Children, Youth and Environments 24(2), 2014

Taking Kindergartners Outdoors: Documenting Their Explorations and Assessing the Impact on Their Ecological Awareness

Enid Elliot
Kayla Ten Eycke
Sharon Chan
Ulrich Müller
University of Victoria
Victoria, British Columbia, Canada

Citation: Elliot, Enid, Kayla Ten Eycke, Sharon Chan, and Ulrich Müller (2014). "Taking Kindergartners Outdoors: Documenting Their Explorations and Assessing the Impact on Their Ecological Awareness." *Children, Youth and Environments* 24(2): 102-122. Retrieved [date] from: http://www.jstor.org/action/showPublication?journalCode=chilyoutenvi.

Abstract

Initiated by a team of educators and academics, the only full-day nature kindergarten program in British Columbia started operations in September 2012 at a local elementary school. Following the model of forest schools in Scandinavian countries, the nature kindergarten provides young children with large amounts of time in natural outdoor settings where they can play, explore and experience natural systems and materials. In this paper, we describe the creation of the nature kindergarten and the pedagogical principles on which it is based. We also illustrate children's experiences outdoors. Finally, we report preliminary findings of our research evaluating the effects of being in nature on children's nature relatedness and their environmentally responsible behavior.

Keywords: nature kindergarten, outdoor education, nature relatedness

Initiated by a team of educators and academics, the only full-day nature kindergarten program in British Columbia started operations in September 2012 at a local elementary school. Following the model of forest schools in Scandinavian countries, the nature kindergarten program provides young children with large amounts of time in natural outdoor settings where environmental education is put into context through play, exploration and the experience of natural systems and materials. Every morning, regardless of the weather, educators engage children in the investigation of natural phenomena and learning about the place in which they live.

In this paper, we (a) provide a rich documentation (also called pedagogical narration; British Columbia Early Learning Framework 2008) of the nature kindergarten curriculum implementation, and (b) evaluate the effect of the nature kindergarten on participating children's ecological awareness. We start by presenting research on children's environmental knowledge and attitudes, then describe the idea of forest schools, the creation of the nature kindergarten, and the pedagogical principles that guide its implementation.

Experience of Nature, Nature Relatedness, and Environmental Attitudes

Given the decrease in nature-based recreation over the past few decades (Pergams and Zaradic 2008), there is concern that this reduction in outdoor experiences negatively affects children's environmental knowledge and their attitudes towards nature. Several studies have shown that—at least in highly developed Western countries—children's knowledge and perception of local biodiversity is very limited (Balmford et al. 2002; Lindemann-Matthies 2002). Moreover, in a study based on 50 in-depth child interviews, Strife (2012) reported a worrisome trend of "ecophobia," where children expressed pessimism, fearfulness, sadness, and anger towards environmental problems.

Despite some belief that young children have difficulty understanding complex environmental concepts, there is evidence that young children are interested in and understand some of these concepts (Grodzinska-Jurczak et al. 2006; Palmer and Suggate 2004). A number of studies have examined environmental attitudes in middle- and high-school students (e.g., Larson, Green and Castleberry 2011; Leeming, Dwyer and Bracken 1995; Manoli, Johnson and Dunlap 2007; Powell et al. 2011; Williams and McCrorie 1990), but few studies have assessed environmental attitudes in younger children (Evans et al. 2007). Williams and McCrorie (1990) found that 6- to 8-year-olds hold pro-environmental attitudes and tend to behave in a manner that is environmentally responsible. With the aid of graphically depicted scenarios, children as young as 3 to 5 years are able to identify ecological issues with accuracy (Cohen and Horm-Wingerd 1993). Young children are also capable of taking environmental action and can influence the wider community to act more sustainably (Davis et al. 2005).

Children achieve particularly high ecological awareness and a strong environmental ethic if the acquisition of these concepts is embedded within an active learning context (Knapp and Poff 2001). When outdoors, children have the opportunity to experiment with materials in new and unrestricted ways, which facilitates the

acquisition of practice-based, concrete knowledge of nature as opposed to abstract knowledge of nature derived from secondary sources (Bilton 2002; Lindemann-Matthies 2006; Ouvry 2003). Such experiential, practice-based learning may be especially important for young children who have limited abstraction abilities (Bennett and Müller 2010).

Several studies suggest that environmental education programs can promote environmental understanding and pro-environmental attitudes (e.g., Bogner 2004; Evans et al. 2007; Siemer and Knuth 2001; but see Bogner 2002). For example, in a Turkish study involving a nature camp program for fourth- and fifth-graders, researchers found that children extended their conceptions of nature over the course of the program (Yardimici and Leblebicioglu 2012). Similar findings emerge from urban settings. For example, Shwartz and colleagues (2012) found a strong, positive correlation between participation in an urban nature conservation activity day and immediate interest toward local urban biodiversity. Over time, however, participants did not extend their interest to participating in related activities. This may suggest that the benefit of nature-based education requires longer engagement in the programs. However, in another study, children who attended an environmental education field trip had lasting experiences; they remembered their visit and were found to have developed pro-environmental attitudes one year after the trip (Farmer, Knapp and Benton 2007).

Although research has shown that environmental education has positive effects on children's environmental attitudes, recent research has also emphasized the importance of children simply spending more time outdoors. Collado, Staats and Corraliza (2013) found that prolonged exposure to nature was an important factor in promoting emotional affinity towards nature, which in turn mediated children's willingness to carry out daily conservation actions. Furthermore, a number of retrospective studies have linked frequent outdoor experiences and direct interactions with nature during early childhood to the development of a positive attitude toward the environment (Bögeholz 2006; Chawla 1998; 1999; Palmberg and Kuru 2000; Ward Thompson, Aspinall and Montarzino 2008; Wells and Lekies 2006). For example, recent research suggests that adults who experienced greater exposure to nature as children desired more nature-based experiences in later life and were more likely to employ strategies to overcome constraints in participating in such activities (Asah, Bengston and Westphal 2012; Cheng and Monroe 2012).

