Considering Efficacy of an Outdoor Environmental Education Program: Facilitating Elementary Students’ Environmental Knowledge, Attitudes, and Behaviours

By

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Abstract

Various sources have sought to consider the educational interventions that foster changes in perception of and attitudes toward nature, with the ultimate intent of understanding how education can be used to encourage environmentally responsible behaviours. With these in mind, the current study identified an outdoor environmental education program incorporating these empirically supported interventions, and assessed its ability to influence environmental knowledge, attitudes, and behaviours. Specifically, this study considered the following research questions:

1) To what degree can participation in this outdoor education program foster environmental knowledge and encourage pro-environmental attitudes and self-reported pro-environmental behaviours?
2) How is this effect different among students of different genders, and those who have different prior experiences in nature?

Two motivational frameworks guided inquiry in the current study: the Value-Belief-Norm Model of Environmentalism (VBN) and the Theory of Planned Behaviour (TPB). The study employed a quantitative survey methodology, combining contemporary data measuring knowledge, attitudes, and behaviours with archived data collected by program staff, reflecting frequency of environmentally responsible behaviour. Further, a single qualitative item was included for which students provided “the first three words that [came] to mind when [they] think of the word nature.” Terms provided before and after the program were compared for differences in theme to detect subtle or underlying changes.

Quantitative results indicated no significant change in student knowledge or attitudes through the outdoor environmental education program. However, a significant change in self-
reported behaviour was identified from both the contemporary and archived data. This agreement in positive findings across the two data sets, collected using different measures and different participants, lends evidence of the program’s ability to encourage self-reported pro-environmental behaviour. Further, qualitative results showed some change in students’ perceptions of nature through the program, providing direction for future research.

These findings suggest that this particular outdoor education program was successful in encouraging students’ self-reported environmentally responsible behaviour. This change was achieved without significant change in knowledge or environmental attitudes, suggesting that external factors not measured in this study might have played a role in affecting behaviour.
This work is dedicated, with love,

to the memory of

Jacob Douglas Gordon

whose unconditional support
and encouragement made this,
and so much more
possible.

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I would like to extend my sincere thanks to all of the people who have supported me in the completion of this project, from inception to completion, and all the trials in between. First and foremost, I must thank my parents, Cindy and Jay, for always supporting me in my goals, encouraging me to pursue my full potential, and refusing to let me settle for less than I can achieve.

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Chapter 1

Introduction

Why do humans differ so much in their opinions and perspectives? What leads a person to one action and not another? Why do values differ so drastically between people and groups? These questions are complex, difficult, and applicable to every aspect of the human experience. These questions, when applied to human interactions with the natural environment, shape the foundations of my current research. Studies have shown a general public understanding of the influences human action can have on the environment, and acceptance that environmental quality can impact human well-being (Davis, Le, & Coy, 2011). Nevertheless, the academic literature from a diversity of fields notes that, although people are increasingly aware of environmental problems, environmentally responsible behaviours are not the social norm (Berenguer, 2007). The present study seeks to consider and advance current understandings of the factors that contribute to environmentally responsible behaviours.

As an undergraduate student at Trent University, I was fortunate to be able to develop my skills and knowledge in biology through a close connection with the natural environment surrounding the institution. I was continually afforded the opportunity to connect my learning with the environment. Through this experience, I came to understand two things about the environment that I had not considered before. First, it became startlingly apparent to me that there is a wealth of research substantiating the severity of environmental threats, while also demonstrating that potential solutions do exist. Unfortunately, few of these solutions have been enacted, which raises the question: if humans understand the problems and have developed possible solutions, why are they not acting? Second, I discovered that my regular interactions with the natural environment enabled me to develop a deeper connection with, and appreciation
for, the intricacy and beauty of the natural world. I could not fathom why other people did not seem to see what I saw.

