responded accordingly to them. Given that oral responses are usually easier for students, especially when language proficiency levels vary, I was confident that my questions would be clear and easy for the students to understand and answer. I did make some modifications and additions which led to my finalized list of questions as I added questions about park observations and that alluded to the students' feelings of sentimentism but the difficulty level of the questions remained consistent.

By using my questions as a guide, I was able to ensure that I gathered some specific information from the students while at the same time encouraging students' own unique ideas, experiences, and perspectives to be illuminated (Patton, 1990). I had the flexibility to question the students further on topics that arose in our discussions and elaborate on their specific ideas about and their connections to the park. Noted by Patton (1990), "when one is attempting to understand the holistic worldview of a group, it is not necessary to collect the same information from each person" (p. 286). By not using a highly structured interview, I assured that the tone was relaxed and that students felt comfortable in the interview situation and in sharing their ideas with me. Also, a semi-structured format allowed students' ideas to emerge without being bound by my own questions and agenda.

Each of the interviews was videotaped. This allowed me to participate fully in the conversations without having to disrupt the flow of discussions with note taking. Instead, I viewed each of the tapes afterward and transcribed the entire interviews. By doing this, I ensured that I did not miss any of the students' responses. Using video recordings rather

than simply audio recordings made my transcription much easier as I could quickly determine who was speaking. Also, a video record of the interviews could be used at a later date in the dissemination of my research in future presentations.

#### *Threats to the Validity of the Experimental Design and Counter Measures*

There are some threats to the internal validity of the researcher's ability to make inferences from results gathered using the *One Group Pre-Test-Post-Test* design. First, history can be a factor affecting the outcome of the experiment where events outside of the treatment may influence the outcome. In this study, I made note of classroom experiences occurring between the second and final NEP Scales that may have influenced the students' environmental worldview. Given that the research takes place over several months, maturation is another factor that could impact the validity of the outcome. Rates of maturation in fourth grade students vary considerably and therefore making comparisons *between* students is problematic. The use of a pre-test could also shape the results of the study as participants could remember their responses for later testing. The NEP scales were completed at three and four month intervals therefore it is unlikely that students would remember their response for each statement. Similarly, the NEP scale used a Likert-type system making it much more difficult to recall specific answers. Finally, changes in the instrument used in the research can bring the validity of results into question. This study used the same NEP scale for each of the three administrations.

There are also threats to external validity that must be considered when using the *One Group Pre-Test-Post-Test* design in research and applying findings to other groups.

As the characteristics of the participants and setting are specific, it is difficult to make generalizations based on experimental results. In this study, the participants and setting are narrowly defined: fourth grade students from one class taking part in a unique mapping project at a specific location. The results from this study are not expected to be applied to other groups but are meant to be used as a starting point for further related research projects.

#### *Reliability, Validity, and Generalizability in Ethnographic Case Studies*

It is important to consider and when possible maximize the reliability, validity, and generalizability of qualitative research. Reliability refers to the consistency of the approach across different researchers and projects. To ensure reliability, the researcher should review transcripts for obvious mistakes in transcription. The researcher must check that coding is consistent and does not shift. This is particularly important when coding of data is done by more than one researcher. In this study, transcripts were carefully reviewed during transcription as I replayed audio clips and compared them with my transcribed dialogue. I also read through the completed transcripts to check for accuracy and did this soon after the actual interviews. I did all of the transcription and coding myself so there were no differences in the codes used and I checked to be sure that my classifications fit the codes that I had set.

Qualitative validity involves examining the accuracy of the research findings from the views of the researcher, participant, and reader and is one of the strengths of qualitative research. Validity can be ensured by triangulating different sources of data, member checking to make certain that revealed themes are accurate, identifying the bias

brought to the study by the researcher, spending long periods of time in the field, and peer debriefing. This study draws data from a number of sources: interviews, observations, collected documents, and audio-visual materials, thus improving the validity of the interpretations made. The project took place over a three month period where I worked with the class at least once or twice per week. By spending this time with the students and in their school setting, I was better able to accurately interpret the data that I collected. Member checking is another way to confirm the validity of research findings. During my interviews with the students, I would rephrase their comments to check that I had understood what they meant. I also regularly shared my interpretations with Ms. C. in peer debriefings to check that they were fair and representative of the students. An external audit of my study was also completed by my thesis committee members as they met with me to discuss my results and read my research report.

Qualitative generalization refers to the ability of the research to be applied to other individuals or situations. This is often low in qualitative studies as such research seeks to describe themes and patterns within particular contexts and this is the case with this study. Only one class of students was studied and the conditions of the project were very specific and therefore the findings are of limited generalizability. Instead, the study sought to illuminate any changes in environmental worldview of a class of students and how these changes occurred. The following two chapters reveal how participation in the community mapping project did influence the grade four students' developing environmental worldviews.

## Chapter 4: The Immediate Influence of the Mapping Project on Students

### *Pre-Test NEP Scores*

Twenty-three students, 12 females and 11 males, completed the pre-test NEP Scale in September prior to the start of the community mapping project. One student was absent on the day the scale was administered and did not complete it.

The frequency distributions of students' responses to the pre-test NEP Scale are shown in Appendix E. For most of the items that were pro-environmental (1, 2, 4, 5, 8, and 10), students *really agreed* or *agreed* with the statement. An exception to this was in students' responses to item 2 (*There are too many (or almost too many) people on Earth*). Here, most students indicated that they were *not sure* and equal numbers stated that they *agreed* or *disagreed*.

Trends in student responses to the anti-environmental items (3, 6, 7, and 9) were not so clearly defined. For item 3 (*People are clever enough to keep from ruining the Earth*), students responded *really agree*, *agree*, and *not sure* in equal numbers and slightly more students stated that they *disagree* with the statement. There is a similar range of responses to item 6 (*Nature is strong enough to handle the bad effects of our modern lifestyle*) where students do not clearly agree or disagree with the statement and there were a number of *not sure* responses. Nearly half of the students *really disagree* with item 9 (*People will someday know enough about how nature works to be able to control it*) yet many were *not sure*. Almost all students *disagreed* or *really disagreed* with item 7 (*People are supposed to rule over nature*).

The students' mean pre-test factor and overall NEP Scale scores are shown in Appendix F. Given that the maximum possible score was 5.00 and the minimum possible

was 1.00, on average, the students scored highly on all factors. In particular, the Rights of Nature<sup>2</sup> score was very high. In fact, some students scored 5.00 out of a possible 5.00 on the factor. Even the minimum score obtained by a student was above half and therefore on the pro-environmental side of the scale.

Though not quite so high, the factor scores for Eco-Crisis<sup>3</sup> and Human Exemptionalism<sup>4</sup> were generally pro-environmental. However, in both of these scores, there was a wide range of scoring, from very close to 5.00 and displaying a very pro-environmental view to near 1.00 and anti-environmental.

The students' overall mean NEP score for September was high. The maximum mean score was 4.60 and the minimum was 2.70; both pro-environmental but to varying degrees. The range of scores for the students' NEP mean was narrower than for any of the individual factors (ie: Rights of Nature, Eco-Crisis, Human Exemptionalism).

#### *Students' Prior Pro-Environmental Views*

The students' pre-mapping project NEP scores suggested that the students already held pro-environmental worldviews. Particularly high was the students' mean score for the Rights of Nature factor—4.35 out of a maximum 5.00. When compared the pre-test scores obtained in Manoli, Johnson, and Dunlap's (2007) study validating the NEP Scale for Children, it appears that these high scores are not atypical (see Table 4.1). Bogner (1998) and Dimopoulos, Paraskevopoulos, and Pantis' (2008) studies also identified

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<sup>2</sup> The Rights of Nature factor reflects students' belief in nature's inherent value and its equal rights to flourish.

<sup>3</sup> The Eco-Crisis factor indicates students' beliefs in the likelihood of large environmental changes.

<sup>4</sup> The Human Exemptionalism factor reflects the idea that humans are set apart from other species as they are exempt from the constraints of nature. High scores for Human Exemptionalism suggest that students do not believe that humans are exempt from natural constraints.

students' high attitudinal scores prior to participation in environmental education programs.

*Table 4.1.* Comparison of Pre-Test Mean NEP Scores and Manoli et al's (2007) Pre-Test NEP Scores

Factor	Pre-Test		Manoli Pre-Test	
	Mean	SD	Mean	SD
Rights of Nature	4.35	0.84	4.22	0.70
Eco-Crisis	3.64	1.18	3.58	0.63
Human Exemptionalism	3.20	1.28	2.93	0.74
Total	3.72	1.11	3.58	0.47

Though not atypical, students' high pre-test scores did bring into question how much improvement in scores was reasonable to expect or was even possible to achieve. Similarly, given that worldviews take time to develop and evolve (Bogner, 1998), I questioned what the possibility of changing students' environmental beliefs and understandings was over a relatively short period of time.

#### *Post-Test NEP Scores*

The second NEP Scale for Children was administered in early December at the end of the community mapping project. Appendix G shows the frequency distributions of students' responses to each scale item.

The frequency of responses to the post-test NEP Scale was quite similar to those from the pre-test. For the pro-environmental factors (1, 2, 4, 5, 8, and 10), most students

*agreed* or *really agreed* with the statements. As with pre-test NEP Scale, many students—nearly half—were *not sure* whether they agreed or disagreed with item 2's statement about the number of people on Earth.

Students responded with mostly *disagree* and *really disagree* for three of the anti-environmental items (6, 7, and 9). Interestingly the students' responses for item 3 (*People are clever enough to keep from ruining the Earth*) did not fall primarily into agreement or disagreement. Instead, the responses were spread across each of the possible choices and did not show a clear pro-environmental or anti-environmental view. Ten students *agreed* or *really agreed* with the statement and ten students *disagreed* or *really disagreed* with the statement.

These differences in student responses could have been due to the students holding very opposite views of the statement. However, given their relative consistency of responses across other items, it seems that students could have been confused by the meaning of the statement: did they understand the statement to mean that people were clever enough to realize the need to change their unsustainable lifestyles or that people were clever enough to create new technology that would allow them to retain their lifestyles and not ruin the Earth? When compared to the pre-test responses, more students agreed with the statement, suggesting that some students had become more optimistic about people's role in environmental issues.

As with the pre-test, the students' scales were scored and their mean scores for the overall scale and the Rights of Nature, Eco-Crisis, and Human Exemptionalism factors were calculated. These scores are shown in Appendix H.

Like the pre-test's mean scores, the students' overall NEP and individual factor scores were quite high. The Rights of Nature factor was again particularly high. Out of twenty-three students who completed the scale, ten scored 5.00 out of a possible 5.00 on this factor. Also on this factor, the minimum student score was 4.00, a securely pro-environmental value. These scores collected for the Rights of Nature factor suggest students' acknowledgement of human's role in nature being equal to those of other living things.

Similarly high scores were seen in the Eco-Crisis and Human Exemptionalism factors. However, the minimum scores for both of these factors were considerably lower than the maximum scores and resulted in a wide range of scores in both factors.

The students' mean overall NEP score was high. The range of students' scores fell within the pro-environmental view but since the range was relatively wide, the degrees of pro-environmental view varied.

#### *Comparison of Pre-Test and Post-Test NEP Scores*

In the pre-test NEP Scale, the students ( $n = 23$ ) received an overall average  $M = 3.72$  out of a maximum of 5.0 with a  $SD = 1.11$ . Within the scale, students scored an average  $M = 4.35$  with a  $SD = 0.84$  on the Rights of Nature factor, an average  $M = 3.64$  with a  $SD = 1.18$  on the Eco-Crisis factor, and an average  $M = 3.20$  with a  $SD = 1.28$  on the Human Exemptionalism factor.

The same 23 students completed the post-test NEP Scale immediately after completing the community mapping project. They received an overall average  $M = 3.92$  out of a maximum of 5.0 with a  $SD = 1.03$ . The students scored an average  $M = 4.67$

with a  $SD = 0.84$  on the Rights of Nature factor, an average  $M = 3.85$  with a  $SD = 1.02$  on the Eco-Crisis factor, and an average  $M = 3.28$  with a  $SD = 1.09$  on the Human Exemptionalism factor.

Using SPSS, a repeated measures analysis of variance<sup>5</sup> was run on the 23 students' pre-test and post-test NEP scores to determine if there were significant changes in the total NEP scores and the three factor scores. At an alpha of 0.05, analysis determined that there were no statistically significant differences among the groups (see Appendix I).

Examination of the standard deviations calculated for each comparison reveals an increased consistency of scores. The standard deviation from the means for the overall NEP scale, the Rights of Nature factor, the Eco-Crisis factor, and the Human Exemptionalism factor all decreased from the pre-test to post-test results. This indicates that students' responses to each of the scale items became more consistent and that the mean values offered a more accurate representation of the students' views. This similarity is to be expected from participation in shared group activities.

The improvement of students' environmental worldview immediately after participating in the community mapping project is in contrast to those studies finding that environmental education programs did not influence students' attitudes toward the environment (Armstrong & Impara, 1991; Eagles & Demare, 1999; Haluza-Delay, 2001). Compared to these studies, this mapping project was long-term and therefore allowed more time for the activities and experiences to be internalized by the students and possibly influence their beliefs about the environment.

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<sup>5</sup> A repeated measures analysis of variance was run rather than repeated t-tests as repeated t-tests would inflate the type 1 error rate—the chance of finding something that in fact is not there (Howell, 2004). The ANOVA accounts for this.

The mapping project also centred on a natural space that was local and familiar to most students. For these reasons, students may have felt more ownership over the setting and experience than if an unknown and distant environment was studied. This ownership could have in turn resulted in the students' improved environmental worldviews. These feelings of stewardship were also evident in Barnett et al's (2006) study of students who participated in a locally situated urban field ecology program.

The considerable improvements in the Rights of Nature factor are consistent with the focus of the community mapping project itself. Ms. C. and I emphasized observing and recognizing the plants, animals, and ecosystems that are at Sandy Beach Provincial Park. We allowed the students to realize the interactions and complex relationships among the living and non-living things that live in and visit the park. We also encouraged the students to make connections to their own past experiences at the park and in other natural spaces and to extend and deepen their connections through our varied mapping activities. Therefore, the students' improved Rights of Nature scores indicate that pedagogy does make a difference in reaching environmental education's goals.

#### *Post-Mapping Interview Results*

The interview comments made by the students were grouped into four themes: 1) knowledge; 2) attitudes and feelings; 3) humans' actions and influence in the park; and 4) ownership and connection to place and experience. Knowledge, attitudes, and actions are three of the goals of scientific literacy (Ministry of Education, 2005) and are included in aims of environmental education (Hungerford & Volk, 1990). Many of the students' comments did not fit neatly into any of these three categories as they were statements and

remarks about the students' unique perceptions of and connections to the park and the mapping experience. Therefore these comments were grouped separately into *ownership and connection to place and experience*. Within this category are indicators of children's bonding to place and personalization of experience, a factor previously identified as predictive in the development of later pro-environmental behaviour (Chawla, 1999, 2003; Corcoran, 1999; Ewert, Place, & Sibthorp, 2005; Lane & Wilke, 1994; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Wells & Lekies, 2005).

### *Knowledge*

The students' developing knowledge of the park and their related comments were grouped into four categories: 1) biodiversity; 2) specific and advanced vocabulary; 3) adaptations and roles of plants and animals; and 4) change over time.

#### *Biodiversity*

The first question posed to students in the group interviews was related to the biodiversity of species and systems that exist at Sandy Beach Provincial Park. Students tended to list animal species when asked what plants and animals that they saw at the park. The most commonly referenced animals were squirrels (six out of eight interview groups), woodpeckers (four groups), ants and ant hills (three groups), jellyfish (three groups), and birds (three groups). Only three students said that they heard animals at the park: seagulls, tree frogs, and crickets. Overall, the groups noted 26 different types of animals that they saw or heard at the park.

The students recalled far fewer types of plants. Most of the plants noted by students were fruit-bearing; half of the groups interviewed remembered observing huckleberries. On the first and second visits to Sandy Beach, most students tasted blackberries and huckleberries; some sampled Oregon Grape. None of the groups mentioned seaweeds and algae as plants that they had observed although all of the students took part in tidal walks. The only tree recalled by students was the Western Red Cedar.

When asked about smells that they sensed at the park, students mentioned additional organisms and signs of life: huckleberries, fungus, deer feces, flowers, pine, dog feces, and seaweed. Six out of eight interview groups mentioned smelling the ocean, sea, or a *salty* smell. Several groups noted that the salt smell varied in strength depending on location. Charles<sup>6</sup> used gestures and different volumes to communicate how the concentration of the salty smell was different between the seaweed and the ocean:

SJ     You smelled the ocean, did the ocean and the seaweed smell the same or were they a bit different?