Nevertheless, there is a particular need for school-based environmental education, as many parents often miss teaching opportunities to make outdoor experiences meaningful to their children, despite a willingness to take their children into natural settings (Dai 2011). On the basis of these findings, early childhood educators have stressed the importance of connecting children to nature as a means of fostering environmental awareness and sustainable behavior (Maynard and Waters 2007). However, no study has systematically investigated whether intensive environmental education in the context of a nature kindergarten program affects children's affinity or relatedness to nature and their environmental behavior.

Creating a Nature Kindergarten

The idea that nature is a "teacher" has been part of early childhood educational thought for several hundred years (Carlgren 1976; Montessori 1971). This idea served as a foundation and motivated the creation of forest schools in Europe. Over 40 years ago "rain or shine" schools were created in Denmark. These schools spread to Germany where they were called *Waldkindergartens*. These "forest schools" have provided outdoor experiences for children in the early years (3 to 6 years old). Considered good options for young children's education, forest schools have been enthusiastically embraced by educators, parents and children in Norway, Sweden, Switzerland, Germany and Denmark. Research in these European settings has shown that the children attending forest or nature kindergartens go on to do well in primary school and beyond (Gorges 2000; Kiener 2004). Within the last 15 years, the UK has also been developing a forest school system (Knight 2009; Warden 2010), with Australia and New Zealand also following this model.

While there have been many educators in Canada who take young children outside on an informal basis and provide experiences focused on local nature, there has been little organized commitment to young children's learning outdoors in natural settings. However, interest has been growing; for example, Carp Ridge Forest Preschool near Ottawa, which was modeled after the forest schools, was established in 2009, and the Equinox School in Toronto has also recently created an outdoor kindergarten class.

Inspired by her son's *Waldkindergarten* experience in Germany, Frances Krusekopf, a district principal in the Sooke School District on southern Vancouver Island, saw the possibilities of creating a similar program through both parental eyes and an educator lens and wondered how the experience might work for the children in her school district. She connected with Enid Elliot, a faculty member in the Early Childhood Education department of Camosun College in Victoria, British Columbia, who had done research on local early childhood programs with children and with early childhood educators regarding their experiences outdoors. Having read about forest schools in Europe and having seen the example of the Carp Ridge Forest Preschool, Enid was similarly interested in developing an outdoor early childhood program in Victoria as a model for engaging children in learning and growing outdoors.

Gaining the Sooke school board's support, Frances and Enid gathered an advisory committee who began planning a nature kindergarten. There was a great deal of community interest, which included faculty and staff from the University of Victoria, Camosun College and Royal Roads University, as well as the Royal British Columbia Museum, Capital Regional District Parks, and other community groups and individuals. Kindergarten teachers and early childhood educators collaborated on a plan to establish a two-year pilot project in which 22 students would spend the mornings from 9:00 to 11:45 outside their school, exploring their local natural environment in an intact old-growth Douglas Fir forest located adjacent to Royal Roads University.

The advisory committee worked to develop pedagogical principles, a risk management plan, job descriptions for the teacher and early childhood educator,[1] and an orientation for the teacher, educator and other interested people. The British Columbia Curriculum governs the province's public schools and uses the British Columbia Early Learning Framework as a guide during early childhood (Government of British Columbia 2008). Drawing from this curriculum framework, the advisory committee created principles to articulate the manner and attitude with which the nature kindergarten would be undertaken. The following set of pedagogical principles were developed to help inform and guide the program: (a) connecting deeply with nature; (b) aboriginal ways of knowing; (c) physical and mental health; (d) learning as part of the community; and (e) environment as a teacher. Over time and with experience of the actual program, these dynamic principles were modified through thoughtful discussion to become: (a) connecting deeply with nature through play; (b) local ways of knowing and understanding; (c) physical and mental health; (d) learning collaboratively as part of an empathetic community, and (e) the environment as a co-teacher.

Evaluating the Nature Kindergarten

While one part of our project was to create and implement a nature kindergarten program, the other part of the plan was to evaluate the effects of participating in the program on children through collaboration between the teachers and school district, universities and college. We used both qualitative and quantitative methods in the evaluation. First, Enid Elliot conducted a rich documentation of the Nature Kindergarten curriculum implementation throughout the year, and she used a variety of methods including observation, interviews, digital photography by children and researchers, drawing, and narrative to capture children's experience in the nature kindergarten. This innovative process of interpretively representing children's explorations and inquiries helped the program developers to refine the pedagogical principles and learning activities (MacDonald 2007; Rinaldi 2001; 2005; 2006). The rich documentation also became an important part of the research data set. Including children's voices and perspectives in our planning and research is important for understanding the meaning of the experience for the children. This approach is part of a growing trend to utilize multiple ways of including children's inputs about their environment (Clark 2010; Clark, Kjorholt and Moss 2005; Clark and Moss 2001; Stacey 2009).

Second, we evaluated the effects of the nature kindergarten on a variety of aspects of children's functioning, including their activity level, motor coordination, attentional regulation, social skills, well-being, nature relatedness and environmentally responsible behavior. Children in the nature kindergarten and in regular kindergarten classes were assessed at the beginning and toward the end of the school year, and changes in these areas of functioning were compared. In this paper, we focus on the findings regarding nature relatedness and environmentally responsible behavior.

Method

Context

The nature kindergarten started in September 2012 with a kindergarten teacher, an early childhood educator and a full kindergarten class of 22 (which dropped to 21 after the first six weeks). Neither the teacher nor the educator had taught a full year of kindergarten before, nor had been outside with a class every morning in all weather conditions.