Thankfully, these negative perspectives were countered when I was afforded the opportunity to complete a teaching placement with a local outdoor education program. In my short time at the centre, I witnessed the immense changes that occurred for visiting urban students. When they arrived, most of these students were uncomfortable and resistant to being outside. They cringed at the sight of insects, paled at the idea of being cold, wet, or dirty, and repeatedly expressed longing for the modern comforts to which they were accustomed. Yet consistently, by the end of their short visit, these students allowed themselves to become open to and aware of the environment and the experiences surrounding them. They were happily engaged in activities and more attuned to their surroundings. For me, these students demonstrated that everyone can learn to care about and enjoy the environment when provided with the right set of experiences. Various studies have reported similar successes with other outdoor education programs (Breunig, 2012; Collado, Staats, & Corraliza, 2013). What changed as a result of participating in the outdoor education program that caused these children to be so much more comfortable and caring towards the environment? Perhaps more important: could the changes I observed be repeated, quantified, and rendered sustainable?

It is these experiences that have directed my passion for and interest in the environment. These, followed by an investigation of academic literature on the subject, have reinforced for me the importance of childhood outdoor educational experiences in fostering a sense of concern and responsibility for the environment. Further, most environmentally active adults trace current environmental inclinations to their childhood experiences in nature, emphasizing the importance of early interventions for sustained outcomes (Chawla & Cushing, 2007; Hinds & Sparks, 2008).
Efficacy of Outdoor Environmental Education

The literature highlights the importance of experiences with prominent role models, including family or extra-familiar individuals, such as teachers, drawing further interest to the investigation of outdoor education in encouraging environmental responsibility (Chawla & Cushing, 2007; Hinds & Sparks, 2008). The current study is conducted to further my own understanding of how environmental action can be fostered in children. By working with the program in which I witnessed such apparent success, I hope to contribute to its growth as it has contributed to mine. It is my intention that the current research will enhance program officials' understanding of the impact of their programs. Further, it is intended to contribute to an improved understanding of the potential attitudinal, behavioural, and educational benefits of an empirically based outdoor education program, while ultimately improving future outcomes and experiences for students.

To date, various researchers have sought to investigate the questions posed above. Some have focused on the success of specific interventions (Carrier, Thomson, Tugurian, & Stevenson, 2014; Collado et al., 2013; Duerden & Witt, 2010; Fisman, 2005; Goodwin, Greasley, John, & Richardson, 2010; Karpudewan, Roth, & Abdullah, 2015; Osbaldiston & Schott, 2011; M. Stern, Powell, & Ardoin, 2008; Tate, Stewart, & Daly, 2014; Zelezny, 1999), while others have focused on the social and cognitive underpinnings driving behavioural choices (Ajzen, 1985; Ajzen & Fishbein, 1980; Aronson, 1990; Berenguer, 2007; Corbett, 2005; Hinds & Sparks, 2008; Kaplan, 2000; Karp, 1996; Mikulincer, Shaver, Gillath, & Nitzberg, 2005; Milfont & Sibley, 2012; W. P. Schultz, 2002; P. C. Stern, 2000; P. C. Stern, Dietz, & Kalof, 1993; Tabernero & Hernández, 2012). Studies tying the two themes together have focused on the importance of attitudes and knowledge, but until recently there has been a lack of emphasis placed on actual behavioural changes as a result of an intervention (Duerden & Witt, 2010).
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My research seeks to assess changes to children’s knowledge of the environment, pro-environmental attitudes, and self-reported pro-environmental behaviours through participation in outdoor environmental education programming, emphasizing that change in these variables reflects the effectiveness of an outdoor education program in reaching its goal of encouraging responsible environmental awareness and engagement. Within this document, pro-environmental attitudes are defined as the collection of beliefs, affect, and behavioural intentions a person holds regarding environmentally related activities with nature (Price, Walker, & Boschetti, 2014). Specifically, attitudes measured reflected the New Ecological Paradigm (NEP) Worldview (Dunlap & Van Liere, 1978) as described in detail in Chapter 2. Pro-environmental behaviours are defined as behaviours that are comparatively better for the environment in any given scenario (Kollmuss & Agyeman, 2002; Osbaldiston & Schott, 2011). The term pro-environmental behaviour is often used interchangeably with the term Environmentally Responsible Behaviour within the academic literature. Pro-environmental behaviours may be relatively simple, such as placing recycling in the appropriate container, or difficult, such as participating in environmental activist movements.