C     No

SJ     How were they different?

C     Like the ocean had the, hold on

X     Salty

C     WHOOSH! [gestures] and the seaweed just had that whoosh [gestures]

In the group interviews, students were asked what indicators of animals they saw at the park. The posed question gave the students examples of signs of animals: footprints, holes in trees, and feathers. Six groups reported seeing deer tracks on the

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<sup>6</sup> Pseudonyms were used to protect students' anonymity.

ground. When asked how they knew that the tracks were from deer, Quinn, William, and Lisa shared that

Q They look like a U

W Like horseshoes

L Like this [gestures with hand]

W Like horseshoes

SJ OK

L Well, like, just in a triangle form

SJ Uh huh

L With a little cut in the middle

SJ Sort of like a triangle with a

Q Like a pie with a little cut

Groups also recalled seeing footprints from dogs, raccoons, squirrels, crabs, and humans.

The students identified five different kinds of feather: seagull, woodpecker, eagle, crow, and owl. When questioned further, students tended to use a process of elimination to

identify what type of feathers they saw:

SJ What kind of bird feathers?

L Seagulls

SJ You thought they were seagulls, how did you know?

W Woodpecker

L Because um, uh, if they were eagles', um, eagle feathers would be much, much bigger and these were only about that big [gesture with hands] and crows' are about that big too

Finn used the features of an observed feather to determine what bird it came from:

F Uh, I think an eagle because it was uh, tip, it was white

SJ OK

F And on the bottom it was black

Some students also recognized eagles' and spiders' nests and woodpeckers' and rabbits' holes. Despite most groups telling the story of Ethan's wasp stings only one group—Ethan's own—mentioned wasp stings as a sign of animals.

Students were asked where they saw or heard plants and animals in the park. All eight groups noted seeing organisms in the forest. This is where students recalled seeing birds, deer, and squirrels. Half of the groups mentioned seeing plants or animals at the beach; most groups noted the beach as where they saw the jellyfish and crabs.

As students compared Sandy Beach Provincial Park to other parks and discussed why Sandy Beach was important to them, many groups noted the variety of natural areas at Sandy Beach. Students mentioned that Sandy Beach “has a bunch of nature there” and that there was “much more vegetation” at the park than in Seaside and in other parks.

Victor described how Sandy Beach was different from other parks:

V Cause it's rocks, beach, forest, and stuff like that

SJ So there are lots of different, different areas at [Sandy Beach]

V Yeah

SJ So you mentioned

V Different locations

Victor and Jack further shared characteristics of Sandy Beach compared to the rest of Seaside, noting the uniqueness of having forest within the park and that “it's kind of like a park, not like a normal park, it's like a forest park.”

The students' references to more animal than plant species could have been because they consciously interacted more with animals at the park: students stopped to watch squirrels run in trees, turned over rocks to find crabs, and photographed

woodpeckers. Of those plant species recalled, many were berries that students experienced by eating. These findings support the inclusion of interactive and multisensory activities in the environmental education curriculum.

Although they were asked about plants and animals that they saw or heard, only three students spoke of organisms they heard. This highlights the dominant use of sight in observation. It also suggests that curriculum should consistently encourage students to safely use all of their senses when making observations and recognize that sensory experiences help to create deeper understanding.

The students' detailed discussions of signs of animals indicate that they are actively making connections to their prior knowledge and experiences of natural history. They are also alluding to their familiarity with and understanding of common local species. If Weilbacher's (1993) assertion is correct and "individuals will only miss a species if they know it and have developed a relationship with it" (p. 7), the students' knowledge could lead to positive environmental actions.

#### *Specific and Advanced Vocabulary*

As the students discussed their experiences at Sandy Beach, many students referred to organisms by their specific names rather than in general terms. For example, both Jack and Xavier noted that they had seen *pileated woodpeckers* whereas other students referred to the species as *woodpeckers*. Likewise, Victor and Finn described more specifically than *tree* or *cedar* and used *Western Red Cedar* as they shared the plants that they saw in the park. Mark also recalled finding a *burrowing spider's nest*. Several students mentioned seeing a number of plants and animals around the *slough*. In

their discussions about animals, most students used *bee* and *wasp* interchangeably as though they were the same species.

During our visits to Sandy Beach, Ms. C. and I used specific names for plants, animals, and habitats in our discussions with the students. On a “Sound and Colour Walk” with Jack and Xavier’s group, we saw a pileated woodpecker and the group watched as Jack spent several minutes taking photographs of the bird. It is possible that Jack and Xavier’s recollection of seeing the pileated woodpecker and remembering its specific name is due to this experience. Here again the value of interacting with objects of study is shown as is the teacher’s active use of specific vocabulary.

Some students used taxonomic vocabulary that was beyond the average fourth grade level. Mark shared what he saw on one visit to the park:

M I remember I saw this chiton on the beach

SJ Did you?

M It was fossilized

Mrs. C. and I also encouraged students to use field guides during our field trips and back at the classroom to help them identify organisms that they observed at the park. In the classroom, Mark used a field guide to identify an unknown animal—a chiton. To do this, he had to remember details of the animal’s appearance and then compare these with the field guide descriptions and photographs of animals.

Mark’s statement that the chiton “was fossilized” and the interchangeable use of *bee* and *wasp* indicate that the students held some misconceptions about local species. These highlight again the importance of teachers modelling the use of correct terminology in their practice.

*Adaptations and Interactions of Plants and Animals*

In their discussion of plants and animals at the park, students described a number of physical and behavioural adaptations of plants and animals to their environment. Zoe and Bailey noted that there were different sized cones in the park and that these came from different kinds of trees. In separate groups, Alice and Rachel explained how seagulls would drop shells from great heights onto rocks below, breaking the shell so the seagull could feed on the meat inside. They also noted that the birds would dive down to grab the food and quickly fly away. Sienna recalled seeing an eagle's nest, "a big round thing with a hole in it," to which Tara added that eagles' nests are in tall trees as the birds "need to protect their nests and their babies so high is good."

Paige provided a detailed description of the difference between eagles' and owls' flight, reporting that she had learned about owls in the third grade.

- P     Yep, yeah, I saw a bald eagle and whenever bald eagles go, like flap, all you hear is "whoosh, whoosh, whoosh" [gestures with arms], not owls
- SJ    Yeah? So eagles, their wings make an awful lot of noise then do they?
- P     Yeah
- SJ    OK, but owls don't make so much noise?
- P     Yep
- SJ    Why do you think that is?
- P     Because they're, they have soft downy feathers to make them not fly that, I think they can fly soft
- M     I think that owls just glide
- P     No
- M     Well they just like, that's what it looks like
- P     No

M Just gliding around

P No, they flap their wings and when they try to get their prey, they swoop down and their prey can't even hear

The students recognized that the plants and animals they saw did not live in all areas of the park. Alice noted that ferns were growing deep in the forest and not in open, grassy areas. She shared that she thought this was because they need a bit more shade and that the ferns could grow faster in the forest.

Many students described unique relationships between organisms living in the park and identified that different species help to support the lives and health of other species. Norah noted a seemingly reciprocal relationship where spiders had moved into a hole made by a woodpecker and built a nest. The spiders had a place for their nest but Norah pointed out that this would also be good for the woodpecker as it would be able to feed on the spiders. As Jack and Xavier worked on the emergent bulletin board map of the park with me, Xavier talked about the *sticky ball bush* in one of the photographs. Jack noted that the bush was sticky because it allows the bush's seeds to be spread widely as they are carried by things that brush up against them. In the same conversation, Xavier also mentioned that he found a mushroom that smelled of trash. Jack thought that this might be to scare off animals or to attract pollinators like bees.

As they discussed whether or not plants heal themselves after being damaged, Oliver and Bailey described how fallen trees can become nurse logs and home for other organisms.

SJ What else happens to those trees when they fall down, what happens to the trees?

O I know

SJ OK

O They become nursing logs

SJ They become nursing logs

O For other plants

SJ What does that mean?

B Oh, um

O Means, it sometimes decomposes into soil and other times it stays there and you probably see plants growing out of it

SJ OK

O Maybe another tree

SJ OK, that's pretty cool

B Um, it can be a home for another animal

One group noted that an animal's movements and resulting tracks can change depending on how the animal is feeling and what the animal is doing. Rachel, Sienna, and Tara talked about raccoon tracks that they had seen in the park and used gestures and sound effects to describe how a particular print might have been made. They also noted that "depending on what [the animal] is doing, their foot would print different."

The students' discussions reveal a developing understanding of the intricate connections between living things and how they interact within their environments. Their observations and conclusions are also specific to Sandy Beach, indicating that their experiences during the mapping project helped to further their environmental understandings. This is an important finding as it suggests that community mapping projects can support the development of environmental awareness and sensitivity in students, a precursor to responsible environmental citizenship (Hungerford & Volk, 1990).

*Change Over Time*

In the group interviews, students shared their observations of the changes occurring at Sandy Beach Provincial Park over the course of our mapping project. Many students commented on how the number of wasps changed over time. Ethan, who had been stung on the first visit to the park, and Charles discussed the apparent decrease in the wasp population and connected that to the change in season from summer to autumn to near winter.

SJ Now, Ethan, you mentioned that it might have had something to do with the seasons, so you said that there were a lot of wasps

C Exactly, that's part of mine, like it might be getting close to winter so they have to go get food

E But they wouldn't start hibernating even close, that close to the third time we went with the, it might

C No it would just be going to get food

Ethan and Charles reasoned that the wasps were going to be hibernating in winter and were gathering food for that. Ethan also suspected that some of the wasps had perished. Alice similarly commented on the varied numbers of wasps and bees and speculated that the number of wasps and bees would be higher in the spring and summer because of flowers blooming in the park. She and her group members all stated that wasps and bees were not in the park in the wintertime. Ian and Norah shared that wasps would not be in Alberta or Saskatchewan in November because "it gets really, really snowy" and "[wasps] hate snow."

Charles recalled a recent visit to the park outside of our field trips when he noticed that "it was much colder, [there was] less water, less seaweed, less people" and where there was once a nest of squirrels there was nothing. Charles commented that he thought that this was because "people had just taken over" or possibly due to the squirrel

parents abandoning their young. He also mentioned that he was bored at the park then because there were not as many things there compared to visits earlier in the autumn and late summer.

As she described her favourite place at the park—the logs at the beach—Gemma noted that the logs were not always in the same place and that their placement changes. She attributed this to the movement of the ocean water, stating that “sometimes the water, the water comes up and it, they float on top of the water and [the water] shifts them.”

The students’ discussions of changes that they observed over the course of the mapping project indicate that their experiences at Sandy Beach contributed to their evolving understanding of the local environment and its components. When those observations were combined with their prior knowledge of natural systems, some students developed their own theories about why changes occurred. In instruction, personal theories could be shared with classmates and contribute to students’ collective construction of knowledge of natural systems. By discussing students’ own theories, any misconceptions can be illuminated and cleared.

The contribution of authentic observations in natural spaces to students’ knowledge supports the use of experiential learning opportunities in the curriculum, particularly in environmental education. Also, programs that include long-term observations of natural systems allow for changes to be realized. These longer programs have imparted a greater change in students’ environmental knowledge, attitudes, and behaviour than short-term experiences (Bogner, 1998; Dettman-Easler & Pease, 1999; Lindemann-Matthies, 2002; Stern, Powell, & Ardoin, 2008).

### *Attitude and Feelings*

Probably the most enlightening and touching of the students' comments were those that expressed their attitudes about the park and the feelings they experienced when at the park. Within this grouping, the students' expressions were classified into four themes relating to the students' feelings at and about the park and how they defined the park: 1) anthropocentrism versus concern for other living things; 2) *free*; 3) the park as a place of refuge; and 4) *home*.

#### *Anthropocentrism versus Concern for Other Living Things*

Many of the students shared comments that placed humans and their needs and wants above those of other living things. Victor spoke about how he did not like the trails in the park but rather preferred to make trails of his own by whacking bushes out of his way. Ethan shared his concerns about plant growth spreading onto trails and through the forest and how this would not be ideal for people.

E     Because we don't want to spread more plants, or it will just consume the forest, then when people go there, there's not enough room to go there, and really if it's balanced like it is um, when there is a bit of trail

SJ    Yeah

E     So that people can walk on it, it's OK, but when there's no trail or no plants, it's not OK

Ethan's idea of balance involved the interests of people (ie: having a trail) and a controlled population of plants.

As she shared a story about a walk with her mother, Rachel made an interesting comment that highlighted the placement of people above other members of the

environment. Rachel had discussed how on walks her mother often picked up litter and was doing so on this occasion.

R We saw a glass on the road so then she said "Pick it up" and I was like "OK" and I was like tons, it was like right by the highway so it was like "No" so then she went and picked it up and then she threw it in the bush

SJ Yeah

S Why in the bush?

R Cause then nobody'd step on it

S Well good thing for humans. What about birds? There could be a bird that lives in that bush

Rachel understood that it was important for the glass to be off of the road so that people would not step on it. On the other hand, Sienna considered what could have been influenced by the piece of glass being thrown in the bush: birds.

In the post-mapping interviews, many students' comments reflected strongly anthropocentric and egocentric views. Students' own interests tended to override those of other living things. Given the still dominant anthropocentric views of society, it is not surprising that students would feel this way. The students' revealed egocentrism and anthropocentrism brings clarity to the depth of their understanding of the interconnectedness of natural systems and of their own place within them. Their previous observations and conclusions about the relationships between living and non-living things do not appear to extend to include humans. Students' comments here are critical because they conflict with their responses on the NEP Scale that identified a strongly pro-environmental view of the Rights of Nature. It is possible that the students understood theoretically how they should view the rights of other living things but in practice they do not consistently display this equality in their actions or language.

*Free*

Three girls in the class, Sienna, Tara, and Zoe, were particularly drawn to the amphitheatre in the park. They each chose it as their special place in the park and on our special places field trip, their groups took many photographs at the amphitheatre (Figure 4.1).



*Figure 4.1.* Students at the amphitheatre.

In their group interview, Sienna and Tara shared that they felt *free* at the amphitheatre.

T I really like the amphitheatre

S Same here

SJ You like the amphitheatre?

S Cause I feel like just free

T Yeah, you feel like you can do anything

On their special place dioramas, Sienna and Zoe similarly stated that they liked the amphitheatre because they “feel free there” and “you can act out and feel free.” On her diorama, Tara noted that she had acted in a skit at the amphitheatre.

It is important to note that Sienna and Tara are best friends and sit next to each other in class. For this reason, they influence each other in a number of ways and have many shared interests. This was evident in their interview as they frequently agreed with each other. That said, feeling *free* in natural spaces was similarly noted by Haluza-Delay (2001). He found that urban teenage participants felt a sense of freedom while on a 12-day wilderness program. It is encouraging that students who spent time at Sandy Beach, a local and familiar natural space, also felt *free* as it suggests that those feelings are not limited to wilderness settings set apart from students’ own natural communities.

#### *The Park as a Place of Refuge*

In their interviews, many students commented on how relaxing Sandy Beach was. Jack and Mark noted that the park was “really quiet,” “peaceful,” and “more relaxing” because “there’s like no cars... going by” and there was not a highway nearby as is the case with many other parks. Ian also stated that Sandy Beach was a peaceful place to spend time. Mark further commented that “it’s always fun to go relax on the beach and stuff and play around.”

Some of the students stated plainly and poignantly that Sandy Beach was a place where one could escape from life’s stresses and worries and noted the importance of having places to do this.

SJ So it’s kind of like a place where you can get away from

C Yeah, you can get away from

SJ Stresses and things that you have to worry about

C Yeah

E And civilization

X You can just go sit on the beach and relax

C Just go on and sit by a tree, close your eyes

SJ Yeah?

C Listen

SJ So is it important to have parks like that?

All Yes

C Very

Along with being a relaxing place, many students commented on their own feelings of safety and security at Sandy Beach Provincial Park and in particular locations at the park. Paige discussed how the beach was a safe place to be because it is very open and therefore “your parents can find you on the beach.” Charles also noted that he felt much safer at the beach in Sandy Beach Park than in other parks. Charles, Ethan, and Xavier commented that Sandy Beach did not have the illegal activities that were common in cities and towns and was therefore a safer place to be.

C It feels much safer like there’s not as much legal things going on, illegal things

X There’s nothing illegal that’s down there

C I know, there’s no killing people, there’s no murdering

E And that can happen practically in town, cities

X Anywhere

Ethan shared that he felt that the *dinosaur tree*<sup>7</sup> was like his “guardian” and similar to a character in *Lord of the Rings*. He and his group members, Charles and Xavier, discussed more deeply the connection that they felt with trees and Ethan suggested that this feeling may have stuck with people from when they relied more heavily on trees for their livelihood.