Documenting, Thinking and Narrating

Each week Enid Elliot went with the nature kindergarten class into the forest, or to the nearby beach if there was too much wind or there had been a cougar sighting. She wrote observations, took notes and photographed—as well as held hands, listened to ninja stories, wondered at worms and "spotted" for tree climbers. She was "Miss Enid" with an "Auntie" status amongst the children. Being able to share with the children and later with the educators gave her a unique view of the program.

Being outside each week, she experienced the weather and the setting; two-and-a-half hours in the pouring rain in winter gave her a better sense of both the children's and the educators' experiences. She understood better how to keep warm in a downpour; came to appreciate the children's understanding of the cedar tree as a friend who could lessen the force of the rain when stood beneath; and appreciated the differences that came with the change in seasons as she walked down the class' familiar path.

Assessing Nature Relatedness and Environmentally Responsible Behavior

In research on adults, the construct of "nature relatedness" captures affective, cognitive, and experiential aspects of an individual's affinity to nature (Nisbet, Zelenski and Murphy 2009). Nature relatedness has been linked to participation in environmental organizations, activities in nature, and self-identification as an environmentalist (Nisbet, Zelenski and Murphy 2009). There is very little research on nature relatedness in young children, and there has been no study measuring this construct in kindergartners. We were also interested in assessing children's environmentally responsible behavior. Several standardized measures of this construct are available for adults (e.g., Kaiser and Wilson 2000); yet again, there is a scarcity of measures for very young children.

To measure children's nature relatedness and their environmental behaviors, we used a game-like assessment, adapted from previous research with elementary school children (Evans et al. 2007). The measure consisted of a game board wherein the child "competed" against the interviewer. At 11 junctures around the board, the child had to choose between various options he or she would prefer (the game was set up so that the child arrived at each junction before the interviewer). The choices were depicted graphically on the board and read aloud to the child. The first choice served as a practice item (ride in a car versus ride on the bus). Among the remaining 10 choices, four choices targeted nature relatedness (play outside versus watch television inside; walk through the forest versus walk through the

shopping mall; play with dolls or trucks versus play with sticks and leaves; and feed birds and other animals in winter versus don't feed birds and other animals in the winter), and six choices targeted environmentally responsible behavior (separating paper from regular trash versus mixing them together in one trash can; do artwork on one versus both sides of paper; use a leaf blower versus a rake to clear leaves; give your brothers and sisters or other children the toys you do not play with anymore versus throw the toys away; and turn the tap off when brushing your teeth versus leaving it on). Children received a score of 2 for choosing the more nature-oriented action or environmentally responsible option, and a score of 1 for choosing the other option. Responses to the four nature-relatedness items (maximum score of 8) and environmental behavior items (maximum score of 12) were aggregated. Previous research has shown that this type of measure has good internal consistency and temporal stability, and has excellent convergent validity with children's responses to interview questions (Evans et al. 2007).

To examine whether the experience in the nature kindergarten affected children's nature relatedness and their environmentally responsible behavior we compared the responses of children in the nature kindergarten to those of a control group of children attending regular kindergarten. The children in the control group came from two schools in the same school district as the children in the nature kindergarten. Children were assessed at the beginning (mid-October 2012) and toward the end (May 2013) of the school year. All 21 children (11 girls, 10 boys) in the nature kindergarten class and 22 children (15 girls, 7 boys) in the control group participated in the assessments of nature relatedness and environmentally responsible behavior. At the first assessment, children in the nature kindergarten were on average 63.71 (*SD* = 2.97) months old, and children in the control group were on average 63.43 (*SD* = 3.63) months old. At the second assessment, children in the nature kindergarten were on average 70.62 (SD = 3.01) months old, and children in the control group were on average 70.38 (*SD* = 3.56) months old. For all participating children, we had obtained parental consent and child assent prior to the assessment.

Results

We will first describe Enid Elliot's experiences, observations, and reflections and complement these with a narrative from the early childhood educator, Erin VanStone. Then we will summarize the findings of the assessment of participating children's nature relatedness and environmentally responsible behavior.

Documenting, Observing, and Narrating

When children went outside, they did not take toys with them. Each carried a backpack with her or his snack and water, a small first-aid pack and a little notebook and pencil in a ziplock bag. The educators brought along a stroller that contained trowels, clipboards, a tarp, and guide books. While the children had conversations about video games, the actual games they played took place in nature: among the trees, bushes and rocks, and using sticks or imagination for props. A couple of themes will illustrate children's experiences and the unique learning opportunities provided by the nature kindergarten.

First Steps—A Community of Safety
Together the educators and children practiced safety measures focusing on the creation of a "community of safety." In our planning, we all felt that emphasizing both caring for self and for others would help create safety for everyone outside. Children learned signals for gathering and for danger, and practiced simple first aid. In this practice, the children learned both to care for one another and that their individual safety depended on others, particularly in less predictable situations outside the classroom. Children were aware that there were possible dangers. Encouraging a spirit of collaboration and a sense of responsibility for the group made their time in the forest safer and encouraged the development of a community of learners who would not only care for each other, but would go on to share ideas, thoughts and skills. Focusing on safety for the group helped begin the process of creating a community that would continue to grow stronger over the year.

Community of Learners
Once the children understood some of the reasons and basic guidelines for coming together and staying together, the educators could focus on encouraging the children's collaborative thinking and learning. Children provided each other with concrete help and support; sharing with others how to get on top of a large log (often more than 1 meter in diameter), or cheering on someone's first walk rather than crawl across a mossy log, or showing a friend how to find the shrimp in the creek were all acts of support and collaboration.

After careful observations, the educator and teacher reflected on what they were learning about the children and how they would approach future planning. Through photos, videos and notes the educators were able to create narratives of the children's experiences. This example, written by the early childhood educator Erin VanStone, is from early in the year. It is entitled, "An Interview with a Tree."