Purpose

My research seeks to analyze the effectiveness of a recently developed outdoor environmental education program, featuring a design supported by current empirical research. Specifically, it investigates changes to students’ knowledge, pro-environmental attitudes, and self-reported pro-environmental behaviours through the program, in relation to the Value-Belief-Norm Model of Environmentalism (P. C. Stern et al., 1993) and the Theory of Planned Behaviour (Ajzen, 1985). Specific research questions for the current study are as follows:
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1) To what degree can participation in this outdoor education program foster environmental knowledge and encourage pro-environmental attitudes and self-reported pro-environmental behaviours?

2) How is this effect different among students of different genders, and those who have different prior experiences in nature?

Context

The program to be considered in the current study is implemented by Redstart Conservation Areas (RCA)¹ and has been run for the past five years. It strives to provide an integrated environmental learning experience for students in Grade 6 (aged 11-12) through interactive experiences with nature, including an overnight visit to a local outdoor education centre and in-class educational sessions. Further, it builds on traditional overnight field trip experiences through the inclusion of in-school lessons to reinforce learning before and after the actual outdoor centre visit. This program has been developed with the assistance of third-party funding, and is offered exclusively to Grade 6 students from low socioeconomic status (SES) urban areas. The intent of this program is to extend outdoor environmental experiences to students who would otherwise not have these opportunities. All programming reflects grade-level curriculum expectations; however, these expectations are extended through emphasis on enhancing ecological literacy and leadership in environmental initiatives within local communities. Unique to this program is the expectation of classroom commitment to a community stewardship project that is intended to foster engagement in an environmental project within participating schools' local communities. Some prior stewardship projects have included

¹ Information about programs has been derived from program documents and conversations with administrators. References citing program documents have been excluded, and program name and locations have been replaced with a pseudonym in order to ensure program confidentiality.
planting of butterfly gardens, trees, or shrubs; classroom vermicomposting; and building bird houses, feeders, and bee condos. Each project is intended to promote increased awareness and stewardship, and energy conservation, waste minimization, or increased biodiversity in the community. The current study sought to determine if this program had impacts on student knowledge, pro-environmental attitudes, and self-reported behaviour, in hopes of better understanding the impacts that outdoor environmental education can have on environmental engagement and responsible action.
Chapter 2

Literature Review

Previous research has largely followed one of two distinct approaches to understand the factors leading to pro-environmental behaviours. First, there is a body of research that examines the social and psychological underpinnings of environmental awareness and responsibility. Second, there is research that addresses the success of particular treatments, where treatments are often explicitly or implicitly associated with social and psychological theories. The following sections review previous research in theoretical models of pro-environmental behaviour and the effectiveness of interventions intended to alter model variables. The chapter concludes with a description of the models and interventions that inform the current study.

Social and Psychological Determinants of Pro-Environmental Behaviour

Multiple social and psychological theories have been suggested to explain the existence of pro-environmental behaviour. Some investigations of note have assessed the implications of personality (Milfont & Sibley, 2012), relationships (Interdependence Theory; Davis et al., 2011), internal pressures (Value-Belief-Norm Model of Environmentalism; P. C. Stern et al., 1993), and external pressures (Theory of Planned Behaviour; Ajzen, 1985; Ajzen & Fishbein, 1980).

Personality trait research from Milfont and Sibley (2012) has suggested that individuals who possess an agreeable, conscientious, and extraverted personality, who demonstrate openness to experience, and who have a heightened degree of neuroticism may be predisposed to more pro-environmental behaviours. However, this line of investigation developed rather recently and lacks sufficient detail within the literature to be used as a basis for investigation in the current study. Further, as Milfont and Sibley (2012) indicated in their study, the ability of personality types to predict pro-environmental behaviours is weak. Therein lies support for the current focus
on other models, while not excluding the consideration of personality research in the future pending improved empirical support.

Interdependence Theory seeks to explain the relationship between an individual and his or her environmental activism by likening it to a romantic relationship (Davis et al., 2011). This theory suggests that, as an individual’s perception of dependence on a partner increases, commitment to that partner also increases (Davis et al., 2011). In turn, commitment increases an individual’s willingness to make sacrifices for the well-being of the partner (Davis et al., 2011). Davis et al (2011) suggest that, when applied to the relationship between humans and the environment, an increased sense of dependence on the environment may lead to increased human commitment and therefore increased willingness to sacrifice for the benefit of the environment (Davis et al., 2011).