E It’s kind of like you know trees make you feel a little bit more safe

SJ You feel safe with the trees, why do you think it is that trees make us feel safe?

E Because it might be old instincts because back when we didn’t have metal, we didn’t have that [points at camera], we didn’t have this [point to work surface behind]

C We didn’t have roads

E We didn’t have this [points to work surface beside]

C Well, kind of yes we did, we had tables

E Um, we, we all used wood for most things and we didn’t use all of it like we do now and I guess we just feel safe there because it’s almost like the trees have helped us so much

SJ Mmm hmm

Students also noted that the park was a safe place for plants and animals to be. Gemma commented that the park’s lack of roads made it safer for plants and animals. She stated that this was why many plants and animals lived at Sandy Beach.

Despite these general feelings of safety and security, one student discussed how too many people made the playground less safe. Paige said that she did not like the playground because it was too crowded with people and that this made it more likely for some people to get hurt.

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<sup>7</sup> Students created their own names for many features of the park.

The students' comments clearly identify Sandy Beach as a positive place to spend time. Students' feelings that they could escape from civilization and relax while at the park parallel Kaplan and Kaplan's (1989) research into restorative environments. Natural spaces can allow people to be away from everyday pressures and reduce feelings of stress (Kaplan & Kaplan, 1989). Past studies have also suggested the restorative benefits of time spent in natural settings (Hartig, Mang, and Evans, 1991; Kaplan, 2001; Ulrich et al, 1991; Wells and Evans, 2003). For students, this positive relationship with the park could be a key experience in nature that leads to pro-environmental decisions and actions when they are adults (Chawla, 1999, 2003; Corcoran, 1999; Ewert, Place, & Sibthorp, 2005; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Wells & Lekies, 2006).

Several students shared that they felt that Sandy Beach was somewhat of an environmental benchmark against which other areas could be measured. Norah commented that the park was a good place to go "to get the idea of what the world should be like." Charles, Ethan, and Xavier shared this idea as they discussed what Sandy Beach was like.

E Kind of more like, almost like, you know when you look at the Earth, it's supposed to be green and blue?

C Yeah

X That's probably what it is

E Well, that's probably one of the only places in [Seaside] that is green

C, X And blue

Charles went further to state that Sandy Beach was "more like what you think of land."

Similarly, Xavier noted that Sandy Beach was "a real place."

These comments highlight the students' idea of what the world should be like—Sandy Beach. Their perceptions are interesting because Sandy Beach is a park in which the presence of humans is obvious and their role in shaping the immediate environment is clear. It is possible that the students' affection for the park leads them to set it as a benchmark for other environments. Sandy Beach could also be the most pristine natural setting that many of the students have experienced. Seeing the park as “a real place” could encourage students to recognize and respect it and other natural settings with mindful decisions and actions. Having experienced “what the world should be like” could also illuminate the dramatic changes made by humans to other environments.

### *Home*

Along with Sandy Beach Provincial Park being safe and relaxing, Charles stated that the park felt like home. In fact, he mentioned the park feeling like home four times in his group interview. He commented that settlers who came to Seaside might have compared Seaside to Sandy Beach and concluded that Sandy Beach was “more like home.” Both Charles and Ethan mentioned in their group interview that being at Sandy Beach gave them good thoughts and also brought back memories.

Given the amount of time he has spent at Sandy Beach and his related memories, it is not surprising that Charles identifies the park as home, a place that is cherished. These feelings of home could be retained and, as claimed by significant life experiences researchers, may lead into later pro-environmental attitudes and actions (Chawla, 1999, 2003; Corcoran, 1999; Ewert, Place, & Sibthorp, 2005; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Wells & Lekies, 2006).

### *Humans' Actions and Influence in the Park*

In their group interviews, students shared some of their perceived impacts of humans and their actions on the environment, particularly at Sandy Beach Provincial Park. Their ideas and concerns were grouped into categories: 1) pollution; 2) population and space; 3) development versus “natural” spaces; 4) species and habitat disturbance and destruction; and 5) effects beyond the park. These categories mirror those that dominate environmental discourse and concern.

#### *Pollution*

When discussing the effects of human activity in the park, many students described pollution at the park. Several students noted litter but tended to see its ill effects on humans rather than on other living and non-living members of the biological community. For example, Tara mentioned that people could drop bottles and then other people might step on the broken glass. Tara noted as well that this broken glass could eventually become beach glass, a perceived positive effect of littering.

Some students did not like areas of the park because of the pollution. One place at the park that Bailey did not like was the parking lot. She stated that this was because “there’s too many cars” and “they are polluting the air.” Interestingly, students noted that it was the gasoline from cars that caused air pollution. Zoe said that much of the pollution at the community park was due to “tons and tons of gas from cars going by.”

Pollution from cars was discussed by other students as well. Comparing Sandy Beach with other parks, Zoe, Bailey, and Oliver shared that air pollution was not as bad at Sandy Beach as it was at the community park. They said that this was because there

were fewer cars at Sandy Beach. An exception to this was during the summer. Oliver noted that the summer had the most camping and Zoe stated that the pollution was “because of gas from cars.”

The students also expressed that smoking and cigarettes had a detrimental effect on life in the park. Charles said that smoking in the park could “kill the plants.” Rachel recalled a time when she saw an animal perish after eating a cigarette, claiming that “it kind of died because of the chemicals.” Norah was not only bothered by smoking in the park but also with cigarettes being put out on the ground and discarded, saying that this really bugged her.

Some students were concerned about campfires and how they might harm animals. Sienna commented that campfire smoke “could get in [an] animal’s eyes.” Tara shared that smoke from burning plastic was potentially harmful to animals.

T If you burn plastic the animal could breathe it in and maybe like get really sick

R But you don’t burn plastic

T I know, ha ha

S But if you did

Zoe noted that noise pollution might be an issue for the animals at the park. She shared that differences in hearing range and the loud noises created by humans could negatively affect some animals.

SJ Can you think of any other effects that people using the park might have on the plants and animals

Z Yells

B Yells

SJ Sorry?

- Z Yelling, ha ha
- SJ So the sound of people there
- Z Yeah
- SJ OK, yeah, now how would that affect the plants and animals that live there?
- Z Um,
- SJ How would, how would noises like that affect those things that live in the park? What do you think?
- Z The, um, animal, cause they could have a high hearing, like
- SJ Right, right, the animals that are there, you say they could have
- Z Like high hearing so then like it'd be like scream then it might be a little too loud for them

Bailey added that screaming and other loud noises in the park could cause some birds to fall out of trees.

Littering, smoke, and gas from cars were the main sources of pollution noted by the students. As they described how pollution would affect the plants and animals, most students did not give detailed explanations of *how* they would be affected, only that they would be. This implies that students recognize that pollution is not a good thing but that they are not clear on why or how it actually damages organisms and ecosystems. This is not uncommon in students—knowing *knowledge what* but not *knowledge why* or *how*. Also, elementary school students are regularly told that littering and smoking are bad so it is not surprising that they likely transferred these ideas to their discussions about Sandy Beach.

The students' comments again reflect a largely anthropocentric view as they discussed how pollution had a negative effect on people—stepping on broken glass, disliking certain areas of the park, and being irritated by the discarded cigarette butts on

the ground. Students did however allude to their concern for animals' well being; these concerns were connected to pollution issues at Sandy Beach. This suggests that participating in the mapping project could have stimulated the students' thinking about how human actions can influence environmental quality and increased their awareness of negative environmental impacts.

### *Population and Space*

As previously noted, students recognized that the park was much busier and more crowded in the summer season. That said, when compared to other parks, some of the students commented that despite having so many people there, Sandy Beach did not feel overly crowded. Gemma related this to the size of the park, stating that "it's quite bigger [sic] than all the other parks so even though there's tons of people in it you barely see any of them because there, it's so spread out." Oliver also commented on the amount of space at Sandy Beach and said that this made it a good place for camping. He identified how the campsites were separate, noting that ample space between the sites was important. In discussing the small size of the playground compared to the playgrounds of other parks, Lisa said that it was probably planned this way. Quinn stated that a larger playground would "take up too much room."

Here again, students' comments indicate an anthropocentric view as ample and uncrowded spaces are seen as beneficial to people and their activities. None of the students said that fewer people at the park would be preferable for other living things there.

*Development versus Natural Spaces*

As they compared Sandy Beach with other parks, students communicated that many other parks were much more developed with buildings and conveniences. Ian recalled that at Sandy Beach “there’s no electronics there, just wildlife and nature.” Whereas Sandy Beach has a beach and forest, Ian, Gemma, and Norah commented that the community park had an ice cream stand, toys, stores, a water park, and a concession stand. Further development of the community park was also highlighted. Bailey noted that the community park was “a little beach but it’s getting like worked on by big machines.” Oliver shared that if there was development going on at Sandy Beach, trees would likely be cut down and this would in turn “cut down our air supply.” As noted earlier, the students also acknowledged the presence of cars in and roads through many other parks. Charles stated that without many roads, Sandy Beach was “not as taken over.”

Participants in Haluza-Delay’s (2001) study described nature as being undisturbed and free of people and development. Aside from the cars, students’ comments here and their earlier claims of Sandy Beach being an ideal suggest that they identify Sandy Beach as nature. Charles said that it was “not as taken over”, suggesting that development can be intrusive and undesirable. His statement suggests that he places value on the natural features of the park.

Norah spent some time discussing the prevalence of “high tech machines” and electronics and her concerns about such machines ruling the world. She shared that she had seen a television program that communicated that some people wished for the world

to have only a model of nature rather than nature itself and saw this as fine. When asked if she agreed, Norah said that she did not.

Norah's comments highlight a major influence on children's environmental attitudes—television. Eagles and Demare (1999) stated that both print and film media are very influential on young people's developing environmental ideas and attitudes. They found that sixth grade students who had viewed environmental television and films held significantly higher ecologicistic and moralistic environmental attitudes than students who had not viewed environmental television and films. These findings support and encourage environmental educators' use of media that is accurate, honest, and does not promote fear and feelings of helplessness in students (Sobel, 1999).

#### *Species and Habitat Disturbance and Destruction*

In discussing how humans' actions in the park influence other members of the Sandy Beach community, students shared the negative effects of humans in the park. Quinn noted that campers cutting down trees could actually be destroying animals' homes. Similarly, Oliver expressed concern that when walking or bush whacking, people might step on and squish small animals.

Lisa, Quinn, and William's group talked about touching sea anemones: how they seem to suck your fingers, how it feels weird and tickly, and how "it feels like it has a blender in there." After being asked if touching anemones hurt the animals, Lisa and Quinn quickly replied that it was not harmful. William shared that people could in fact harm anemones by touching them

W Cause you can put very bad germs in it

SJ OK

W Like sometimes like if you have like very different stuff from other places that's not from the ocean sometimes it can get like

L OK dude, where'd you learn this stuff?

W I just read stuff

SJ Yeah, well it's like, it's like not washing your hands, I mean that's how we get sick when we've got germs all over us

W They can get like some sort of cancer and they could easily die

William's comments reveal another major influence on students' environmental attitudes found in Eagles and Demare's (1999) study—books. They found that, along with watching television and films, reading environmental books was correlated with ecologicistic and moralistic attitudes toward the environment (Eagles & Demare, 1999). As with television and film, it is crucial to select environmental books that are honest and take a pro-active stance.

The students also shared how plants were negatively affected by humans in the park. Many students claimed that when branches and trees were damaged it took a long time for them to recover if they recovered at all. Oliver, Gemma, and Paige stated that damaged plants cannot fix themselves. Zoe added that plants would have to start over and re-grow. Mark also pointed out that damaged plants would have to re-grow and that this process would take a long time. He went further to discuss plants that had been stepped on or squished. Mark shared that these plants might survive but that they were “not going to just pop back up.” He restated the time that it would take for re-growth, partly due to the fact that a plant that had been stepped on would not be growing straight up. Gemma added that a plant that had been stepped on would bend over but “it won't die that

second, it will kind of just have trouble growing.” She also noted that some plants would “grow back but other plants don’t.”

Jack said that plants that were not too badly damaged could heal themselves. He went further to say that some damage might help strengthen plants.

J Like with trees, if you cut off the little branches

SJ Yeah

J It’s fine and then the tree keeps on like growing the trunk and getting big branches stronger

The students’ discussions of damaged plants and their repair did not include human interventions. Instead, students presented only ways that humans can cause damage and none of the actions that could be taken to repair or mitigate the damage. This omission relieves humans of responsibility for their actions.

### *Effects Beyond the Park*

Two students shared very bold statements about the role of humans in the environment and in creating global environmental issues. After Ian commented that “animals have [the same] right to live as people” and I asked what the students thought of that, Norah and Ian discussed global warming. Norah was firm in her statements as she shared that without humans we would not be facing the crises that we now are. She and Ian predicted that global warming would kill all humans or that the world would “just be a big garbage dump.” Ian claimed that “the world will recover in a thousand years no matter what we did but we would die from global warming” and humans would be extinct. To this, Norah stated that she thought this was alright.

N I really think that the world would be better without humans

Norah also expressed her frustration with people who put human interests before those of other beings. When asked if she thought that people could change their actions enough to avoid a deeper global crisis, Norah indicated that people needed to change the way they thought about things.

N Well, it depends on, um, like what you, what other people think about it, that's pretty much what I think it's all about, it's because some people think that humans deserve to live more than the entire, um, the entire place where we actually were made

SJ Mmm hmm

N Like monkeys

SJ So you, we might need to go ahead and change the way we think about things first

N Yes

Norah further shared her anger about humans causing the extinction of species and stated that human activity could lead to mass extinction of all species.

N Well, sometimes I get so angry that people just don't care. What I really don't like is people are like, making sharks extinct and they have been around for 40 million years and if they kill one thing, eventually we'll all go "Poof"

Since Norah and Ian's comments about global warming were volunteered and not directly asked about, they suggest that students are making connections between those topics highlighted during the mapping project and global environmental issues. The mapping project could have stimulated broader thinking and questioning about environmental topics and in turn increased environmental awareness. As noted earlier in this chapter, improved environmental awareness can contribute to the development of responsible environmental citizenship (Hungerford & Volk, 1990).

The fact that Norah and Ian are expressing these emotions at a relatively young age brings into question the approach that teachers and our broader culture follows with environmental issues. Too often students are presented with doom and gloom stories of environmental destruction and crisis (Sobel, 1999). These images of environmental crises can cause students to feel helpless, hopeless, disempowered, and unable and uninspired to make positive changes. It seems that Norah and Ian's comments about the impending human extinction and it being a positive thing could stem from such doom and gloom stories.

Instead, environmental education needs to focus on presenting the positive changes and roles that people can play in the environment. Students need to understand the importance of their efforts to live sustainably and they should actively participate in local efforts where they can see the difference that their actions make (Sobel, 1999).

#### *Ownership and Connection to Place and Experience*

Students showed their connections to the park in a variety of ways. These were grouped into three categories: 1) shared stories and existing connections; 2) created names; and 3) special and favourite places.

#### *Shared Stories and Existing Connections*

In their interviews and discussions, most students shared stories of their past experiences at Sandy Beach Provincial Park. Many students talked about how they often went to Sandy Beach with their friends and families for walks and to go to the beach. Lisa stated that her favourite place at the park was the beach because on a third grade trip

to the park, she found a sea anemone there. Jack shared that he camped at the park a long time ago with his family and this was why the park was a special place for him. He also recalled an experience of a very long day of hiking where he was extremely hungry and found some huckleberries to eat; his favourite place at the park was now a large patch of huckleberry bushes. Charles shared that he and his family did the Terry Fox Run at the park. Charles also noted that his family had many connections to Sandy Beach: his parents were married at a church nearby and his grandmother lived very near to the park. Alice even retold her mother's story of camping at the park when she was in the seventh grade.

Students also made and expressed connections between the Seaside Museum manager's visit to the classroom and places they had visited at the park. When discussing signs of animals that they observed at the park, Charles and Xavier shared a vivid description of the accident that claimed the life of Mrs. Barry's<sup>8</sup> second husband, a story first told to the class by the museum manager. Zoe questioned whether an earring that she found on the beach may have once belonged to Mrs. Barry. Some students also discussed First Nations uses of the park, a topic that they learned about with Mrs. E., the school's First Nations resource person, noting that this history made the park very special to them.