The children were given the challenge to interview a tree. Equipped with a clipboard, pencil and some brainstormed questions, they set off to choose their tree. They asked the trees questions such as the following: How old are you? How tall are you? What type of tree are you? What types of animals live in you? What kinds of bugs like you?

> Zoey immediately went to the cedar tree beside our circle. She asked the tree a question and waited for an answer:
>
> *Zoey: How are you, tree? Tree? Hello? Ms. Van Stone… My tree is sleeping; it isn't talking back to me.*
> *Ms. Van Stone: Maybe you need to listen in a different way.*
> *Zoey: Oh, he said he was good. Tree, is there any animals that visit you? He said a woodpecker!*
> *Tegan: Tree, how old are you?*
> *Presley: Is there any other bugs in you? My tree is named Chloe.*
> *Jackson: This tree is smooth and bumpy. It is very tall.*
> *Rylan: It is hard.*

Elliott: It told me it is 100 years old!
Erik: And 25 meters tall.
Brady: No, it is 30 meters tall.
Erik: Wait a minute… he told me it was 25! It is tricking us!
Brady: First it was 30 meters, now it is 810 then 900.

Scarlett asked her interviewee many questions and then drew a picture of her tree. Her tree has many branches and takes up most of her page. She asks the tree, "Tree? Does this look like you?" She looks at the tree and smiles. The children all "write" their interview answers down on the paper or discuss them with the teacher and educator. They then draw a picture of their tree. After everyone is finished the children meet in the middle of the site and make a circle. Ms. Lockerbie asks the children to share their interview with their friend beside them.

In reflecting on children's interviews, the educator wrote:

Wow! What a wonderful time we had today. The children were very engaged in interviewing their tree of choice! Some children were placing their ear against the tree while others waited patiently for their tree to respond. Erik even noticed that Brady, Jackson and he were all interviewing the same tree and getting different answers. The children were all engaged in writing the height or number of animals that lived in the tree. They were learning that when you ask a question, you have to wait for an answer. I noticed children patting the tree and telling the tree what they noticed about it. Ben said to the tree, 'I notice that your needles are brown.' He then drew the brown leaves. Jackson said to the tree, 'I observe that you are big and old.' The children then engaged in a conversation about the tree's age in relation to how big it was. One child even made the connection that some of the smaller trees may be the bigger tree's baby. The children were also making connections about the types of trees they were interviewing. They then drew the characteristics of the trees that they had interviewed. The children are learning to describe and record what they see. They are then learning that they can share this information with others. They are working hard at connecting this new information with information they already know and how to draw conclusions.

The teachers also learned how to share information and build on their common experience with the children. Listening to the children's comments, asking questions and wondering aloud with children led to teaching that happened in spurts and learning that wandered from social interactions of magic ponies to encounters with worms. Teachers shared with children and children shared with teachers and with each other. Information about birds was mixed with Mario Brothers, and fear and fascination about cougars were mixed with play about dragons.

Instead of dreary recitations, teachers would incorporate lessons of counting, naming, deciphering, sorting, and cataloguing into the children's nature-immersed

experiences. Through conversations and discussions, the children developed skills in thinking and talking about their experiences. Thus, the teachers helped mediate childen's experience in nature and encouraged their explorations. Focusing on children's interests and inquiries, the teachers learned to ask their own questions of what they were seeing and learn alongside the children. Through this method they were able to gain another perspective and reflect on their teaching.

Empathy

Children entered into the other-than-human world of the old-growth forest, connecting with skunk cabbage, worms, trees and birds, which became members of the children's larger community. The children found worms for whom they made old age homes, cared for pregnant worms and wondered if a worm was a boy or girl. They spoke of "my forest" as an affectionate connection, not a possessive one. As Pelo (2013) says,

> *Empathy turns us toward the living world with imagination and curiosity, with courage enough to let go of our habitual and easy understandings... Empathy sizes us in right proportion to others, not more-than, or better-than, or worthier-than, but connected by the shared capacity for joy and suffering* (147).

To illustrate, a boy walking beside Enid showed her two worms and told her that he has a boy worm and a girl worm. She asked him how he knew that it was a girl worm and was told that the long and skinny worm was the girl worm. The teacher overheard this conversation and remarked there is a book in the school library about worms and perhaps they could look at it. Apparently, they did look at the book on worms because the next week, Enid was walking down the trail with the same boy, who showed her that week's worm. "A boy or a girl?" she asked. He looked at her condescendingly and said "worms are half boy and half girl." Theories can be formulated and re-formulated.

This example shows that not only were children developing relationships with each other they were developing relationships with the worms and trees in their forest. Through these connections, they created "kinship relationships and rules for sharing and caretaking that weave the clans together" (Sobel 2008, 30), as is illustrated in the next example.

One day walking to our site during a heavy downpour, Chloe noticed a large rock embedded in the trail. Enid wondered if the rain was uncovering the rock while Chloe thought it might be growing. Another child suggested it might be moving. In the forest, all was possible. The children seemed to experience a sense of kinship with rocks that grow and worms that have babies and trees that communicate. The children paid attention to the world they found outside, and not only were they paying attention, they seemed to be engaged fully. Walking down the trail, looking for worms, hearing the breezes, feeling the rain and sun, the children's bodies were engaged as they connected to the experience. Meaning seemed to be "rooted in the sensory life of the body" (Abram 1996, 80).

Deep Engagement

Being outside in a forest setting, children's learning and experiences were broad and rich. They learned through their bodies, senses and spirits and connected these experiences into a deep understanding of place. They also had the privilege of learning over time in the same environmental context. Over the year they saw the forest transform through the seasons, experienced a plethora of worms in the rainy season and the emergence of slugs in the spring, mushrooms in fall and new bright green of the trees and bushes in the spring. All of this led to the children developing a sense of intimacy or home-ness with their place, "my forest."