Although each of these theories demonstrates some ability to explain pro-environmental behaviour, two theories boast extensive empirical support within the academic literature: the Value-Belief-Norm (VBN) Model of Environmentalism, and the Theory of Planned Behaviour (TPB).

**The Value-Belief-Norm Model of Environmentalism.** VBN links value orientations (Schultz & Zelezny, 1999; Stern, Dietz, Abel, Guagnano, & Kalof, 1999; P. C. Stern et al., 1993) with an environmental worldview (Dunlap & Van Liere, 1978) to predict pro-environmental behaviour. It has been deemed a successful model in various studies (P. C. Stern et al., 1999; Wynveen, Kyle, & Tarrant, 2011). VBN theory was built upon Schwartz’s Norm Activation Theory of Altruism (Scultz, 2002; Stern et al., 1993), which holds that, when individuals perceive a threat to others and believe they are able to relieve that threat, their personal moral norms are activated, driving a sense of moral obligation to act (Figure 1; Stern, 2000). Moral
norms are functionally defined as a sense of moral obligation (Nordlund & Garvill, 2002; P. C. Stern et al., 1999). For the current study, altruism describes any behaviour carried out for the benefit of another person, regardless of cost or benefit to the actor (W. P. Schultz, 2002). This study does not seek to debate the existence of altruism as a construct; rather, VBN appeals to one’s awareness, concern, and sense of moral responsibility to relieve negative consequences or suffering for that which is cared for.

![Figure 1](image)

Figure 1. Stern’s (2000) Value-Belief-Norm Model of Environmentalism.

VBN builds on Norm Activation Theory through the addition of value orientations, and specifically addresses environmentalism through the inclusion of a popular environmental worldview measure (Dunlap & Van Liere, 1978; Stern et al., 1993). VBN theory depicts a causal chain of five variables, each of which may be appealed to or modified to facilitate behaviour (P. C. Stern et al., 1993). Each variable in the chain influences the variables below it (P. C. Stern et al., 1993). The variables, in order, are values, New Ecological Paradigm (NEP) Worldview (often referred to and described interchangeably as environmental attitudes), beliefs about consequences to something that is valued, beliefs about personal responsibility to relieve those consequences, and personal norms (P. C. Stern, 2000; P. C. Stern et al., 1993).

Values can be defined as internal standards that apply in all areas of life and dictate behaviour (Karp, 1996). Three core values exist within the VBN: egocentric, or value for self;
altruistic, or value for other humans; and biospheric, or value for nature (W. P. Schultz, 2002; P. C. Stern, 2000; P. C. Stern et al., 1993). Values are rarely independent of each other, often coexisting and interacting (P. C. Stern et al., 1993). While each value can be appealed to in fostering pro-environmental behaviours, there is evidence to suggest that egocentric values have more impact on actions than biospheric or altruistic values, particularly when action for biospheric or altruistic values necessitates some cost to oneself (Kaplan, 2000). However, it is possible to align an action with multiple values. For example, encouraging individuals to derive a solution to aid the environment or other humans allows an individual to find a solution that limits personal cost and may even contribute to personal gain (Kaplan, 2000). Some research has also suggested that it may be possible to foster connection of altruistic and biospheric values with one's egocentric values through incorporation of other people or the environment into one's sense of self or personal identity (W. P. Schultz, 2002). Integration of nature in one’s sense of self may be encouraged through emphasis on local natural features and problems, or by spending time with nature to develop a connection and familiarity with it (Duhn, 2012; Fisman, 2005; Hinds & Sparks, 2008; Pelo, 2014). Values can be connected to the next link in the causal chain: NEP Worldview.

NEP Worldview is often described as a pro-environmental attitude. A person who holds an NEP worldview is one who views humans as a part of nature, not as its rulers, and acknowledges the risk of environmental crisis (Dunlap & Van Liere, 1978). It is juxtaposed with the Dominant Social Paradigm Worldview, which reflects the perspective that humans rule over nature, and that nature exists for human consumption (Dunlap & Van Liere, 1978). According to VBN, the NEP worldview is an essential key to triggering pro-environmental behaviour through
the recognition that human behaviour can influence the environment, just as the quality of human life is tied to the health of the environment (P. C. Stern et al., 1993).