The students also shared stories of their memorable experiences during our three visits to Sandy Beach. Sienna and Tara talked about how they walked along the beach counting all of the jellyfish that they saw—48 altogether along one stretch of rocky shoreline. Ethan and Xavier shared their unfortunate story of being stung by wasps in the “attack zone” near the big field and parking lots. Several other students, those in Ethan

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<sup>8</sup> Mr. and Mrs. Barry were the first Europeans to live on the property that would become Sandy Beach Provincial Park.

and Xavier's group and those who only had second-hand accounts of the story, also told of the boys' encounter with the wasps. Many students also mentioned being followed by a small black cat as they walked through the park, a cat that Ian named "Boo."

The students' oral descriptions of what they observed and did at Sandy Beach led to many related stories of experiences that they had in other parks and places. As he talked about what people can do at Sandy Beach, Xavier launched into a story of how he saw a bear on a boating trip at Cave Lake. When his group talked about tasting berries in the park, Quinn shared that his grandma made jam out of Oregon Grape and that was why he liked to eat the berries so much. Some students also talked about camping in other parks.

For many students, visiting Sandy Beach was a regular activity and additional trips to the park as part of the mapping project could have made the park even more familiar to them and deepened their connection to place. Students' experiences at the park also included family, friends, and teachers. Regular childhood experiences in natural spaces, particularly those shared with a close adult, are primary predictors of future pro-environmental concern and action (Chawla, 1999, 2003; Corcoran, 1999; Ewert, Place, & Sibthorp, 2005; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Wells & Lekies, 2006). This suggests that participation in the mapping project could help students to become environmentally responsible citizens.

The interviews themselves allowed students to revisit their experiences at the park as they shared stories from their time spent there. Their shared stories revealed connections that students had made between the activities of the mapping project and their own experiences at the park and in other natural spaces, suggesting that participating

in the project could have deepened their understanding of natural phenomena both at the park and elsewhere.

### *Created Names*

On our visits to the park, students were encouraged to create names for the organisms that they observed, particularly those species whose common names they were unsure of. Many students were already identifying specific trees by their own created names.



*Figure 4.2. The dragon tree.*

For example, several students referred to one unique tree near the beach as the *dragon tree* or *dinosaur tree* (Figure 4.2). Norah even went so far as to name it *Fluffy*.

On his “Sound and Colour Walk” on the second visit to the park, Xavier identified a prickly bush whose common name we were unsure of as the *sticky ball tree*. He continued to use this name two months later in his group interview, noting that he saw the *sticky ball bush* at the park. He and Charles used the shape and texture of berries to help them to differentiate and uniquely name species.

C I saw uh, I saw squishy balls which are, um,

X I saw spiky balls, like the ones that have the spikes, like the really spiky seeds

SJ OK, OK

C I saw squishy balls, nicknamed squishy balls, real name um, ah shoot, uh, uh, the white ones

SJ The white ones?

E Snowberries

C Yeah

Charles also renamed the ant trails that he saw throughout the park as *ant trenches* because they “[were] like a little *war ditch*.” Norah and Ian mentioned Charles’ newly named *big menacing rabbit hole*. Ethan referred to the area at the park where he was stung by a wasp as the *attack zone*. He used this term in his informal discussions about the park, on the emergent bulletin board map, and in his retelling of the stinging incident in his December group interview.

Naming plants and animals in the park in this way makes them more memorable than referring to them by their scientific names. The students had to observe the organism closely to determine a suitable name. By naming things, they also had a connection to

those living things—the plants and animals became “theirs.” This connection and feeling of ownership and responsibility could develop into stewardship of the park and its ecosystems (Barnett et al, 2006).

### *Special and Favourite Places*

One of the goals of the mapping project was to share and celebrate the students’ own special places at the park. After our visits, we discussed what our favourite parts of the park were and what those places were that we did not like. After the first visit to the park in early September, the class did a quick tally of students’ favourite places that they went to. Out of 26 students, 13 said that the forest trails were their favourite place. Eight students liked the shoreline and logs the most and five students preferred the beach at low tide. None of the students chose the playground as their favourite place from the first Sandy Beach field trip.

During their group interviews, students shared their favourite places at Sandy Beach as well as those places that they did not like. The majority of students preferred natural components of the park. The only favourite places that were human-created were the amphitheatre, the playground, and the nature house. Students that liked the log fort on the beach stated that they enjoyed playing on it, hiding, jumping, and scaring people (Figure 4.3). Oliver liked how they could slide down the driftwood slide that they made at a log pile. Mark appreciated how there was a lot of water by the log fort and a view of the mountains. Gemma liked how the position of logs was always changing. Students reported liking the beach because there were many animals to look at and places to explore. Victor enjoyed seeing the seastars in particular. Paige liked all of the “beautiful

shells” at the beach and the view of the mountains and island. Noted previously, Sienna and Tara’s favourite place was the amphitheatre because it made them feel *free*. William and Charles stated that they liked everything at the park.



*Figure 4.3.* The log fort on the beach.

Those places that students did not like at the park were related to unpleasant sensory experiences. Students that did not like where the wasps were tended to be those students who were stung or were in the same group as those who were stung. Those students who did not like the washrooms and outhouses complained of the smell and the insects nearby. The parking lot was disliked by Mark because there was not shade there on sunny days and by Bailey because there were too many cars and too much pollution. Some students said they did not like the “plain” trails because there were not many colours along them and that they preferred to make their own trails. Paige worried that she might get hurt at the playground and therefore did not like it.

The final visit to the park showcased students' own special places to which they felt a connection. The students displayed these places in dioramas with short explanations as to why the places were special. For most students these were the same as their favourite places at the park. Many boys identified the logs and log forts as their special places because they enjoyed climbing, playing, sliding, and running on them. Gemma liked how the logs were all different shapes and colours. Bailey similarly chose a Douglas-fir tree fort as her special place because she like to play there. Other students chose special places because of plants and animals that they had found there. Oliver's special place was "where [he] found [a] little snake in the forest." William liked "the beach high tide line along the squishy shore where [he] found fish bones in the seaweed." The beach, Lisa's special place, had beautiful shells and Xavier's tide pools had "clams, sometimes jellyfish, crabs, and fish in them." Previously noted, Jack liked the huckleberries along a trail. Some special places were specific trees. Norah and Ethan both said that the *dragon* or *dinosaur tree* was their special place and Alice liked the arbutus tree that was shaped like a slingshot. Finn's special place was the *eagle tree* that had cushiony moss growing around it. Finally, a few students' special places were developed sites at the park. The amphitheatre was special to three girls: Sienna, Tara, and Zoe. Dana's special place was the nature house because she "like[s] picking the glass off of it."

By specifically focusing on personal connections and special places at the park, Ms. C. and I encouraged the students to take ownership of and value the park and their experiences there. These feelings of ownership could translate into stewardship of the park (Barnett et al, 2006). The students' detailed descriptions of their favourite places

seem to counter the overwhelming persistence of “nature-deficit disorder” (Louv, 2005). Instead the students experienced joy and pleasure in being immersed in the natural world. They were drawn to diversity of life in the park and were keen to explore it. These findings suggest that community mapping projects can foster the development of a “sense of wonder” in its participants. Explorations of the natural world can lead to improved awareness of the total environment and the development of pro-environmental values, prerequisites for responsible environmental citizenship (Hungerford & Volk, 1990).

## Chapter 5: The Lasting Influence of the Mapping Project on Students

### *Class Activities Between the Post-Test and Follow-Up Data Collection*

Prior to discussing the follow-up results, it is important to note the curricular activities that the students took part in between completing the post-test NEP scales and interviews and the follow-up NEP scales and interviews three and a half months later. During this time, Ms. C.'s class did not do any community mapping work. They did however take part in some activities that may have influenced their responses on the follow-up measures. In February, all of the students worked on and presented science projects at the school science fair. Several of students' projects studied the water cycle and factors affecting plant growth. The students also observed and followed the development of salmonids in the school aquarium and learned about Fraser River sturgeon. They would also be taking part in the release of the young salmon and a salmon dissection after the follow-up NEP scales and interviews. The emergent bulletin board map and the playground map produced by the students were kept on display in the hallway and in the classroom after completion of the mapping project (Figure 5.1). Similarly, the book of Sandy Beach field trip photographs and the class book of special place letters remained in the classroom.



Figure 5.1. Completed emergent bulletin board map of Sandy Beach.

### Follow-Up NEP Scores

The frequency distributions of the students' responses to the follow-up NEP scale are shown in Appendix J. As with the pre-test and post-test NEP scales, most students *agreed* or *really agreed* with the pro-environmental items (1, 4, 5, 8, and 10). Many students were not clearly in agreement or disagreement with item 2 (*There are too many (or almost too many) people on Earth*). To this statement, nearly one third of students answered *not sure*.

For the anti-environmental items (3, 6, 7, and 9), student responses did not follow an obvious pattern. Over one third of students *really agreed* with item 3 (*People are clever enough to keep from ruining the Earth*) but the same number of students *disagreed* or *really disagreed* with the statement. There were similar patterns in student responses to

items 6 (*Nature is strong enough to handle the bad effects of our modern lifestyle*) and 9 (*People will someday know enough about how nature works to be able to control it*).

However as in the pre- and post-test NEP scales, students overwhelmingly *disagree* and *really disagree* with item 7 (*People are supposed to rule over nature*)—over 95% of students.

The students' follow-up mean factor and overall NEP scores are shown in Appendix K. The students' mean scores for the Rights of Nature and Eco-Crisis factors were strongly pro-environmental. In fact, eleven out of 23 students scored means of 5.00 out of 5.00 on the Rights of Nature factor. Students' mean scores for the Human Exemptionalism factor were less consistent and ranged from 1.33 to 4.67 out of a maximum of 5.00.

The students' follow-up mean NEP scores were high, averaging 3.88 and ranging from 3.0 to 4.8. This indicates an overall pro-environmental worldview.

#### *Comparison of Pre-test, Post-test, and Follow-up NEP Scores*

Students received an overall average  $M = 3.88$  out of a maximum of 5.00 with a  $SD = 1.03$  on the follow-up NEP scale. Within the scale, students scored an average  $M = 4.68$  with a  $SD = 0.84$  on the Rights of Nature factor, an average  $M = 3.85$  with a  $SD = 1.05$  on the Eco-Crisis factor, and an average  $M = 3.13$  with a  $SD = 1.06$  on the Human Exemptionalism factor (see Appendix L).

Using SPSS, a repeated measures ANOVA was run on the 23 students' pre-test, post-test, and follow-up NEP scores to determine if there were significant changes in total

and factor scores between pre-test and follow-up scores and between post-test and follow-up scores.

At an alpha of 0.05, the analysis indicated that there was a significant main effect for the Rights of Nature factor as measured across the three time periods (pre-test to follow-up),  $F(9.685, 33.383) = 5.846, p < 0.011$ . Mauchly's Test of Sphericity indicated that the assumption of sphericity for Rights of Nature had been violated ( $\chi^2(2) = 10.237, p < 0.006$ ); therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ( $\epsilon = 0.759$ ). Specifically, there was a significant increase between pre-test ( $M = 13.04, SD = 1.718$ ) and follow-up ( $M = 14.04, SD = 1.261$ ) scores (see Appendix I).

Significant changes in overall NEP scores were not measured between the pre-test and follow-up and the post-test and follow-up. Similarly, significant changes were not found between pre-test/post-test and post-test/follow-up Eco-Crisis and Human Exemptionalism scores. Finally, there were no significant changes in Rights of Nature scores between the post-test and follow-up.

Students' retained high scores for the Rights of Nature factor is encouraging as it suggests that community mapping projects can have a lingering influence on students' environmental worldviews; in this research for three and a half months. The significant improvement in the Rights of Nature factor is particularly meaningful as significant changes are typically difficult to identify in small sample sizes. These results indicate that community mapping can change students' views of the environment and would be a useful tool for teachers to include in their curriculum to meet the long term goals of environmental education—the development of environmentally responsible citizenship in students.

This study's positive changes in worldview parallel the results of Dettmann-Easler and Pease (1999) and Kruse and Card (2004) where students' improved environmental attitudes persisted over time. As in Kruse and Card's findings, the students' overall NEP score did decrease slightly between the post-test and follow-up writings. However, the follow-up mean NEP score remained above the pre-test mean score. This decrease suggests that the influence of the community mapping project may have been even greater had the project lasted longer than three months. This is supported by the tendency of longer term environmental education programs to impart greater change in students' knowledge, attitude, and behaviour than short-term experiences (Bogner, 1998; Dettmann-Easler & Pease, 1999; Lindemann-Matthies, 2002; Stern, Powell, & Ardoin, 2008).

The standard deviations calculated for the follow-up mean NEP and factor scores remained near post-test values. As noted in chapter four, this indicates that students' follow-up responses were consistent and that the mean scores accurately communicate the students' views.

The frequency and consistency of students' pro-environmental responses to the Rights of Nature and Eco-Crisis factors indicate that students are firm in their belief that plants and animals should have the same rights as people and their understanding that people's treatment of nature and natural spaces can have a very negative effect on the environment. Students' responses to four scale items did not show such clear patterns. These were the three Human Exemptionalism items (items 3- *People are clever enough to keep from ruining the Earth*, 6- *Nature is strong enough to handle the bad effects of our modern lifestyle*, and 9- *People will someday know enough about how nature works*

*to be able to control it*) and one Eco-Crisis item (item 2- *There are too many (or almost too many) people on Earth*). Responses from the pre-test NEP scale completed for these items contain a high percentage of *Not Sure* answers. For item 2, nearly half of all students responded with *Not Sure* on the post-test NEP Scale and nearly one third said *Not Sure* on the follow-up NEP Scale. These responses to item 2 could point to a number of concerns. As the students live in a community that does not suffer directly from the strains of overpopulation and crowding, they may have a difficult time understanding what “too many people” might look and feel like and how too many people can have a negative effect on the environment. Although the children that completed the trial NEP Scale did not have difficulty comprehending the item, these experimental students may have.

Students’ responses to the Human Exemptionalism items were inconsistent and did not follow a pattern, indicating a lack of consensus among the students. Substantial percentages of students agreed and disagreed with these statements. The items themselves are problematic, particularly when presented to relatively young students. As noted in chapter four, Item 3 (*People are clever enough to keep from ruining the Earth*) could be perceived in different ways. Similarly students could have had difficulty understanding item 6 (*Nature is strong enough to handle the bad effects of our modern lifestyle*). Given that the students were between eight and ten years old, they would not have known any reality apart from a modern lifestyle. Unless they have learned about past ways of life, they would have been challenged to make sense of this item.

### *Follow-Up Interviews*

As with the previous, post-mapping interviews, students' comments were organized into the same four themes: 1) knowledge; 2) attitudes and feelings; 3) human actions and influences; and 4) ownership and connection to place and experience.

#### *Knowledge*

The students' comments reflecting their knowledge of the park were again grouped into four categories: 1) biodiversity; 2) specific and advanced vocabulary; 3) adaptations and roles of plants and animals; and 4) change over time.

#### *Biodiversity*

The follow-up interviews suggest that students' understanding of the park's biodiversity remained the same as only slight variations in comments were made. As in the post-mapping interview, when asked what plants and animals they saw at the park, students listed more types of animals than plants. The students recalled seeing or hearing 34 kinds of animals; eight more than they listed right after completing the mapping project. Students remembered seeing 18 types of plants and fungi. Once again, and despite going on tidal walks, seaweed was not mentioned as a type of plant that students saw at the park. Two types of trees were identified: Douglas-fir and cedar. One student mentioned seeing a mushroom and a red mushroom with white dots. Again, students recalled observing these things primarily in the forest or on the beach. One student remembered seeing an animal under a rock but specific locations such as this were not identified in the post-mapping interviews and were shared just once in the follow-up

interviews. This comment suggests that this student's perception of an animal's home includes much smaller scale habitats.

When asked about signs of animals that they saw in the park, the students listed 25 different indicators of animal presence; more than in the interviews immediately following the project. Along with the previously noted tracks, feathers, and holes, students also noted insect bites, partially eaten leaves, ripped bark, and road signs as indicators of animals' presence. Most groups again commented on smelling pine and salt water or the ocean.

Comparing Sandy Beach to other parks and to their community of Seaside, students once again shared that Sandy Beach was "like, all wildlife" and had "a whole lot more birds and plants" and "animals and nature there." Students also noted that there was a "bigger animal population, animal and plant population than human population" at Sandy Beach.

As in post-mapping interviews, the presence of the forest and the number of trees was also discussed: there was a "forest at [Sandy Beach], not just a beach" as in Seaside and Sandy Beach had a "hundred times more trees" than Seaside.