Children were deeply engaged in the woods or at the beach. Their bodies, minds and spirits were alive and participating. There was no need to sit still on a carpet while the teacher helped a child who did not understand or a child who had other questions. The educators might be involved with one child, but the other children had materials to look at or explore, and there always was another child with whom to talk or play.

Often bells, schedules and rules regulate children's first experience of school. But in the nature kindergarten, a child who chose to be a dog for the morning could bark with minimum disruption when compared to the disruption her barking would cause within the four walls of the classroom. The forest spaces allowed for children to be deeply engaged whether with a peer, the teacher or the materials at hand; their experience of school seems to be one of engagement. In the nature kindergarten, the children could be drawn into a deep exploration of the dead decomposing owl at the side of the trail, or the worms that come to the surface in the pouring rain, or the log that is rotting and home to a variety of small animals. They also intensely engaged with each other and with their own games and play. Play could involve much of the group and deal with complex issues of death, power and compassion. Whether involved in play, educator-initiated discussions and activities or opportunities for risk, the children experience an engagement that seems to be deep, sustaining and powerful as illustrated by Enid's observation:

> *Play in puddles and exploring creeks is intense. Children are wholly engaged. Getting their feet soaked regularly does not deter them from splashing, wading and jumping, even in the coldest of weather. Their attention is on the feel, the movement, the idea of water. This feeling of engagement, of deep engagement, is a fine way to start a school career. This state of being so engaged and absorbed that wet feet don't matter is being in a state of* flow *as Csikzentmihalyi (1990) calls it; the children's skills and interests are challenged by the environment so that their attention is focused and intrigued by what they are experiencing.*
>
> *When children realize their feet are wet and their raincoats are getting wet and school is still a 20-minute walk away, each child must find strategies for getting back up the hill. Outside there are real challenges that can only be overcome with one's own effort.*

Assessment of Nature Relatedness and Environmentally Responsible Behavior

Turning to the quantitative assessment of the effects of the nature kindergarten, Table 1 shows the mean scores and standard deviation on the measures of nature relatedness and environmentally responsible behavior for October 2012 and May 2013 by kindergarten group (nature kindergarten and control group). A 2 X 2 Analysis of Variance (ANOVA) with nature relatedness as the repeated measures factor and group (nature kindergarten or control group) as independent variable showed a significant effect for group, $F(1, 41) = 4.30$, $p < .05$, with children in the nature kindergarten having higher nature relatedness scores than children in the control group. Neither did the scores for nature relatedness change over the study period, $F(1, 41) = 0.01$, nor was the interaction between nature relatedness and time of measurement (October 2012, May 2013) significant, $F(1, 41) = 0.79$. Even though the interaction between group and time of measurement was not significant, independent samples t-tests with group as independent variable showed that scores for nature relatedness did not differ significantly between groups in October 2012, $t(41) = 1.09$, $p > .28$, but they did significantly differ at the end of the school year $t(41) = 2.07$, $p < .05$, with children in the nature kindergarten having significantly higher nature-relatedness scores than children in the control group. The nature-relatedness scores of the children in the control group actually declined over the year. There were no main effects or interactions for environmentally responsible behavior (all Fs < 0.40).

Table 1. Means and standard deviations for nature relatedness and environmentally responsible behavior at the beginning and end of the school year by group

	Nature Relatedness		**Environmentally Responsible Behavior**	
	Oct. 12	May 13	Oct. 12	May 13
Nature Kindergarten (n = 21)	6.43 (1.25)	6.62 (.97)	10.57 (0.93)	10.71 (1.06)
Control (n = 22)	6.05 (1.05)	5.82 (1.50)	10.59 (1.14)	10.73 (0.83)

Note: Standard deviations in parentheses.

Discussion

In this paper, we described the creation of and pedagogical principles guiding the nature kindergarten in Victoria, British Columbia. We also illustrated the unique experiences and learning opportuinities children encounter in nature, and we presented preliminary data that examined whether attending the nature kindergarten affected children's nature relatedness and their environmentally responsible behavior.

Our observations suggest that being in nature fosters a community of learners. Outdoor play offers a flexible social space with multiple opportunities for negotiating roles and collaborating on larger outdoor projects (Aasen, Grindheim and Waters 2009). These larger projects, in turn, require teamwork, which then promotes the development of social skills (Davies 1996). Children in the nature kindergarten offered each other help and supported each other's efforts, thereby promoting their social skills.

It has been suggested that exploration and mastery of challenges presented by unfamiliar outdoor terrain might also foster the development of self-esteem in children (Sandseter 2009; Swabrick, Eastwood and Tutton 2004). Indeed, our observation supports this suggestion. By being outside in the forest, children discovered their own ideas, strengths and confidence.

Over the year, children's relationship with the forest grew and they learned experientially about their place in that forest of large trees and wild animals. Children knew the smells of that place in the rain, the sun and the wind; they knew how the earth felt and sounded when filled with water in winter or dry from summer sun in the fall. They felt the soft green of the fir trees and Oregon grape in the spring, and had picked up worms and theorized about their lives and who they were. They looked up birds in guidebooks and listened to the woodpeckers creating holes and finding insects. Curiously exploring their surroundings, they learned about their place in a deep and meaningful way. Rachel Carson (1965) wrote:

> *A child's world is fresh and new and beautiful, full of wonder and excitement… If I had influence with the good fairy who is supposed to preside over the christening of all children, I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength… if a child is to keep alive his inborn sense of wonder without any such gift from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in* (42-43, 45).