Within the VBN causal chain are two key beliefs that must be activated in order to engage behaviour: beliefs about the consequences to something valued, and beliefs about personal responsibility to relieve those consequences (P. C. Stern et al., 1999). These beliefs can connect to any of the three value classifications. Some examples of consequences to egoist or altruist values may include time, financial cost, social cost, and physical or emotional harm, while biospheric consequences may include species or biodiversity loss, pollution, deforestation, and climate change. These do not constitute comprehensive lists of the potential consequences a person may perceive, and what is considered a consequence may differ by person. Individuals can believe in consequences to themselves, to others, or to the environment, and derive personal ascription of responsibility for the care of what is valued. Beliefs regarding consequences and responsibilities are not as tightly linked with personal identity as values, and thus may be the easiest variable within the chain to address (P. C. Stern et al., 1993). Changes to beliefs are generally due to the adoption of new knowledge (P. C. Stern et al., 1993), and this knowledge may include both information about consequences (issue-related knowledge) and beliefs about personal responsibility and ability to relieve consequences (action-related knowledge; Duerden & Witt, 2010; Wyles et al., 2013). While too much knowledge can be overwhelming, induce a sense of helplessness, and ultimately discourage people from acting (Kaplan, 2000), both action-related and issue-related knowledge are equally important (Wyles et al., 2013). Without issue-related knowledge, people fail to understand the consequences to what they value, while a lack of action-related knowledge limits their belief in their personal responsibility and ability to relieve these consequences (Wyles et al., 2013). Knowledge of both types can come from various
situational factors (Kaiser, Hübner, & Bogner, 2005). Under this model, attitudes, perceived behavioural control, and awareness of subjective norms may interact or act independently to lead to behavioural intention (Ajzen, 1985). If there are no barriers hindering this intention from being enacted, behaviour will result. This model implies that, when people are either internally driven to act, or when social pressure is sufficiently high, behaviour will result.

Attitude, in TPB as with VBN, reflects one’s perspectives towards a concept, in this case environmentalism. Perceived behavioural control, described as one’s perception of ability to act in light of situational factors, can account for more variance in behaviour than attitude or
subjective norms, particularly where one does not identify with a social group (Armitage & Conner, 2001; Terry, Hogg, & White, 1999). Perceived behavioural norms can be described as awareness of behaviours in “a behaviourally relevant reference group” (Terry et al., 1999, p. 238) and have been shown to significantly contribute to intention to engage in pro-environmental behaviour, but only in individuals who strongly identify with said reference group. Subjective norms have been found to be a generally weak predictor of intentions or behaviour (Armitage & Conner, 2001). Further, it has been indicated that TPB needs further clarification and may need to incorporate more variables (belief salience, past behaviour/habit, self-efficacy, moral norms, self-identity, and affective beliefs) to represent a comprehensive model of behaviour (Conner & Armitage, 1998).

![Figure 2. Ajzen’s (1991) Theory of Planned Behaviour.]

**Integrating VBN and TPB.** Clear discrepancy exists within the literature over whether VBN or TPB best depicts the drivers of environmental behaviour. There are acknowledged benefits and weaknesses to both theories; however, both VBN and TPB overlap in their inclusion of personal beliefs and attitudes. Between the two models, however, more detail is included in VBN. Logically, I am inclined to argue that the debate of which model is superior is
unnecessary. If the external factors described in TPB can be described as perceived consequences to egoist values, the two models may be integrated (Figure 3). To be more specific, the social normative pressures described in TPB may also reflect social consequences for self if action is not taken. A similar integration has been proposed by Kollmuss and Agyeman (2002; Figure 4).

Figure 3. Proposed integration of Stern’s Value-Belief-Norm Model of Environmentalism and the Theory of Planned Behaviour
Figure 4. Kollmuss and Agyeman’s (2002) Model of Pro-environmental Behaviour
Regardless of the pattern of this integration, both internal and external variables have been shown to influence pro-environmental behaviour. It would be ideal to consider all internal and external variables in depth to truly identify the changes that contribute to possible behavioural change through the program. However, as is discussed in depth below, the current study is constrained in its ability to measure diverse variables due to a current lack of age and culturally-appropriate measures. As such, the current study was only able to focus on changes to knowledge, attitudes (NEP Worldview), and self-reported behaviours.