Several students indicated that the different plants and animals living at the park were why people went to the park and why they themselves enjoyed going there. Alice<sup>9</sup> noted that many people went to Sandy Beach so that they could "discover new animals" and "learn new kinds of plants." Heidi liked to go to the beach so she could study crabs to see if they were male or female. Finn chose his favourite place at the park because there he "could hear the squirrels going through the trees." Xavier enjoyed walking along the trails so that he could listen to the birds.

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<sup>9</sup> Pseudonyms were used to protect students' anonymity.

*Specific and Advanced Vocabulary*

As in the post-mapping interviews, Jack and Xavier mentioned seeing and hearing a *pileated woodpecker* at Sandy Beach. Other students clearly described a *pileated woodpecker* but referred to the bird as a *woodpecker*.

P Oooh, I know, it had like a long [gestures from own nose] beak

SJ Mmm hmm

P It had like black back

M They're probably red but

P Yeah, it had like a black back and like a red thing [gestures behind head] coming out of his head

Paige's detailed description suggests that she would be able to identify the bird though not by name. Weilbacher (1993) stresses the importance of teaching names in nature study "to know who [species] are" (p. 7) but if students can describe and discuss in detail the organism without specifically naming it, are they too not coming to know the organism? Unless specific vocabulary use is being modelled regularly by teachers, it is not realistic to expect students to use it.

As he discussed some scratches on a tree, Ethan commented that they could have been made by a *cougar* sharpening his claws. Charles said that "we don't have cougars" to which Xavier confirmed that yes, we did. Ethan noted that cougars were also called *mountain lions* and Xavier stated that they could be called *pumas*. Quinn, Lisa, and William shared how on one visit to Sandy Beach, Lisa tasted *sea asparagus*. This was not shared in the post-mapping interview.

Mark once again recalled finding a fossil-type creature that, after prompting, he confirmed to be a *chiton*.

M Me and Charles found this like type-ton (?) or whatever it was called, it was like this, it was a fossil of a

SJ Oh was that, um, a chiton that you saw?

M Chiton, yes

As with Paige earlier, Mark was clear on the animal that he was referring to but could not remember its specific name.

#### *Adaptations and Interactions of Plants and Animals*

Students tended to discuss similar themes of adaptations and interactions but shared different examples than in the post-mapping interviews. Some groups discussed the physical characteristics of the animals that they saw at Sandy Beach. Finn, Jack, and Victor recalled a feather that they saw at the park with Finn noting that it was likely from an eagle as it was black with a white tip. The other boys said that not all eagle feathers were like this and that, depending on the species, gender, and what part of the body it came from, an eagle feather could be brown or black and white.

Two groups noted seeing bird footprints on the beach. Xavier clearly recalled and demonstrated with his fingers that the small print showed three toes: two in the front and one in the back. Ethan thought that the print could have been made by a crow or a seagull. Zoe, Oliver, and Bailey also referred to bird footprints on the beach. After drawing the shape of the print on the table with her finger, Zoe and her group members discussed what type of bird might have made the print.

SJ So what does that tell us about the kind of bird that it might be?

B Maybe duck or eagles

Z I don't think eagles have that kind of feet

O Seagulls don't have that kind

Z They don't swim and they mostly need that webbed feet to swim so it mostly would have been a duck [to B]

The students' comments suggest that they are applying what they already know about avian behaviour to identify what kind of bird made the print.

Most groups talked about animals' homes and habitats in their interviews. As in the post-mapping interviews, students talked about eagles' nests needing to be high in trees, ferns growing in shaded areas, and holes made by woodpeckers becoming homes for other animals. Sienna mentioned seeing a bird carrying a leaf and predicted that the leaf would be used in building a home or bed for the animal; Tara wondered if it might be used to patch something. Victor noted that seastars tend to live under rocks. He said this was important because they needed to stay wet so they could breathe and avoid suffocation. Alice also noted the importance of water for crabs to help keep them cool as she retold the story of her and Rachel finding a warm-bodied crab on shore and putting it back into the water. William questioned Lisa's statement about seeing a king crab at Sandy Beach, noting that these crabs were only found at depths of around 500 feet.

Several students discussed animal responses to possible predators and danger, a topic that was not discussed in the post-mapping interviews. Many recalled seeing holes on the beach made by burrowing clams. Heidi commented that the holes were there so that the clam could breathe. Lisa, Quinn, and William described how and why water shoots up out of these clam holes when people step near them.

- L I was at a different beach, I was with my friend, I didn't, it was just a little hole, and I just stepped by it and then I looked up and it didn't do anything and then I looked down and it got me right in the face. And it didn't taste good
- SJ Why do you think that is that when you step near these things
- L They think a predator is coming
- SJ So then what does the water do?
- L It makes them go away
- SJ So they shoot that water out of the hole to scare away things
- L Yeah
- Q And when they dig deeper it builds up pressure

It is possible that students learned about predator/prey relationships in their study of salmon and sturgeon and they could have been applying this to their observations at Sandy Beach.

After I spoke of seeing a pair of great horned owls at Sandy Beach and described their unique behaviour, Norah pointed out that their behaviour was likely a warning sign. Norah shared with me that she closely studied the owls that lived near her backyard. Her comments suggest that she is making connections between her prior knowledge of owl behaviour and my observations at the park.

The students discussed observations of specific animal behaviour in the park. Paige remembered seeing seagulls drop clams from great heights to break their shells, an observation that was also made by students in the post-mapping interviews. In her recollection, Paige noted that "Ms. C. said that's how the seagulls [get food]." Many students shared stories of throwing rocks and sticks at ant hills. When the ant hills were

disturbed, the students said that the ants came out of the hill toward them. Sienna and Tara explained that there were many jellyfish on the beach because it was the migration season for large groups (“twice the size of this room”) of jellyfish. They claimed that many of the organisms became stranded on the beach when they rode the waves in to the shore, becoming lodged on the sand and pebbles of the beach and “scatter[ing] all over the place.”

Many students talked about bees, wasps, and hornets. These names were used interchangeably by most students. It was noted that honeybees were important because they “repollinate flowers” but most described how bees, wasps, and hornets sting. In Charles’ description of being stung by a bee, Xavier corrected him, saying that only wasps were able to sting. Similarly, Norah recalled a time when she and a friend were stung twice by a bee. Ian interjected, questioning whether it was a bee or a hornet that stung them.

I How can it, was it a bee?

H Well

I Or was it a hornet?

H I don’t know

I Was it like long [gestures with arms] because hornets can sting like twice [two fingers up] until it dies. So they both stung you and your friend, then it would die cause bees can only sting like once then they die

In their discussions of how plants and animals recover from being hurt or damaged by peoples’ activities in the park, Quinn stated that a bee with a squished wing would not be able to heal but William thought that it might be able to recover. Ethan described the differences between animals, plants, and humans recovering from injuries.

E I think that plants will heal faster because they can regrow and sometimes be stronger but animals can only be just as strong as they were normally

SJ OK

C Like if they got shot in the leg

SJ Right

X What if you get shot in the leg?

E I think that animals for some reason, they actually heal faster than humans I think

SJ Mmm hmm

E Cause if they're to survive in the wild, they'll get hurt pretty much almost everyday

SJ There are lots of things that can harm them

E And humans, we're bigger than quite a few animals so [shrugs shoulders]

Ethan's personal theory appears to draw from his prior knowledge and experiences. In it, he acknowledges the stresses faced by wild animals. He also sets humans apart from other animals, not recognizing in his comment that humans are animals as well.

### *Change Over Time*

During their interviews, some students mentioned changes in plants, animals, and activity at the park across the three field trips and beyond. Sienna and Tara expressed seeing more plants and animals on the second and third visits to the park than on the first field trip. In particular, Sienna and Tara noted seeing more animals and stinging nettles on the second visit. Lisa noted that Oregon Grape could not be found in the forest at the

time of the interview in late March. Quinn said this was because the berries are only out at the end of spring, close to summer.

In the follow-up interviews, there was little discussion about the changing number of wasps at the park over the course of the project. Only Ian claimed that the number of wasps at the playground stayed the same across all visits to the park. Ian's statement was different from those observations made by several students in the post-mapping interviews who saw the wasp population decreasing with each visit to the park. It is possible that for Ethan, the student who spoke in depth in the post-mapping interview about wasps and being stung, the troubling memory of being stung had faded over time. Therefore, his recollections of Sandy Beach may not have been dominated by memories of wasps.

### *Attitudes and Feelings*

The students' expressions of attitudes and feelings toward the park environment and the wider environment gathered from the follow-up interviews were organized into 1) anthropocentrism versus concern for animals; 2) the park as a place of refuge; 3) *happy*; and 4) *fun*. The feelings of *free* and *home* that were apparent in the post-mapping interviews were not evident in the follow-up interviews and are therefore not included here.

The students' follow-up interviews revealed affective responses to the park but these feelings were not expressed as specifically or in as much detail as was done in the post-mapping interviews. This suggests that those feelings were now broad and

generalized. It is also possible that these responses could be applicable to natural spaces other than Sandy Beach.

### *Anthropocentrism versus Concern for Other Living Things*

Students again shared statements that placed human interests and convenience above the well being of other living things. Zoe's favourite place at the park was where she saw a squished snake because she "hates snakes" and "loves it when they get squished." The part of the park that Mark did not like was the prickles on the blackberry bushes that cut his hands as he picked the berries. Mark also complained about the swampy area at Seaside beach, saying that it was "disgusting." When describing the layout of the park, Zoe, Bailey, and Oliver agreed that it was important to have distinct sections of the park so that people would not get lost and would be able to easily find things, particularly bathrooms. Charles and Xavier discussed parks in general and noted that some parks, such as Sandy Beach, are made for people to walk at whereas others, such as the community park, were created for people to play at. They did not talk about parks being created to benefit other living things. On one visit to Sandy Beach, Norah walked across many herring eggs on the sand. After hearing this, Ian said, "Poor little guys." Norah responded by crossing her arms and stating that "there's still millions upon millions of them." As noted in chapter four, students' anthropocentric comments are in contrast to their NEP responses that indicate a high regard for the rights of other living things.

Not all students expressed such anthropocentric views. In fact, some students' comments suggested that they held a deeper respect for other living things, a view not

clearly expressed in the post-mapping interviews. As he answered a question about how people use the park, Ethan recognized that animals use the park to meet their needs and use the park more than people.

E The animals use it more than anyone, well are you talking about people or animals?

SJ Well, I was talking about people but tell me a little bit about what you're thinking with animals though

E They use it for food, shelter, homes, they use it even...and there's a playground for people and also there's a playground there for animals just in the woods

Alice recalled one of her visits to a wooded area near home and said that she and her sister are always careful not to scare the animals that they see. She also said that when she is in the woods, she hopes that she does not come across any deer because she does not want to make them feel threatened. Alice noted that when deer are “shocked” or “disturbed” that they might “run over and attack you.”

Some students related actions taken on animals in the park to those that might be taken on people. After hearing about how one group threw a crab into a tidal pool, Ian likened the action to being forced out of one's house.

I That kind of sounds kind of mean, you threw him in a tide pool, it's kind of like kicking you out of your house

Similarly, after discussing how animals recover from injuries including being shot in the leg, Xavier exclaimed, “What if you get shot in the leg?” Norah told of how when she first saw a manta ray, she “gave him a little pat on the back and he didn't sting [her].”

These comments speak to the students' broadening concern and sense of compassion for other living things. They suggest that the students see animals as sentient

beings that are capable of feeling and also as needing leisure time. Norah's comments indicate that she understands the reciprocal nature of the relationship between living things. Students' developing sense of compassion for other living things is also apparent in the students' improving Rights of Nature scores.

Students also talked about how living things are perceived by others. The varied perceptions of "goodness" and "badness" did not come up in the first interviews. Ethan, Charles, and Xavier had an interesting discussion about good bugs and bad bugs and what defines a bug as being good or bad.

SJ I wonder, how do we decide what the bad bugs are and what the good bugs are?

E The bad bugs would be something like spiders

X Spiders are good, they eat flies

C Anything that hurts anything else unless it eats bad bugs

E Like worse bugs

SJ Mmm hmm

E And like the good bugs are probably like caterpillars, some types,

X A fruit fly is a good bug

E I know there are some kind of caterpillars that have, like spikes on them that can eject and paralyze or something, I forget

SJ OK

E There's also a type of caterpillar called the blue horned caterpillar and I think its horn, it rams into you, it paralyzes I think

SJ Mmm hmm

- E So like there's pretty much of every species of bug, there's a bad type of it and a good type
- SJ OK, so for every, for every species there are bad types, bad types of bugs and good types as well. So, it sounds kind of like most, most bugs, I mean they
- C Ladybugs aren't bad
- SJ They do good things and they do bad things, it just depends
- X Bees are a good thing, honeybees are a good thing, they pollinate flowers
- E How about like if it's a really bad thing, it's usually a pretty good thing they do

This difference of opinion in relative “goodness” or “badness” was similarly noted by Norah. She mentioned that when people see seals fishing they think it is “cute” but when sharks hunt they are seen as “dangerous animals.” She concluded that these occurrences are all simply a part of “the chain of life.”

Heidi shared that people's actions in the park usually have a negative effect despite our counter efforts. She described trying not to step on shells on the beach but because there were so many, they were almost impossible to avoid. Heidi's expressed dilemma of walking on the beach plainly illustrates the difficulty in finding a middle ground between humans' own interests and respecting other living things.

- H And there's so many shells, you just try not to step on them but they're all around you so you kind of have to but you try not to

### *The Park as a Place of Refuge*

As in the post-mapping interviews and discussed in chapter four, students said that the park was a place to go to relax as it was “a bit more calm” than the rest of

Seaside. Students again described the park as a peaceful place to be. Though sharing that the park was relaxing and peaceful in their follow-up interviews, students did not elaborate on that feeling to the extent that they did in the initial post-mapping project discussion. This could mean that students' feelings were not as deeply held or that possibly that they were no longer connected to specific responses as they were immediately after the mapping project was completed.

The students expressed feeling safe at the park. Instead of discussing the park's lack of human-related dangers (eg: crime), in the follow-up interviews students referred to the minimal danger posed by wildlife. Zoe noted that the wildlife there was "not too wild, like no bears, no cougars and lions." Oliver added that this made the park "way safer." Interestingly the feelings of these elementary school students do not match the dangers of natural spaces that are often perceived by teachers (Simmons, 1998).

Ethan shared his feelings of safety when he is in the woods.

E And I feel really safe deeper, the deeper I get into the woods, the safer I feel [shrugs shoulders]

Ethan's feelings of safety in the woods and with trees were detailed in the post-mapping interviews as well. His deeply held connection to trees and wooded areas and feeling of safety within them was unique among the students. He shared with me that he did spend a lot of time at the park with his mother; she also accompanied us on two of our field trips to Sandy Beach. Having his mother share experiences in the park with him may have contributed to his feelings of being safe at the park—he would not have felt alone and would be less likely to feel vulnerable or in danger. This time spent together in nature could help Ethan to maintain his positive attitude toward the environment and his caring relationship with other living things. Also, as noted in chapter one, childhood time spent

in natural spaces with a parent can lead to responsible environmental citizenship (Chawla, 1999; Corcoran, 1999; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980).

The only comment related to the park being an ideal setting and a benchmark for other natural areas was made by Victor as he likened Sandy Beach to a museum.

V [Sandy Beach] isn't a park, it's a museum [joking voice]

Despite his joking voice, Victor still touched on an important feature of Sandy Beach: it is not “wild nature” by any means. In fact, Charles once referred informally to Sandy Beach as a “garden.” Also, some students discussed how the park was organized into different areas for camping, picnicking, walking, and so on. This suggests that though viewed as an ideal, students do understand that Sandy Beach is not a pristine natural environment. That said past research has demonstrated the positive effects on children’s environmental attitudes of time spent by exploring vacant lots, gardens, and nature parks (Louv, 2005). Similarly, although it is not “wild nature,” Sandy Beach is a park that most students had connections to and experiences at prior to beginning the project, further enhancing influences of participating in the mapping project on the students’ environmental awareness and beliefs.

### *Happy and Fun*

Two themes that were not obvious in the previous interviews that presented themselves in the follow-up interviews were feeling happy at the park and going there to have fun.

When asked how people use the park, Charles noted that it was a place where people could “just walk around and feel happy and don’t feel stupid.” Alice spoke of her feelings about the park and the value of the park to others saying that a “place like that makes people happy and I’m one of those people.” Some students specifically commented that the park was a place to go to have fun. Quinn said that people go to the park to “like, have fun” and Alice mentioned that “you can just go there to have fun by yourself” as well.