Carson's choice of the word *companionship* seems to be deliberate; it is not the teaching that an adult does or even the guidance of that adult, but the "companionship" of an adult that is important. Children have the ability to find their way to a love of nature, of being outdoors, of moving their bodies in a generous fashion.

Cobb (1977) interviewed adults about the effect of being outdoors in a natural setting as children and noted the impact of this time spent outdoors for many writers, intellectuals and artists: "the child 'knows' or re-cognizes that he makes his own world and that his body is a unique instrument, where the powers of nature and human nature meet" (89). Children have considerable abilities to think and wonder; during the time spent outdoors they had opportunities to develop relationships with the outdoor environment. By learning to have a sense of the

materials and inhabitants of their local environment, they seemed to develop an understanding at a foundational level of the materials, forces and energies outside the classroom. For example, understanding their relationship to gravity begins with jumping from rocks or logs; knowing what to expect from the seasonal weather comes from experiencing the rain, wind and sun over the course of the year. This type of primordial familiarity with nature provides the grounding for any type of knowledge:

To return to the things themselves is to return to that world which precedes knowledge, of which knowledge always speaks, and in relation to which every scientific schematization is an abstract and derivative sign-language, as is geography in relation to the countryside in which we have learned beforehand what a forest, a prairie or a river is (Merleau-Ponty 1962, ix; emphasis in original).

Retrospective studies have linked this deep experience of nature in early childhood to the development of a positive attitude toward the envrionment and environmental stewardship (e.g., Chawla 1998; 1999). Our observations suggest that children in the nature kindergarten established a deep connection to the environment, demonstrated caring and showed concern. These are attributes often associated with family, but as Martin (1992) suggests, these are qualities needed now in all of our communities.

The quantitative assessment of participating children's nature relatedness partly confirmed this impression. Children in the nature kindergarten were more closely related to nature than children in the regular kindergarten. However, there were no significant differences in how nature relatedness changed in both groups over the course of the school year. There was a (nonsignificant) trend for children in the nature kindergarten to have higher nature relatedness scores at the beginning of the school year, suggesting that parents with children more closely related to nature were more likely to enroll their children in the nature kindergarten. At the same time, the difference in nature relatedness between children in the nature kindergarten and children in the regular kindergarten increased over the school year, such that the initially nonsignificant difference between groups turned into a significant cumulative difference by the end of the year. This was due to the fact that the nature-relatedness scores of the children in the nature kindergarten slightly increased over the year, whereas those of the children in the control group slightly declined over the same time period.

Suprisingly, there were no significant differences in environmentally repsonsible behaviors between children in the nature kindergarten and the regular kindergarten. One explanation of this finding is that the measure of environmentally responsible behavior might have incurred ceiling effects. Future researchers should try to design a more fine-grained measure. It is also possible that nature-based education reaps benefits for environmentally responsible behavior only over longer time spans. Follow-up research is necessary to clarify this issue.The main limitation of this study was that the sample size was relatively small. This may have contributed to the failure to find significant differences between children in the nature kindergarten and in regular kindergarten in changes in nature relatedness and

environmentally responsible behavior over the course of the school year. In this respect, the inclusion of the second cohort of children in the nature kindergarten will increase our statistical power. Furthermore, the measure of nature relatedness and environmentally responsible behaviors (i.e., the board game) may be not sensitive enough to pick up differences between groups. It is also possible that the board game is not an effective measure of nature relatedness and environmental behavor in children this age. In our current research, we also use qualitative interviews to probe more deeply into children's nature relatedness and environmentally responsible behavior. Finally, the fact that the kindergarten teacher and the early childhood educator were inexperienced and had to learn to work with a new curriculum that was still in the process of development could also have influenced the outcomes for children. It might be beneficial to include naturalists or environmental edcuators aspart of the program in future implementations of the nature kindergarten.

To conclude, the nature kindergarten gives children the opportunity to experience nature in the context of a community of learners. The nature kindergarten provides children with education that encourages outdoor, child-centered activities that afford personal experience within the environment. Education within nature is particularly important in early childhood because direct experience with various environments facilitates the development of positive feelings and attitudes towards nature and natural phenomena (Lee and Ma 2006).

Endnote

1. In British Columbia, a teacher has a BA in education and is registered with the British Columbia Teacher's College; an early childhood educator is required to complete a Basic Early Childhood Education Training Program (minimally 10 months, usually two years) from an approved training institution and has a license to practice through the Early Childhood Education Registry.

***Enid Elliot**, Ph.D., is an early childhood educator who has been continually surprised, intrigued and delighted by the children, families and early childhood educators with whom she has worked, played and loved. Having experienced the influence of natural settings on young children over the years, she was involved in creating the Nature Kindergarten in the Sooke School District, which opened in September 2012. The past two years she spent one day a week learning and listening with the children and educators outside. She is currently on faculty at Camosun College and an adjunct at University of Victoria.*

***Kayla Ten Eycke**, Ph.D., is a postdoctoral fellow at the University of Calgary. She researches cognitive development in children with autism spectrum disorder.*

***Sharon Chan**, MSc, is a graduate student in the counseling and clinical program at the Ontario Institute for Studies in Education, University of Toronto. Her research focuses on the development of working memory and problem solving ability in*

children. Specifically, she is interested in studying the effects of training studies on improving cognitive outcomes in children.

***Ulrich Müller**, Ph.D., is a professor at the University of Victoria, Department of Psychology. His research focuses on cognitive and social development in early childhood. He currently serves on the board of directors of the Jean Piaget Society and is associate editor of New Ideas in Psychology.*

References

Aasen, W., L.T. Grindheim, and J. Waters (2009). "The Outdoor Environment as a Site for Children's Participation, Meaning-Making and Democratic Learning: Examples from Norwegian Kindergartens." *Education* 37: 5-13.

Abram, D. (1996). *The Spell of the Sensuous: Perception and Language in a More-than-Human World*. New York: Pantheon Books.