**Appealing to Beliefs, Attitudes, and Norms to Foster Pro-Environmental Behaviour**

It is possible to alter or appeal to both internal and external variables to encourage pro-environmental behaviour. Several interventions have been considered within the literature for their ability to alter both internal and external variables, either explicitly or implicitly. Most of these have focused on internal variables. For example, values for the environment may be modified in various ways. Treatments that alter environmental values may doubly alter NEP worldview, through enhancing perceptions of human interconnectedness with nature. Treatments may include a focus on direct experience with natural features in both natural and urban environments (Chawla & Cushing, 2007; Duerden & Witt, 2010; Fisman, 2005; Pelo, 2014). These may be especially successful when sustained contact is possible, particularly with local natural environments, as these locations make it easier for students to relate to the content (Chawla & Cushing, 2007; Collado et al., 2013; Fisman, 2005). Studies within the literature suggest it is important to engage individuals in setting personal goals, with specific emphasis on projects that address problems within local communities (Chawla & Cushing, 2007; Clay, 2006; Duhn, 2012). Further, encouraging people to empathize with nature through perspective-taking exercises may trigger their sympathy for, and value of, the environment (Berenguer, 2007; W. P.
EFFICACY OF OUTDOOR ENVIRONMENTAL EDUCATION

Schultz, 2002). Finally, one meta-analysis found that interventions performed with children are often more effective in encouraging pro-environmental behaviours than those same interventions performed with adults (Zelezny, 1999). There is some suggestion that this greater impact may be linked to the ease of manipulation of values that are still developing, further contributing to the importance of understanding the processes behind pro-environmental behaviour, and fostering pro-environmental behaviours in childhood (Zelezny, 1999). Ultimately, each of these treatments may serve to increase value for the environment, but may also contribute to the incorporation of the environment and biospheric values in one's sense of self, thus linking them with egoist motivations, which are far easier to address.

Beliefs may be the easiest internal variable to affect, as beliefs about consequences or risks or personal responsibility in a given scenario are not strongly tied to one’s self-identity (W. P. Schultz, 2002). Beliefs about consequences to things of value are primarily influenced by issue-related knowledge (Wyles et al., 2013). One study revealed that knowledge priming can influence choices in pro-environmental behaviours (Tate et al., 2014). When knowledge is combined with confidence in one's ability to act, it can support beliefs about personal responsibility and one’s ability to relieve consequences. This confidence may be developed through acknowledgement of success and practice with the necessary skills (Chawla & Cushing, 2007; Clay, 2006; Osbaldiston & Schott, 2011). In the case of children, it is particularly important that actions are taken seriously by adults so that they are not deterred or devalued (Chawla & Cushing, 2007). At this point, one’s sense of moral obligation should be enacted, and appropriate actions should be taken, if they are known.

Finally, appropriate behaviours can be taught by providing opportunities to learn and practice skills through active involvement in projects (Chawla & Cushing, 2007; Karpudewan et
Behaviours may also be learned through modelling of appropriate behaviours by others in similar social situations (Aronson, 1990; Osbaldiston & Schott, 2011). Socially accepted or propagated behaviour may be recognized as social norms, which may encourage pro-environmental behaviour through external social pressure. For example, a child can learn appropriate behaviours from observing adults, so it is important for adults to act as role models to encourage appropriate behaviour. Prompts (e.g., reminders to turn out lights, signs indicating what should be placed in garbage/recycling, etc.) have been effective in triggering simple behaviours that may become habit (Osbaldiston & Schott, 2011), and small commitments subsequently translate to larger commitments (Aronson, 1990). One suggested method, titled participatory problem solving, enlists individuals' help in developing solutions to problems (Kaplan, 2000). This engagement not only fosters commitment to project outcomes, but also provides opportunities to practice behaviours and develop behavioural options that benefit all three VBN values, thus reducing the perceived cost that could be a deterrent to action (Kaplan, 2000). Fostering self-efficacy, the belief in one's ability to control and guide actions to tackle problems, may be key to encouraging the development and activation of personal norms (Tabernero & Hernández, 2012).