Charles and Alice’s comments about being able to “just walk around and feel happy” and that “place[s] like that make people happy” suggest that it is actually being in the park and actively experiencing it that makes people happy. Charles’ statement that Sandy Beach is a place where people “don’t feel stupid” suggests that it is a place where stresses and concerns can be let go and people can simply feel content. The students’ feelings of happiness and having fun at the park support past findings of improved mood and positive affect with time spent in and near natural spaces (Hartig, Mang, & Evans, 1991; Kaplan, 2001).

These descriptors of *happy* and *fun* are not as specific as other feelings expressed in the interviews. That *happy* and *fun* were persistent in the follow-up interviews and not the immediate post-experience interviews suggests that it is the time between interviews that has dimmed or replaced these emotions with broader ones. In the last few weeks of the mapping project, right before the post-mapping interviews, the students worked on descriptive letters and poetry related to Sandy Beach and their experiences there. For these, Ms. C. and I challenged the students to pinpoint their feelings and use specific descriptors to capture them in words. We wanted them to really explore what they felt

and go beyond the *happy* and *fun* that are often favoured by elementary school students who are unsure of what they want to say. Many of the phrases used by the students in their writing came up in their interviews. Those expressions would not have been fresh in their minds over three months later. Therefore, they may have relied on the more generic *happy* and *fun* to describe their feelings at the park.

### *Human Actions and Influence in the Park*

Students shared the impact of human activities on the environment at Sandy Beach and beyond. As with the post-mapping interviews, students' comments were organized into five categories: 1) pollution; 2) population and space; 3) development versus "natural" spaces; 4) species and habitat disturbance and destruction; and 5) effects beyond the park. When asked how people use the park, two students, Lisa and Ethan, asked if I meant using the park "in a good way or a bad way." I replied that I'd like to know about both positive and negative ways that people used the park.

#### *Pollution*

Most groups commented that one of the ways that Sandy Beach was different from the rest of Seaside was that there was no pollution there. Ian went further to state that he didn't think the park should ever be polluted and that it should just stay as it is. Zoe said that the trees give oxygen and with more trees, the air is better.

Many students noted that Sandy Beach was less polluted than the community park and the rest of Seaside, stating that this was important for nature. One of the reasons that they liked Sandy Beach was that it was not as polluted as other parks. This indicates that

the students may value places that are not as negatively influenced by people's actions and may be later inclined to protect such areas.

Not all students believed that there was no pollution at the park. Litter, cars, gasoline, and campfire smoke were again identified as sources of pollution at Sandy Beach. Norah stated that there was a lot of graffiti there and Sienna and Tara said that animals might eat the garbage left by people in the park. In the follow-up interviews, noise pollution was not identified as a concern at the park.

Ian shared some of his ideas about how forests recover from pollution and why it is important to stop polluting.

I And um, when pollution is on like a forest, like a jungle or something, uh, it can take one year to recover. That's all it takes

SJ So it just takes a year to recover

I Yeah so if we put more in, we might have maybe like three years, so I think that's why we should stop. One day something might happen, an explosion, and we might, we might be gone where the dinosaurs are gone

Ian's misunderstanding highlights the need for teachers to be aware of the sources of students' information and the reliability of those sources. Again, it reinforces the need for teachers to provide environmental education that dispels myths and presents ecological issues in a way that is clear, honest, and accurate, allowing students to make informed decisions about their own actions. Similarly, teachers need to go deeper than presenting only walking and recycling as ways to reduce pollution; they need to communicate the need for people to rethink how they *dwell* in a place (Orr, 2004).

*Population and Space*

Students offered differing descriptions of how busy the park was, particularly when compared to the rest of Seaside; similar comments were shared in the post-mapping interviews.

Mark stated that Sandy Beach was not as busy with people as Seaside and claimed that this was because it was in the country and was not a tourist attraction.

SJ Why do you, why do you think [Sandy Beach and the community park] are different that way?

P I don't really

M Tourist attraction probably cause [Sandy Beach is] farther out in the country and it,

P Is it?

M But downtown, yeah it is

P Farther out like downtown

M Tourists don't go there, like they don't even know it's there but in downtown [Seaside] there's the big park like that and they want the tourists to go there

Lisa and Quinn disagreed, saying that more people actually go to Sandy Beach than the community park.

*Development versus Natural Spaces*

As in the post-mapping interviews, a main difference cited by many students between Sandy Beach and Seaside and its parks was the lack of development at Sandy Beach. Oliver explained to me that parks were used for different purposes and that the community park in Seaside was a "playground park" and therefore did not need to have trees.

In the follow-up interviews, students' discussions focused more on the presence of natural features (eg: plants, animals, water) than on the absence of built structures (eg: shops, toys, cars). Ian acknowledged that there were buildings at Sandy Beach but rather than being made "out of bricks and fancy," its buildings and furnishings were of a different style and made of wood—"wood, wood, wood." Charles noted that because it has more trees and no cars, Sandy Beach "feels better," suggesting that to him, natural spaces are preferable to built ones. This parallels findings from environmental psychology research (Kaplan, 2001).

Karen said that big parks like Sandy Beach were important because they provided room for animals to live in the forest and away from the trails. Sienna and Tara similarly expressed the importance of Sandy Beach as a place for many plants and animals to live.

S If [Sandy Beach] wasn't there, think of all the animals, ants, all of those things

T Trees

S Trees, if [Sandy Beach] got cut down and buildings got put up there, think of all the animals and things that would be just gone, dead

The girls' musings indicate that they see parks as places that protect living things from people's actions and that they feel that parks are important. It also indicates their concern for the well being of other animals. Interestingly their voiced concern does not extend specifically to the health of plants, suggesting that their view of living things' rights might apply primarily to animals.

*Species and Habitat Disturbance and Destruction*

As with the post-mapping interviews, most students said that people can unknowingly disturb or damage plants and animals and their habitats when walking, running, or cycling in the park. Norah recalled a visit to Sandy Beach when she walked on the beach and inadvertently stepped on many herring eggs.

N I killed thousands upon thousands upon thousands of herrings, hahaha

SJ Oh, no

N Oops

SJ Yeah

I It's like, oh, you kill like a thousand with your foot

N Oops

N Well as long as you're not stepping on any of them

I Like at the beach, poor little guys

N There's still millions upon millions of them [arms crossed]

Trees could be damaged when branches are broken off and bark is peeled off. Victor noted that this happens with Arbutus trees to which Jack commented that "it's kind of natural anyways" because the bark peels on its own. The students' comments suggest that they believe humans' negative impact on the environment can sometimes be dismissed, indicating the students' anthropocentrism. It seems that students acknowledge their negative influences on other living things but not always to the point of changing their actions.

Further questioning about if and how changed plants and animals are able to heal and repair themselves gave insight into the students' ideas about how systems react to

change. Most students stated that when a plant is damaged, it will likely die. Others noted that the ability of a plant or animal to heal and survive depended on the amount of damage it sustained. Alice said that some parts of plants are more important than others, explaining that a plant could lose a leaf or a petal (“it’s just a petal”) and easily survive but could not live if its stem was broken. Unlike the previous interviews, most students did not discuss the amount of time needed for plants or animals to recover from disturbance. Only Ian referred to time when he stated that “a forest...can take one year to recover” from pollution.

Of those situations where students said plants and animals would survive damage, students gave a number of explanations why this was the case. Though a rare comment, Sienna and Tara talked about how it was normally only the “strong” and “old” plants that were “used to growing” that survived. Lisa and Quinn shared how when unwell, plants tend to “shrivel up and drop seeds.” They stated that most of the seeds are dropped immediately around the plant, “almost exactly right beside it,” but that some are blown away. Ian said that when animals are injured or changed they might evolve or mutate into physically different animals. He gave the crocodile as an example, stating that “in the beginning of time, they used to be like super huge and now they’ve shrunk.”

In many groups, students said that human help was needed to help plants and animals heal after being injured or damaged, an idea that did not arise in the post-mapping interviews. Oliver stated that the damage “stays like that until somebody comes around and fixes it.” Mark, Sienna, and Tara said that often when plants are damaged, people need to tie the plant to a stick for it to survive. Sienna also commented that people usually needed to replant in damaged areas.

Some students discussed the ability of plants and animals to rebuild their homes and habitats after dramatic changes. Gemma recalled seeing revegetation areas at Sandy Beach that were fenced off from trails to keep people from walking through them. She said that in these areas plants were beginning to grow once again on their own. Finn shared the story of how his father had demolished a massive ant hill in their backyard with a Bobcat but that the ants had simply rebuilt their home on the other side of the fence, just outside the backyard.

Ethan and Heidi commented on the difficulty of visiting and experiencing the park without causing some damage or disturbance to its organisms and habitats, even questioning whether it was possible to do so. As he discussed walking on trails and how it influenced living things in the park, Ethan said that despite our efforts not to, people usually harmed the plants and animals.

E For everything a person could do in [Sandy Beach]

SJ Yep

E It can either, if they're careful it does hurt them

SJ Right

E But even if you're sort of careful, it still usually hurts them

Heidi talked about the difficulty of walking on the beach without stepping on animals, noting that as hard as people try, it is very difficult to avoid doing.

H And there's so many shells, you just try not to step on them but they're all around you so you kind of have to but you try not to

I It's like "No, I can't do this, no, no, oopsy daisy" [stepping with feet]

The students' comments about supporting and damaging the environment highlight humans' conflicting and often overlapping roles of helping and harming living things.

### *Effects Beyond the Park*

Once again, Norah and Ian talked about global warming in their interview, this time after being asked how people's use of the park affected the plants and animals that lived there. Norah expressed that "we think we're trying as hard as we can to stop [global warming] but we know what's happening and pretty much nobody's really doing anything about it except for schools," revealing her deeply held feelings of frustration that were shared in previous interviews and discussed in chapter four.

Norah and Ian also shared their worry about logging in a local valley. They said that the logging was killing trees and a variety of birds, including owls, blue jays, and herons, and should be stopped. Norah pointed out that logging was causing the only regional species of spotted owl to become "more extinct." Norah shared her feelings about species loss in the post-mapping interviews as well. Norah and Ian's strong feelings about environmental issues close to home could empower them to become environmentally pro-active. Noted in significant life experience research, such negative environmental events experienced in childhood can be related to adult environmental beliefs (Chawla, 1999; Ewert, Place, & Sibthorp, 2005; Tanner, 1980).

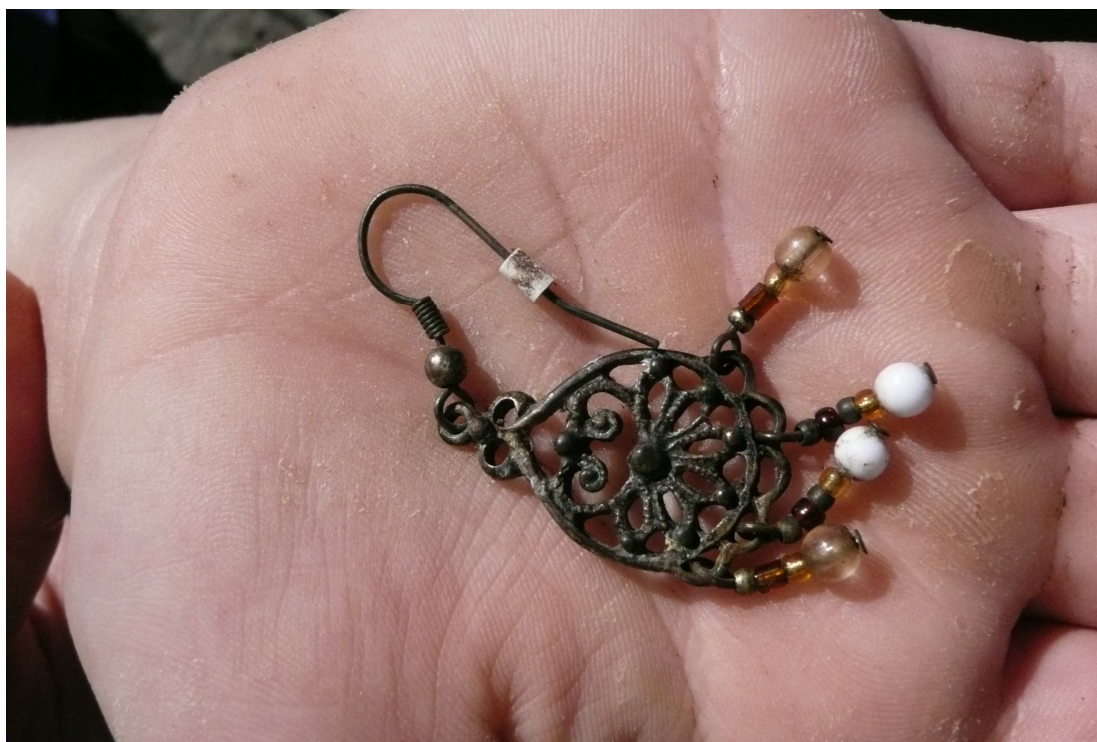
### *Ownership and Connection to Place and Experience*

Finally, the students shared their unique connections to the park and their experiences there. As in the post-mapping interviews, students' comments were grouped

into: 1) shared stories and existing connections; 2) created names; and 3) special and favourite places.

### *Shared Stories and Existing Connections*

All of the groups of students shared stories of past experiences at Sandy Beach, either from the mapping unit field trips or visits to the park with family, friends, or previous classes. These included recollections of being stung by wasps and finding Mrs. Barry's earring (Figure 5.1), both discussed in the post-mapping interviews.



*Figure 5.2.* Mrs. Barry's earring.

Many of the students shared stories involving family members. When she found a feather, Paige knew that it belonged to an eagle because her father collected eagle feathers and therefore she had seen them before. Charles and Xavier both had grandparents that lived close to natural settings. Charles' grandmother "lives right next to

[Sandy Beach]” and therefore “has a beach in her backyard.” Xavier said his grandmother lives north of Seaside, surrounded by trees and near a river of spawning salmon, and that he always goes there.

Several students referred back to past outdoor experiences when answering questions in the interview. Quinn discussed finding red and black ants in a hole beneath the road where he used to live. William also shared a story about ants where he and a friend threw things at an ant hill and were then climbed on and bitten by ants. Jack recalled seeing a raven land on a powerline breaker near his home, resulting in several days without electricity.

As discussed in chapter four, the students’ many connections to the park and its environment could lead to later pro-environmental action (Chawla, 1999, 2003; Corcoran, 1999; Ewert, Place, & Sibthorp, 2005; Palmer, Suggate, Robottom, & Hart, 1999; Tanner, 1980; Wells & Lekies, 2006).

### *Created Names*

As well as using common and specific names to identify organisms seen in the park, many students also used their own created names when referring to specific plants and animals in both the post-mapping and follow-up interviews. These included the *dragon tree*, *dinosaur tree*, and *sticky ball tree*. When listing plants and animals that they had seen in the park, Ethan said, “*Dragon tree*,” with a smile on his face. Students also recalled seeing the *smoker tree*, *hammock tree*, *ghost tree*, and *ribbon tree* (Figure 5.2). In their recollection of being stung by wasps, Xavier and Ethan referred a part of the park as the *wasp zone*; Ethan had previously referred to this as the *attack zone*.



*Figure 5.3. The ribbon tree.*

Once again, Norah called the dragon tree *Fluffy*. She also named the “nice” wasps *Jeremy* and *Jacob* and called a shrimp *Bob*. Alice spoke about Norah’s experiences with wasps, saying that she thought one had been named *Fred*. As noted in chapter four, this personalization and ownership of place could evolve into active stewardship of the park (Barnett et al, 2006).

#### *Special and Favourite Places*

In the group interviews, students were asked what their favourite part of the park was. As noted in the post-mapping interviews, most students’ favourite places were natural locations; the only human-created exceptions were again the amphitheatre, nature house, and playground. Similar reasons to those given in the post-mapping interviews

(eg: exploring, playing, walking, collecting) were given for selecting favourite places at the park.

Two students chose the forest as their favourite place because of the sounds of the animals there. In different interview groups, Finn shared that he liked being able to hear the squirrels running in the trees and Xavier said that he liked the trails the most because he enjoyed listening to the birds. These reasons were not shared in the initial interviews.

In her group interview, Paige shared a recent visit that she had to the park. She spent five days over Spring Break camping with her father at Sandy Beach. Paige said that it was special for her because her father “didn’t have to go off, he didn’t have to work.”

The students’ comments indicate that even three and a half months after the end of the mapping project, they continue to appreciate Sandy Beach and its natural features. These findings are promising as they suggest that participation in the community mapping project may have contributed to students’ awareness and appreciation of the local environment. Noted by Hungerford and Volk (1990), environmental awareness and value is an important precursor of responsible environmental citizenship, the ultimate goal of environmental education.