Asah, S.T., D.N. Bengston, and L.M. Westphal (2012). "The Influence of Childhood: Operational Pathways to Adulthood Participation in Nature-Based Activities." *Environment and Behavior* 44: 545-556.

Balmford, A., L. Clegg, T. Coulson, and J. Taylor (2002). "Why Conservationists Should Heed Pokemon." *Science* 295(5564): 2367.

Bennett, J., and U. Müller (2010). "The Development of Flexibility and Abstraction in Preschool Children." *Merrill-Palmer Quarterly* 56: 455-473.

Bilton, H. (2002). *Outdoor Play in the Early Years*. London: David Fulton.

Bögeholz, S. (2006). "Nature Experience and Its Importance for Environmental Knowledge, Values and Action: Recent German Empirical Contributions." *Environmental Education Research* 12: 65–84.

Bogner, F.X. (2002). "The Influence of a Residential Outdoor Education Programme to Pupil's Environmental Perception." *European Journal of Psychology of Education* 17: 19-34.

----- (2004). "Environmental Education: One Programme-Two Results?" *Fresenius Environmental Bulletin* 13: 814–819.

Carlgren, F. (1976). *Education towards Freedom: Rudolf Steiner Education.* East Grinstead: Lanthorn Press.

Carson, R. (1965). *The Sense of Wonder*. New York: Harper & Row.

Chawla, L. (1998). "Significant Life Experiences Revisited: A Review of Research on Sources of Environmental Sensitivity." *Environmental Education Research* 4: 369-382.

----- (1999). "Life Paths into Effective Environmental Action." *Journal of Environmental Education* 31: 15-26.

Cheng, J.C.H., and M.C. Monroe (2012). "Connection to Nature: Children's Affective Attitude toward Nature." *Environment and Behavior* 44: 31–49.

Clark, A. (2010). "Young Children as Protagonists and the Role of Participatory, Visual Methods in Engaging Multiple Perspectives." *American Journal of Community Psychology* 46(1-2): 115-123.

Clark, A., A.T. Kjorholt, and P. Moss, eds. (2005). *Beyond Listening: Children's Perspectives on Early Childhood Services*. Bristol: Policy Press.

Clark, A., and P. Moss (2001). *Listening to Children: The Mosaic Approach*. London: National Children's Bureau.

Cobb, E. (1977). *The Ecology of Imagination in Childhood*. London: Routledge and Kegan Paul.

Cohen, S. and D. Horm-Wingerd (1993). "Children and the Environment: Ecological Awareness among Preschool Children." *Environment and Behavior* 25: 103-120.

Collado, S., H. Staats, and J.A. Corraliza (2013). "Experiencing Nature in Children's Summer Camps: Affective, Cognitive and Behavioral Consequences." *Journal of Environmental Psychology* 33: 37-44.

Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. New York: Harper and Row.

Dai, A.H.I. (2011). *A Study of Taiwanese Children's Conceptions of and Relation to Nature: Curricular and Policy Implications*. Doctoral dissertation. Available from DRUM (Digital Repository of the University of Maryland): http://hdl.handle.net/1903/12301.

Davies, M.M. (1996): "Outdoors: An Important Context for Young Children's Development." *Early Child Development and Care* 115: 37-49.

Davis, J., M. Gibson, R. Pratt, A. Eglington, and N. Rowntree (2005). "Creating a Culture of Sustainability: From Project to Integrated Education for Sustainability at Campus Kindergarten." In W.L. Filho, ed. *The International Handbook of Sustainability Research*. Paris: UNESCO, 563-594.

Evans, G.W., G. Brauchle, A. Haq, R. Stecker, W. Wong, and E. Shapiro (2007). "Young Children's Environmental Attitudes and Behaviors." *Environment and Behavior* 39: 635-659.

Farmer, J., D. Knapp, and G.M. Benton (2007). "An Elementary School Environmental Education Field Trip: Long-Term Effects on Ecological and Environmental Knowledge and Attitude Development. *Journal of Environmental Education* 38: 33-42.

Gorges, R. (2000): *Waldkindergartenkinder im ersten Schuljahr –eine empirische Untersuchung*. Hohenstein, Eigenverlag. Available from: http://bvnw.de/wp-content/uploads/2013/04/Prof_Gorges_Schulfhigkeit.pdf

Government of British Columbia (2008). *British Columbia Early Learning Framework*. Victoria: Ministry of Education.

----- (2009). *Understanding the British Columbia Early Learning Framework: From Theory to Practice*. Victoria, BC: Ministry of Education.

Grodzinska-Jurczak, M., A. Stepska, K. Nieszporek, and G. Bryda (2006). "Perception of Environmental Problems among Pre-School Children in Poland." *International Research in Geographical and Environmental Education* 15: 62-76.

Kaiser, F.G., and M. Wilson (2000). "Assessing People's General Ecological Behavior: A Cross-Cultural Measure. *Journal* of *Applied Social Psychology* 30: 952-978.

Kiener, S. (2004). "Zum Forschungsstand über Waldkindergärten." *Schweizerische Zeitschrift für Forstwesen* 155: 71-76.

Knapp D., and R. Poff (2001). "A Qualitative Analysis of the Immediate and Short-Term Impact of an Interpretive Program." *Environmental Education Research* 7: 55–65.

Knight, S. (2009). *Forest Schools and Outdoor Learning in the Early Years*. London: Sage.

Larson, L.R., G.T. Green, and S.B. Castleberry (2011). "Construction and Validation of an Instrument to Measure Environmental Orientations in a Diverse Group of Children. *Environment and Behavior* 43: 72–89.

Lee, J.C-K., and M.H.T. Ma (2006). "Early Childhood Environmental Education: A Hong Kong Example." *Applied Environmental Education and Communication* 5: 83-94.