**Informing the Current Study**

In their field trip components, the outdoor education program incorporates aspects of active participation and direct experience with relatively local natural environments (Chawla & Cushing, 2007; Duerden & Witt, 2010; Fisman, 2005; Pelo, 2014; Zelezny, 1999), and emphasizes both action- and issue-related knowledge in education (Wyles et al., 2013). Empirical evidence suggests that the field trip component may foster a connection with the environment and knowledge of environmental problems, thus potentially contributing to changes
in knowledge, pro-environmental attitudes, and intended behaviours. As well, the program supports sustained engagement with the environment through additional in-class programming and community stewardship projects undertaken by the students in each class, projects that incorporate action-related knowledge opportunities to learn and practice skills, encourage projects in local communities, and participation in environmental problem-solving (Chawla & Cushing, 2007; Clay, 2006; Duhn, 2012; Kaplan, 2000; Karpudewan et al., 2015; Zelezny, 1999). Finally, celebrations of success acknowledge the impacts students can make and reward their efforts in sustainability, reinforcing the understanding that students can make a difference (Chawla & Cushing, 2007; Clay, 2006; Osbaldiston & Schott, 2011).

Considering both the internal and external factors in behaviour described by VBN and TPB would be ideal in providing a comprehensive investigation of the factors motivating behaviour through the program. However, it is apparent that previously designed measures for external pressures are lacking. Various studies have demonstrated that outdoor education can alter internal variables, including values (Clayton & Opotow, 2003; Hinds & Sparks, 2008; Kals, Schumacher, & Montada, 1999; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2011; P. W. Schultz, 1998), beliefs – often measured through knowledge – (Duerden & Witt, 2010; Ernst & Theimer, 2011), attitudes (Carrier, 2009; Cheng & Monroe, 2012; Duerden & Witt, 2010; Karpudewan et al., 2015; Manoli et al., 2014, 2007; Powers, 2004; Wu, 2012), and behaviour (Duerden & Witt, 2010; M. Stern et al., 2008). However, few have incorporated measures of all variables, with studies including behaviour change just beginning to emerge (Duerden & Witt, 2010; M. Stern et al., 2008). The current study seeks to build on these studies through measurement of as many internal variables as possible with currently available measures.
For the purposes of the current study, suitable measures have been extracted from the literature to directly or indirectly measure changes to three internal variables: beliefs, NEP worldview (attitude), and intended behaviour. To date, no suitable scales have been found to measure children's egoist, altruist, and biospheric values. Unfortunately, it falls outside the scope of the current study to develop a new psychometric instrument to assess these values. Therefore, analysis of values was excluded, under the assumption that successful activation of later VBN variables depends on the presence of one of the three VBN values.

As with values, there is currently no appropriate measure of children’s beliefs regarding consequences to that which is valued, nor for beliefs regarding personal responsibility to mitigate consequences. However, as has been shown, knowledge is the most direct method of altering beliefs (Tate et al., 2014; Wyles et al., 2013). Therefore, survey items addressing content knowledge obtained through participation are included as a proxy for beliefs, following in the design of previous research (Bogner, 1998; Duerden & Witt, 2010; Ernst & Theimer, 2011; Jensen, 2002; Manoli et al., 2014).

In measuring change in NEP worldview, the Children's NEP Scale was used. The original New Environmental Paradigm scale developed by Dunlap and Van Liere in 1978 is the most popular measure of environmental attitudes seen in environmental education literature (Dunlap & Van Liere, 1978). It was revised in 2000 by Dunlap, Van Liere, Mertig, and Jones to reflect updated terminology and knowledge, and renamed the New Ecological Paradigm Scale (Dunlap, Liere, Mertig, & Jones, 2000). In 2007, the NEP scale was modified for use with children aged 10 to 12, and validated for use within North America (Manoli et al., 2007). Finally, self-reported pro-environmental behaviours were assessed to consider the ability of the program to meet the ultimate goal of encouraging environmental responsibility.
Chapter 3

Research Methods

The current study sought to assess changes in knowledge, attitudes, and self-reported behaviour in Grade 6 students that might arise through participation in an outdoor environmental education program. The research questions for this study were evaluated using a quantitative survey method in order to provide a comprehensive representation of program effect. Two data sets were used in the current study; the first consisting of a contemporary survey and data collection, and the second consisting of archived data provided by program organizers.