## Chapter 6: Conclusions and Implications

### *Findings and Conclusions*

The research question driving this study asked if and how participation in a community mapping project influenced grade four students' developing environmental worldviews. It also asked if and how this influence would last over the course of the school year. The results of the study suggest that participation in a community mapping project can improve students' environmental worldviews and that these changes can persist over time.

On the pre-test NEP scale students scored very high, particularly in the Rights of Nature factor. This suggests that they already held pro-environmental views. Despite their initial high scores, students' scores for the Rights of Nature factor increased significantly from the pre-test to the follow-up scores. There were no other statistically significant changes in the overall mean NEP or factor scores.

Students' post-mapping and follow-up interviews revealed that the students held a solid understanding of the plants, animals, and environments at Sandy Beach. They recalled many different species of plants and animals at the park, some by specific names, and were able to describe and explain some of the natural phenomena they observed. The students' discussions suggested that the park was important to them and they were developing concern for the living things there. However, many comments indicated that the students' continued to hold strongly anthropocentric views and that they placed humans' needs and wants above those of other living things. This was in contrast to their high scoring on the Rights of Nature factor of the NEP scale. Students' projected

anthropocentrism seemed less prevalent in the follow-up interviews indicating that students' views continued to evolve after the mapping project. The students' expressions of feelings and attitudes in the post-mapping interviews were more specific than the broader feelings shared in the follow-up interviews. This suggests that the affective impressions of the mapping experience may have changed to more generic positive feelings about the park and its environment. Students discussed the often negative impact that people can have on the park and on broad environments. Their descriptions included what those effects were but did not elaborate on how or why they were occurring. The students also shared their connections to the park as they discussed their past experiences, created names, and special places at Sandy Beach. The connections they described in the post-mapping and follow-up interviews stayed very similar, suggesting that connections to place and experience that may have been fostered by participation in the mapping project remained steady.

In all, this study suggests that participation in the community mapping project of Sandy Beach Provincial Park has influenced students' environmental worldviews as students developed knowledge, positive attitudes and feelings toward the park's environment, and lingering connections to place and experience. Although students' environmental worldviews were very positive to begin with, further improvements support the efficacy of community mapping as a pedagogical tool in environmental education. Though not specifically examined in this study, participation in this project could also lead to the restorative emotional and psychological benefits of time spent in natural spaces outlined in chapter one—improvement of mood, happiness, attention, and

concentration (Faber Taylor, Kuo, & Sullivan, 2002; Hartig, Mang, & Evans, 1991; Kaplan, 2001; Ulrich et al., 1991; Wells, 2000; Wells & Evans, 2003).

### *Limitations of the Research*

The findings of this study are encouraging for environmental education but are limited in their application to other populations and settings. The study followed one fourth grade class through a community mapping project. Data was collected from only 24 students. Data collected from such a small sample size cannot be used to confidently draw conclusions about much larger populations.

The study looked only at this class among the grade four classes and other grade groups within the school, only one school within a diverse community, and one community within a vast population. It is impossible to make confident generalizations about all students from the evidence presented in this study. In fact, the specific situated nature of the mapping project itself does not allow for easy transferability of findings to other settings.

Not only was the sample and setting specific, the qualities of the students' classroom teacher, Ms. C., limit the generalizability of the study's findings to other classes. As noted previously in chapter 3, Ms. C. is committed to including environmental education throughout the curriculum. Her students regularly take part in environmental study and discussions of environmental concerns and issues. For this reason, Ms. C.'s curriculum has an environmental focus that is not found in all classes and therefore limits the generalizability of this study's findings to classes without an underlying environmental focus.

A control group was not studied in this research project. Likewise, students were not randomly selected to take part in the research; all of the students in the class were recruited. The effect of influences outside of the mapping project can therefore not be discounted from influencing students' environmental beliefs. These influences could include visits to the park outside of the class mapping visits, discussions with family or peers about the project and the park, other classroom activities, and various forms of media.

A quantitative pre-test was completed by the students prior to beginning the mapping project but students were not interviewed before taking part in the mapping project and therefore their prior knowledge of the park was not determined. Students' understanding of and connections to Sandy Beach expressed during their interviews could have been present prior to starting the project.

I came to know and gained access to Seaside Elementary School through my nieces' enrolment at the school. One of my nieces was a past student of Ms. C. and although this aided my entry into the school culture, it also made me less of an outsider through the eyes of the students that I was working with. This may have influenced the way that they completed the NEP scales and communicated with me in the interviews and throughout the mapping project.

### *Critique of the Research Method*

This study employed a mixed methods research design as it combined quantitative experimental design with a qualitative ethnographic case study. By combining the two methods, both a broad overview of the students' environmental worldviews and a more

specific and detailed picture of the students' knowledge, attitudes, and connections to the park were revealed. Given that there are no previous studies on the influence of community mapping projects on students' environmental worldviews, the broad and detailed results provided by this study will prove useful for further related research.

Though it can identify general trends, quantitative methods can impose a dichotomy on the data that is collected. This is particularly problematic in educational research where changes in students' knowledge, attitudes, and actions are not always punctuated but instead emerge along a continuum and over time. In this study, students' overall NEP and factor scores did change but given the small sample size, the only statistically significant result was between the students' pre-test and follow-up Rights of Nature scores. Without the findings of the ethnographic study, these results would have been incredibly discouraging and would not have provided an accurate view of the changes in the students.

As noted in chapters four and five, the New Ecological Paradigm Scale for Children (Manoli et al., 2007) was not without flaws. The scale's brevity and ease of delivery and analysis made it advantageous over other much longer measures of children's environmental attitudes (Leeming et al., 1995; Mussler & Malkus, 1994) yet its shortcomings have led me to question its usefulness to environmental educators and researchers. First, the scale was tested by Manoli, Johnson, and Dunlap with students who had participated in environmental education programs, not specifically place-based environmental education projects such as this mapping project. The scale also included two factors—Eco-Crisis and Human Exemptionalism—that were not directly part of the

study's pedagogy. Ideally, the NEP scale would have been modified to reflect the place-based nature of the project and its focus on the Rights of Nature.

Unfortunately, aside from Manoli, Johnson, and Dunlap's initial study there are no other published studies that critique the scale. Even though the scale was modified to be used with elementary school students aged 10 to 12 years old and a trial was run with a group of fourth grade students, several of the items on the scale seemed unclear to the experimental group of students. Even with my further modifications of the original scale, items 2 (*There are too many (or almost too many) people on Earth*), 3 (*People are clever enough to keep from ruining the Earth*), and 6 (*Nature is strong enough to handle the bad effects of our modern lifestyle*) remained problematic. For these items, students' responses did not follow any particular pattern which could indicate their miscomprehension of the statements.

One factor included in the NEP scale was especially problematic and yielded inconsistent results: Human Exemptionalism. The students' scores for this factor varied considerably and had the widest standard deviations of all the factors. This indicates that the mean scores did not accurately reflect the students' actual scores. The items measuring Human Exemptionalism (items 3, 6, and 9- *People will someday know enough about how nature works to be able to control it*) were the statements that, noted previously, were the most difficult to clearly comprehend. Had the Human Exemptionalism factor been dropped from the analysis, a more favourable outcome—positive environmental worldview—would have been evident.

In order for students' environmental worldviews to be more deeply understood, all of the NEP scale items need to be discussed with students. The NEP scale might be

more effective if used as prompting statements in student interviews rather than as a written scale. This would allow for researchers to easily identify and clarify students' miscomprehension of scale items. It would also allow students to go beyond simply stating whether they agree or disagree with a statement. They would instead be able to elaborate on how and why they hold these views and in turn reveal much more illuminating data to the researcher. In future research, this is how I would choose to use the NEP scale.

The post-mapping and follow-up interviews were conducted as group interviews so as to reduce students' anxiety and hopefully make them more comfortable in a very different setting from the classroom. To make transcription easier, all of the interviews were videotaped. Despite being with their peers, it is probable that the presence of the video camera made some students feel uneasy and less willing to engage in conversation. On the other hand, some students seemed to enjoy the novelty of being filmed and acted silly for portions of the interviews. This reaction may have turned students' attention away from the interview questions, resulting in comments that may not have expressed the depth of students' views and ideas.

A further distraction to students was the room used for the interviews: the art supply and teacher preparation room. Ideally, the interviews would have been set in a familiar location such as the students' own classroom or the school library. Practically, this was not possible as the interviews took place during school hours when these rooms were occupied.

The interviews themselves ran between 15 and 30 minutes depending on the group and the students were asked seven questions, some of which had more than one

part. While many students seemed quite content to be interviewed for that length of time, some grew restless and appeared tired of the process. With these students, their responses to the last few questions tended to be brief and likely were not indicative of their actual thoughts. Similarly, students that were interviewed right before recess or lunch tended to be more distracted than those who were interviewed first thing in the morning or right after recess. Also, the post-mapping interviews took place in early December when the school was preparing for a holiday concert and students were excited about the coming winter break. This was a further distraction for students.

### *The Significance of Insignificance*

The statistical analysis of the students' NEP scale data showed that the only change that was significant was that between the pre-test and follow-up Rights of Nature scores. Statistically all other changes were insignificant. Taking this at face value, the mapping project could be seen as rather unsuccessful. However, when the lack of significant changes is more closely examined, many possibilities emerge and perhaps significance arises out of insignificance.

First, as previously noted, topics related to the Eco-Crisis and Human Exemptionalism factors were not directly included within the mapping project. For this reason, changes in those factors would not be expected and would be quite a surprise to observe. The consistency of these factors and the change in the Rights of Nature factor support the efficacy of the teaching and experiential learning within the mapping project.

The insignificant change between pre-test and post-test Rights of Nature scores and the significant change between pre-test and follow-up Rights of Nature scores alludes

to the extent of time needed for students' environmental attitudes to change. Past studies of students' attitudinal changes have highlighted the difficulty in changing and measuring students' environmental attitudes (Armstrong & Impara, 1991; Bogner, 1998; Dimopoulos, Paraskevopoulos, & Pantis, 2008; Eagles & Demare, 1999; Haluza-Delay, 2001; Ryan, 1991; Stern, Powell, & Ardoin, 2008). The results of this study suggest that changes in environmental attitude become measurable at around three months beyond the pedagogy. This finding supports the use of longer follow-up wait times in research into the efficacy of environmental education programs in changing students' attitudes toward the environment. Similarly, the length of time needed to change environmental attitudes suggests that environmental education programs themselves should be longer term.

Not only should the issue of significance arise in the quantitative component of mixed methods research but it is also relevant in qualitative data analysis. Rather than using a statistical test to determine significance, the researcher determines the significance of results. In this study, the conversations and discussions related to the project that continued well beyond the end of the planned mapping activities were significant. Students continued to make connections to the project as they shared stories of their experiences at the park and described to other students and members of the school community what they did during the project. What the students were doing was extending the project and continuing to do mapwork—making sense of place and their role within it—through their lasting conversations.

Within mixed methods research, significance exists in the communication between quantitative and qualitative results. In this study, there was a single statistically significant quantitative result that, if viewed in isolation, could be considered limiting.

However when read through a lens inclusive of the qualitative findings, the significance of the quantitative analysis is expanded and is in fact complementary to the qualitative data. From this conversation the research question is further illuminated and the significance of the research emerges. Here, the data from student interviews troubled the NEP data analysis and highlighted that, though not statistically significant, there were emerging changes in the students' attitudes specific to the project. Along with the trends evident in the qualitative data, the significant change in students' Rights of Nature score at a delay of three and a half months suggests that student attitudes take time to change and that research on students' developing environmental attitudes should be done at extended intervals beyond the end of environmental education programs.

#### *Future Research*

Given the lack of research on the efficacy of community mapping projects in positively influencing students' environmental worldviews, it is important to continue study in this area. With this project as an initial glimpse into the possibilities for community mapping as a pedagogical tool, continued study might examine longer term projects that span the school year and wider reaching projects that bring together entire grades, grade groupings, or school communities in the mapping of local natural spaces. Undertaking research involving a larger population will allow for results to be more confidently applied to other settings and situations. Alternately, a smaller, randomly selected group of students might be studied phenomenologically to better understand the development of a positive environmental worldview in the individual student.

Additional research might compare and contrast the influences of such mapping projects on primary, intermediate, middle, and secondary school students with the environmental attitudes and beliefs of control groups. This would allow for more confident connections to be made between participation in community mapping projects and subsequent changes in students' environmental worldviews.

As environmental education seeks to create an environmentally responsible citizenship, it is critical to better understand the lasting influence of environmental education programs. Therefore follow-up studies done at longer intervals following mapping projects will help to reveal sustained and more deeply held beliefs about the environment and pro-environmental behaviour.

Planning of the community mapping project itself could involve different curricular foci. This project centred on developing students' sense of the biodiversity, ecological wealth, and interconnectedness of the park and their personal connections to it. Another longer term project could focus on students' responsibility within the park and be primarily concerned with students taking action in the park through planning and undertaking ecological restoration projects. Similarly, mapping work might focus on influencing students' ideas about ecological crises and human exemptionalism—ideas that this project did not exclusively address.

Future research might consider the influence of mapping different local locations—urban natural spaces, pristine parks, reclaimed natural spaces, and gardens—and could inform how educators might effectively utilize different natural areas as curricular resources for environmental education. Working in these areas could develop into collaborative efforts between schools, school districts, local businesses, non-profit

organizations, municipalities, and provincial and federal ministries. Research might also compare the influence of mapping work done as part of residential environmental education programs with the impact of mapping done in students' own local natural areas. Rather than single day visits to natural settings, classes might take consecutive day field trips to local natural spaces.

As much research into the efficacy of environmental education programs has relied on quantitative data collection and analysis, it would be beneficial for future research to draw more upon qualitative measures as well in a mixed method approach. This will allow for broad trends to be identified while also revealing deeper and more individualized responses, particularly those related to local issues and settings. It would also be of interest to utilize student created maps of place as measures of environmental worldview, looking at what students have drawn, labelled, written, and emphasized on their maps. Finally, rather than modifying an adult-based environmental worldview scale, a place-based environmental attitude scale for children and based on their stages of development and bonding with nature (Sobel, 1999) might be developed, tested, and validated for use with children.

#### *Implications and Recommendations for Practice and Teacher Education*

The results of this study are encouraging for teachers who are looking for a practical and effective way to include environmental education in their curriculum—community mapping projects can help to students meet the knowledge, attitude, and behaviour goals of environmental education. Community mapping projects incorporate environmental education's objectives in a meta-disciplinary approach and can easily

incorporate problem- and issues-based approaches to learning. The mapping activities naturally draw from all subject areas and therefore do not require extensive additional preparation time commitments. The mapwork is adaptable to the unique nature of places and activities can develop students' environmental knowledge, attitudes, and behaviours. Community mapwork involves learning in local, natural environments. Students learn to recognize and respect their local ecosystems and can then apply that understanding to larger natural systems. By working locally, it is much easier and less expensive to include repeat visits to the mapping site. Spending more time in the natural settings can help students to develop lasting and meaningful connections to the natural world that can translate into deeply held values and later environmentally responsible citizenship.

Within the mapping project itself, the use of digital photography to visually capture many of the students' experiences at the park was particularly useful as it allowed students to easily recall some of the features and phenomena that they had observed at the park and gave them material to use in their map creations. It was also important to have repeated visits to the park and to allow students some freedom in choosing the places that they would like to explore at the park. In this project, Ms. C. and I did several mapping practice activities with the students at the school. In future projects, I do not think that students would need as much practice before getting into mapping the park. Also, since the students were so familiar with the park itself, they did not need to be introduced to it and could have gone straight into the mapping work. The students' familiarity to the mapping site would need to be determined by the teacher and introductory experiences adjusted accordingly.

For teachers and teacher education programs, this project highlights the value of including locally situated experiential learning opportunities in the curriculum. These findings are not only applicable to environmental study but to all other areas of the curriculum. Likewise, extended periods of time spent in places are valuable in such projects. Also, a high level of teacher involvement and commitment was essential in the success of this mapping project. Ms. C. actively embodied the characteristics of responsible environmental citizenship throughout the project and gave the students a positive role model to follow. Noted by Stern, Powell, and Ardoin (2008), greater teacher involvement in environmental education instruction can improve student outcomes. In this project, positive teacher engagement within the lived curriculum was also critical.

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## Appendix A: Student Consent Form

[UVic letterhead]

September 2, 2008

Dear Student:

My name is Susan Jagger and I am a graduate student at the University of Victoria. I am interested in your feelings about the environment and how your feelings changes after taking part in a mapping project of Sandy Beach Provincial Park. I am especially interested in how these changes last through the school year.