Leeming, F.C., W.O. Dwyer, and B.A. Bracken (1995). "Children's Environmental Attitude and Knowledge Scale: Construction and Validation." *Journal of Environmental Education* 26: 22-31.

Lindemann-Matthies, P. (2002). "The Influence of an Educational Program on Children's Perception of Biodiversity." *The Journal of Environmental Education* 33: 22-31.

----- (2006). "Investigating Nature on the Way to School: Responses to an Educational Programme by Teachers and Their Pupils." *International Journal of Science Education* 28: 895-918.

MacDonald, M. (2007). "Toward Formative Assessment: The Use of Pedagogical Documentation in Early Elementary Classrooms." *Early Childhood Research Quarterly* 22: 232-242.

Manoli, C., B. Johnson, and R.E. Dunlap (2007). "Assessing Children's Environmental Worldviews: Modifying and Validating the New Ecological Paradigm Scale for Use with Children." *Journal of Environmental Education* 38: 3-13.

Martin, J.R. (1992). *The School Home: Rethinking Schools for Changing Families*. Cambridge Massachusetts: Harvard University Press.

Maynard, T., and J. Waters (2007). "Learning in the Outdoor Environment a Missed Opportunity?" *Early Years* 27: 255-265.

Merleau-Ponty, M. (1962). *Phenomenology of Perception* (Colin Smith, trans.). London: Routledge.

Montessori, M. (1971). *The Montessori Method* (15th ed.). New York: Schocken Books.

Nisbet, E.K., J.M. Zelenski, and S.A. Murphy (2009). "The Nature Relatedness Scale: Linking Individuals' Connection with Nature to Environmental Concern and Behavior." *Environment and Behavior* 41: 715-740.

Ouvry, M. (2003) *Exercising Muscles and Minds: Outdoor Play and the Early Years Curriculum.* London: National Early Years Network.

Palmberg, I.E., and J. Kuru (2000). "Outdoor Activities as a Basis for Environmental Responsibility." *Journal of Environmental Education* 31: 32-36.

Palmer, J.A. and J. Suggate (2004). "The Development of Children's Understanding of Distant Places and Environmental Issues: Report of a UK Longitudinal Study of the Development of Ideas between the Ages of 4 and 10 Years." *Research Papers in Education* 19: 205-237.

Pelo, A. (2013). *The Goodness of Rain: Developing an Ecological Identity in Young Children*. Redmond, WA: Exchange Press.

Pergams, O.R.W., and P.A. Zaradic (2008). "Evidence for a Fundamental and Pervasive Shift away from Nature-Based Recreation." *Proceedings of the National Academy of Sciences, USA* 105: 2295-2300.

Powell, R., M. Stern, B. Krohn, and N. Ardoin (2011). "Development and Validation of Scales to Measure Environmental Responsibility, Character Development, and Academic Performance." *Environmental Education Research* 17: 91-111.

Rinaldi, C. (2006). *In Dialogue with Reggio Emilia: Listening, Researching and Learning*. London and New York: Routledge.

----- (2005). "Documentation and Assessment: What Is the Relationship?" In A. Clark, A.T. Kjorholt and P. Moss, eds. *Beyond Listening: Children's Perspectives on Early Childhood Services*. Bristol, UK: Policy Press, 17-28.

----- (2001). "Documentation and Assessment: What Is the Relationship?" In C. Guidici, C. Rinaldi and M. Krechevsky, eds. *Making Learning Visible: Children as Individual and Group Learners*. Cambridge, MA: Project Zero and Reggio Emilia: Reggio Children, 78-93.

Sandseter, E.B.H. (2009). "Affordances for Risky Play in Preschool: The Importance of Features in the Play Environment." *Early Childhood Education Journal* 36: 439-446.

Shwartz, A., A. Cosquer, A. Jaillon, A. Piron, R. Julliard, R. Raymond, L. Simon and A.-C. Prévot-Julliard (2012). "Urban Biodiversity, City-Dwellers and Conservation: How Dose an Outdoor Activity Day Affect the Human-Nature Relationship?" *PLoS ONE* 7(6): e38642.

Siemer, W.F., and B.A. Knuth (2001). "Effects of Fishing Education Programs on Antecedents of Responsible Environmental Behavior." *The Journal of Environmental Education* 32: 23–29.

Sobel, D. (2008). *Childhood and Nature: Design Principles for Education*. Portland, Maine: Stenhouse Publishers.

Stacey, S. (2009). *Emergent Curriculum in Early Childhood Settings*. St. Paul: Redleaf Press.

Strife, S.J. (2012). "Children's Environmental Concerns: Expressing Ecophobia." *The Journal of Environmental Education* 43: 37-54.

Swabrick, N., G. Eastwood, and K. Tutton (2004). "Self-Esteem and Successful Interaction as Part of the Forest School Project." *Support for Learning* 19: 42-46.

Ward Thompson, C., P. Aspinall, and A. Montarzino (2008). "The Childhood Factor." Adult Visits to Green Places and the Significance of Childhood Experience." *Environment and Behavior* 35: 506-522.

Warden, C. (2010). *Nature Kindergartens*. Perthshire, Scotland: Mindstretchers, Inc.

Wells, N.M., and K.S. Lekies (2006). "Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism." *Children, Youth and Environments* 16: 1-24. Available from: http://www.jstor.org/action/showPublication?journalCode=chilyoutenvi.

Williams, S.M., and R. McCrorie (1990). "The Analysis of Ecological Attitudes in Town and Country. *Journal of Environmental Management* 31: 157-162.

Yardimci, E., and G. Leblebicioglu (2012). "The Effect of a Nature Camp on the Children's Conceptions of Nature." *International Electronic Journal of Environmental Education* 2: 93-106.