During the fall, you will be taking part in a mapping project that I will be co-teaching with Ms. C. I will be studying how you feel about the environment before and after the project. To do this, I will ask you to complete question sheets and I will interview you in groups. You will complete the question sheets three times: in September before the project begins, in late November or early December after the project is completed, and in late March or early April four months after the end of the project. These will be done in the classroom during school hours. Your group interviews will take place twice: after the end of the project in late November or early December and four months after the end of the mapping project in late March or early April. They will be done at the school during school hours. Your question sheets and interviews will not be graded and do not count for class marks. I will also videotape the interviews so that I can note your responses.

I do not think that taking part in my research will get in the way of your regular school activities. I also do not think that there will be any risks to you by taking part in my research. By taking part in this project, your attitude toward the environment may improve. Teachers may understand how mapping projects can change students' environmental attitudes and will have a model project to follow with their classes.

You can answer any of the questions and participate in the interviews if you want to. Before doing each question sheet and interview, I will remind you of this. You may choose not to share your answers from the questions sheets and interviews up until my final paper is handed in. After this, my research becomes public and anybody can read it.

If you do participate, I will change your names in my project. The videotapes will only be seen by myself and possibly Ms. C. and my university supervisor, Dr. David Blades. I may use still images or video clips from the interviews in presentations of my research.

The results of this study will be shared with other people after my paper is handed in. I may also share my results with the teachers at your school in a presentation.

Your answers and interview responses will be kept in my computer files. Your questions sheets will be kept in files at my home. I will keep your answers and interview responses

for five years so that I can use them in possible future research projects. After five years, I will erase the computer files and shred your question sheets.

If you have any questions about the question sheets, interviews, or my project, please feel free to contact me (250-370-2720 or [sjagger@uvic.ca](mailto:sjagger@uvic.ca)) or my supervisor, Dr. David Blades (250-519-1084 or [dblades@uvic.ca](mailto:dblades@uvic.ca)). You may also contact the Human Research Ethics Board at the University of Victoria (250-472-4545 or [ethics@uvic.ca](mailto:ethics@uvic.ca)).

If you agree to take part in my research, please fill in the blanks below.

Thank you,

Ms. Susan Jagger

I, (please print your name here) \_\_\_\_\_,  
give my permission to complete questionnaires and interviews in this research project. I  
understand that the interviews will be videotaped.

Your name: \_\_\_\_\_ Today's date: \_\_\_\_\_

## Appendix B: Parent Consent Form

[UVic letterhead]

September 2, 2008

Dear Parents:

My name is Susan Jagger. As a part of my Master of Arts in Curriculum Studies at the University of Victoria, I am researching elementary students' attitudes toward the environment and how these attitudes change with experiences in local natural spaces. I am particularly interested in how these changes, if any, linger over the course of a school year.

During the fall, your child will be taking part in a mapping project that I will be co-teaching with Ms. C. I will be studying how the students feel about the environment before and after the project. To do this, the students will be asked to complete questionnaires and I will be interviewing the students in groups. Questionnaires will be completed in September before the project begins, after the project is completed in late November or early December, and four months after the end of the project in late March or early April. Group interviews will take place after the project's completion in late November or early December and again in late March or early April. The interviews will last about 30 minutes and will take place at the school during school hours. These questions and interviews will not be graded and do not count for class assessment. Participation with the questionnaire or interviews is completely voluntary. I will also videotape the interviews to make transcription and understanding of student responses easier.

I do not anticipate any inconveniences to the students by participating in this research. Similarly, there are no known or anticipated risks to the students by participating in this research. The potential benefits to the students include improved environmental attitudes. Through this research, educators may better understand the effects of community mapping on students' environmental attitudes.

To ensure that students continue to consent to participate in this research, at the beginning of each co-teaching session, I will tell the students that their participation in the questionnaires, interviews, and videotaping is voluntary. I will remind them that they may withdraw from the research at any time until my thesis is defended. At this time, research findings become public.

To guarantee anonymity of students, I will change the students' names in my thesis. Neither will the school, any teachers, or administration be revealed in my work. The videotapes of interviews and classes will only be viewed by myself and possibly Ms. C. and my university supervisor, Dr. David Blades. I may use still images or video clips from interviews in presenting my research results.

The results of this study may be shared with other educators. I also anticipate sharing results with school staff in a presentation.

Data from this study will be kept in password protected computer files. Paper records will be kept in files at my home. The data will be kept for five years to allow for use in possible future research projects. After this time, computer files will be deleted and paper records will be shredded.

If you have any questions about the questionnaires, interviews, or my project in general, please feel free to contact me (250-370-2720 or [sjagger@uvic.ca](mailto:sjagger@uvic.ca)) or my supervisor, Dr. Blades (250-519-1084 or [dblades@uvic.ca](mailto:d blades@uvic.ca)).

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Board at the University of Victoria (250-472-4545 or [ethics@uvic.ca](mailto:ethics@uvic.ca)).

If you give permission for your child to participate in this research project, please complete and sign the form below.

Thank you,

Susan Jagger

My child, \_\_\_\_\_, has my permission to complete questionnaires and interviews in this research project. I understand that the interviews will be videotaped.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix C: NEP Scale for Children

Dear Students,

Please complete the following table. Read each sentence and check the appropriate box: really agree, agree, not sure, disagree, or really disagree.

	Really agree	Agree	Not sure	Disagree	Really disagree
Plants and animals have as much right as people to live.					
There are too many (or almost too many) people on earth.					
People are clever enough to keep from ruining the earth.					
People must obey the laws of nature.					
When people mess with nature it has bad results.					
Nature is strong enough to handle the bad effects of our modern lifestyle.					
People are supposed to rule over nature.					
People are treating nature badly.					
People will someday know enough about how nature works to be able to control it.					
If things don't change, we will have a big disaster in the environment soon.					

## Appendix D: Interview Questions

1. What plants and animals did you see or hear at the park?  
Where did you see or hear them?  
What animal signs did you see at the park, such as footprints, feathers, or holes in trees?  
What smells did you noticed in the park?
2. What is your favourite park of the park? Why?
3. What part of the park do you not like? Why?
4. How do people use the park?  
How does this affect the plants and animals?  
Does the park environment fix itself after being changed or damaged?
5. How is Sandy Beach different from the rest of Seaside?
6. How is Sandy Beach different from other parks, for example the park at school and the community park?
7. Is Sandy Beach important to you? Why or why not?

## Appendix E: Frequency Distributions of Students' Responses to the NEP Scale (Pre-Test)

Scale Item	Responses (% of students)				
	Really Agree	Agree	Not Sure	Disagree	Really Disagree
1. Plants and animals have as much right as people to live.	43.48	34.78	21.74	0.00	0.00
2. There are too many (or almost too many) people on Earth.	0.00	26.09	30.43	26.09	17.39
3. People are clever enough to keep from ruining the Earth.	21.74	21.74	21.74	26.09	8.70
4. People must obey the laws of nature.	56.52	39.13	4.35	0.00	0.00
5. When people mess with nature it has bad results.	43.48	30.43	17.39	4.35	4.35
6. Nature is strong enough to handle the bad effects of our modern lifestyle.	13.04	21.74	21.74	34.78	8.70
7. People are supposed to rule over nature.	4.35	4.35	13.04	13.04	65.22
8. People are treating nature badly.	39.13	26.09	21.74	8.70	4.35
9. People will someday know enough about how nature works to be able to control it.	4.35	13.04	30.43	4.35	47.83
10. If things don't change, we will have a big disaster in the environment soon.	56.52	8.70	21.74	4.35	8.70

*Note.* Items 3, 6, 7, and 9 (anti-environmental) were reverse scored to obtain an overall NEP Score. Items 1, 4, and 7 are included in the Rights of Nature factor, items 2, 5, 8, and 10 are in the Eco-Crisis factor, and items 3, 6, and 9 are in the Human Exemptionalism factor.

Appendix F: Students' Pre-Test Mean NEP and Factor Scores

Student	Factor			Total
	Rights of Nature	Eco-Crisis	Human Exemptionalism	
Alice	4.67	3.25	3.33	3.7
Bailey	3.67	4.25	3.33	3.8
Charles	5.00	4.00	1.67	3.6
Dana	4.33	4.25	2.00	3.6
Ethan	4.33	4.75	4.67	4.6
Finn	4.67	3.75	4.00	4.1
Gemma	5.00	3.50	4.00	4.1
Ian	5.00	3.50	1.67	3.4
Jack	4.33	4.00	4.00	4.1
Karen	3.33	2.25	4.33	3.2
Lisa	5.00	3.75	1.33	3.4
Mark	4.33	2.75	3.67	3.5
Norah	4.67	4.75	4.33	4.6
Oliver	4.67	3.75	4.00	4.1
Paige	2.67	3.50	2.33	2.9
Quinn	3.67	1.50	3.33	2.7
Rachel	4.33	3.50	3.67	3.8
Sienna	4.67	4.00	3.67	4.1
Tara	4.67	4.00	3.67	4.1
Victor	4.33	4.00	1.67	3.4

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William	4.00	4.50	3.00	3.9
Xavier	4.33	3.50	3.33	3.7
Zoe	4.33	2.75	2.67	3.2
Class Mean	4.35	3.64	3.20	3.72

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Appendix G: Frequency Distributions of Students' Responses to the NEP Scale (Post-Test)

Scale Item	Responses (% of students)				
	Really Agree	Agree	Not Sure	Disagree	Really Disagree
1. Plants and animals have as much right as people to live.	82.61	13.04	4.35	0.00	0.00
2. There are too many (or almost too many) people on Earth.	4.35	21.74	47.83	8.70	17.39
3. People are clever enough to keep from ruining the Earth.	26.09	17.39	13.04	34.78	8.70
4. People must obey the laws of nature.	78.26	13.04	8.70	0.00	0.00
5. When people mess with nature it has bad results.	47.83	34.78	8.70	8.70	0.00
6. Nature is strong enough to handle the bad effects of our modern lifestyle.	17.39	8.70	13.04	30.43	30.43
7. People are supposed to rule over nature.	0.00	4.35	0.00	34.78	60.87
8. People are treating nature badly.	47.83	30.43	17.39	0.00	4.35
9. People will someday know enough about how nature works to be able to control it.	17.39	4.35	21.74	21.74	34.78
10. If things don't change, we will have a big disaster in the environment soon.	43.48	34.78	17.39	0.00	4.35

*Note.* Items 3, 6, 7, and 9 (anti-environmental) were reverse scored to obtain an overall NEP Score. Items 1, 4, and 7 are included in the Rights of Nature factor, items 2, 5, 8, and 10 are in the Eco-Crisis factor, and items 3, 6, and 9 are in the Human Exemptionalism factor.

Appendix H: Students' Post-Test Mean NEP and Factor Scores

Student	Factor			Total
	Rights of Nature	Eco-Crisis	Human Exemptionalism	
Alice	4.67	3.25	4.00	3.9
Bailey	4.67	4.75	1.33	3.7
Charles	5.00	4.50	4.33	4.6
Dana	4.67	3.50	1.67	3.3
Ethan	5.00	3.75	4.33	4.3
Finn	4.33	3.75	2.67	3.6
Gemma	5.00	3.50	2.67	3.7
Ian	5.00	3.50	3.33	3.9
Jack	4.00	4.25	3.00	3.8
Karen	4.33	2.50	3.67	3.4
Lisa	4.00	2.00	2.33	2.7
Mark	4.00	3.00	4.00	3.6
Norah	5.00	4.75	4.33	4.7
Oliver	5.00	3.75	3.67	4.1
Paige	4.67	4.50	3.33	4.2
Quinn	4.33	4.00	3.33	3.9
Rachel	4.33	5.00	3.67	4.4
Sienna	5.00	4.50	4.33	4.6
Tara	4.67	4.00	3.33	4.0
Victor	5.00	4.75	2.33	4.1

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William	4.67	4.00	2.00	3.6
Xavier	5.00	4.25	4.00	4.4
Zoe	5.00	2.75	3.67	3.7
Class Mean	4.67	3.85	3.28	3.92

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## Appendix I: Pairwise Comparisons of Mean Scores of NEP Scale and Factors

Measure	Compared Scores		Significance
Rights of Nature	Pre-test (13.04)	Post-test (14.00)	0.059
	Pre-test (13.04)	Follow-up (14.04)	0.044
	Post-test (14.00)	Follow-up (14.04)	1.000
Eco-Crisis	Pre-test (14.57)	Post-test (15.39)	0.750
	Pre-test (14.57)	Follow-up (15.39)	0.698
	Post-test (15.39)	Follow-up (15.39)	1.000
Human Exemptionalism	Pre-test (9.61)	Post-test (9.83)	1.000
	Pre-test (9.61)	Follow-up (9.39)	1.000
	Post-test (9.83)	Follow-up (9.39)	1.000
Total	Pre-test (37.22)	Post-test (39.22)	0.287
	Pre-test (37.22)	Follow-up (38.83)	0.413
	Post-test (39.22)	Follow-up (38.83)	1.000

Based on estimated marginal means.

The mean scores analyzed were the sum of mean scores for each factor and overall NEP scale.  
Significance has been adjusted for multiple comparisons (Bonferroni).

Appendix J: Frequency Distributions of Students' Responses to the NEP Scale (Follow-Up)

Scale Item	Responses (% of students)				
	Really Agree	Agree	Not Sure	Disagree	Really Disagree
1. Plants and animals have as much right as people to live.	82.61	13.04	4.35	0.00	0.00
2. There are too many (or almost too many) people on Earth.	13.04	30.43	30.43	17.39	8.70
3. People are clever enough to keep from ruining the Earth.	34.78	17.39	13.04	21.74	13.04
4. People must obey the laws of nature.	65.22	21.74	8.70	4.35	0.00
5. When people mess with nature it has bad results.	52.17	21.74	26.09	0.00	0.00
6. Nature is strong enough to handle the bad effects of our modern lifestyle.	17.39	21.74	8.70	34.78	17.39
7. People are supposed to rule over nature.	0.00	0.00	4.35	13.04	82.61
8. People are treating nature badly.	26.09	47.83	17.39	0.00	8.70
9. People will someday know enough about how nature works to be able to control it.	8.70	8.70	26.09	21.74	34.78
10. If things don't change, we will have a big disaster in the environment soon.	47.83	21.74	21.74	8.70	0.00

*Note.* Items 3, 6, 7, and 9 (anti-environmental) were reverse scored to obtain an overall NEP Score. Items 1, 4, and 7 are included in the Rights of Nature factor, items 2, 5, 8, and 10 are in the Eco-Crisis factor, and items 3, 6, and 9 are in the Human Exemptionalism factor.

Appendix K: Students' Follow-up Mean NEP and Factor Scores

Student	Factor			Total
	Rights of Nature	Eco-Crisis	Human Exemptionalism	
Alice	4.67	2.50	2.00	3.0
Bailey	5.00	5.00	2.33	4.2
Charles	4.67	4.25	3.00	4.0
Dana	5.00	3.75	3.00	3.9
Ethan	5.00	4.50	4.67	4.7
Finn	4.67	4.50	4.67	4.6
Gemma	4.67	3.00	2.67	3.4
Ian	5.00	3.75	3.33	4.0
Jack	3.67	4.25	3.67	3.9
Karen	3.67	2.50	4.33	3.4
Lisa	4.67	2.50	2.00	3.0
Mark	4.00	3.25	3.33	3.5
Norah	5.00	4.75	4.67	4.8
Oliver	5.00	3.75	3.67	4.1
Paige	4.33	5.00	1.33	3.7
Quinn	5.00	4.00	2.67	3.9
Rachel	4.33	4.00	2.33	3.6
Sienna	5.00	4.75	4.33	4.7
Tara	4.67	3.50	3.33	3.8
Victor	5.00	4.50	2.33	4.0

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William	5.00	3.75	1.33	3.4
Xavier	5.00	3.25	3.00	3.7
Zoe	4.67	3.50	4.00	4.0
Class Mean	4.68	3.85	3.13	3.88

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Appendix L: Comparison of Mean Scores on NEP and Standard Deviations (n=23)

Factor	Pre-Test		Post-Test		Follow-Up	
	M	SD	M	SD	M	SD
Rights of Nature	4.35	0.84	4.67	0.63	4.68	0.63
Eco-Crisis	3.64	1.18	3.85	1.02	3.85	1.05
Human Exemptionalism	3.20	1.28	3.28	1.09	3.13	1.06
Total Score for Scale	3.72	1.11	3.92	1.03	3.88	1.03