Program

The program investigated in the current study is developed by and hosted at three Redstart Conservation Area (RCA) educational centres. The program features extended educational programming delivered in three phases, and operates exclusively with Grade 6 classes from low-SES schools and neighbourhoods. Participation is limited to and funded for schools from low income urban areas where students would otherwise be unable to participate in such programs due to financial barriers. Specific to this program is an ongoing community stewardship project, in which classes select a community or school-based environmental project to complete. The completion of the project fosters active student engagement with the intention of improving the environmental quality of students' local communities. Program educators assist students in choosing an attainable goal, and developing plans and sub-goals so that students can monitor their progress and success (Chawla & Cushing, 2007). Schools participating in this program may apply for a grant to help fund this initiative.

Phase 1 of the program consists of an in-school introductory lesson conducted by RCA educators. This session introduces students to natural science concepts and environmental issues,
including the negative implications of food waste and the importance of biodiversity.

Approximately three weeks later, in Phase 2, classes visit a RCA outdoor education centre, where they stay for two nights. Trip programming reflects grade-level curriculum in an outdoor setting. Teachers of participating schools have the opportunity to select from a series of activities that align with curriculum objectives for students to engage in throughout their stay. Specific activities are selected by classroom teachers from a list of those offered by the program. In addition to this programming, students participate in a lesson designed to help develop their understanding of the distance food travels from harvest to consumption. They are encouraged to weigh their food waste after each meal with the goal of producing no food waste. Finally, in Phase 3, a RCA educator returns to schools to reinforce learning, and to celebrate students’ efforts and achievement in their community stewardship project. This session takes place approximately four weeks after the field trip component.

The program is intended to facilitate an appreciation for and a connection with the local environment through direct interaction and immersion in a natural setting (Chawla & Cushing, 2007; Collado et al., 2013; Fisman, 2005). Through this immersion, students engage with the environment freely in a safe and monitored setting. Students are expected to contribute to the success of their trip by participating in daily chores and group activities. These components are intended to facilitate a sense of responsibility and empowerment in students.

**Contemporary Data**

**Participants.** Participants in the collection of contemporary data included Grade 6 students whose schools completed their field trip in late 2015. These dates are reflective of program schedules, and were within the study timelines. For consistency, schools participating in the field trip component in the month of December were selected to ensure students received a
similar experience. All schools from the approved school board that participated in the program during this time were invited to participate in the current study. All participating students in those schools were invited to be part of the study.

Prior to initiating data collection, it was expected that the program could host up to 10 schools within the given time frame, with approximately 30-40 students per school. These numbers reflected registration shared across the three RCA educational centres. Given these values, the number of potential participants was expected to total between approximately 100 to a possible 400 students. Unfortunately, due to extenuating circumstances (e.g., job action), actual recruitment fell far below these projections.

**Recruitment.** All schools participating in the program within the given timelines were invited to participate in the current study. Schools were not recruited to the programs explicitly for participation in the current study. Rather, schools from the approved board were recruited from an existing pool of those registered in the program within the given time frame of the study. Schools attending the program follow a set recruitment guideline determined by program administrators. Prior to the beginning of a school year, program administrators determine the amount of funding available, and how many schools from each local school board are able to participate in a given year. A schedule is sent to local school boards indicating the number of visits, and a set of designated dates at which schools may attend. School boards are then responsible for approaching schools that meet funding requirements to fill available trips. Program organizers are notified of participating school names and contact information through board representatives as the schedule is filled. Program organizers provided a list of schools registered in the program in late 2015. All schools identified on this list were contacted for recruitment to the current study.
**Ethics.** The current study was granted clearance by Queen's General Research Ethics Board (Appendix A), and the participating school board. Upon ethical clearance, and provision of a list of registered schools, principals were contacted first by email (Appendix B), with a follow-up by telephone. Those principals who agreed to their school's participation in the current study were sent a package of Letters of Information and Consent Forms both for classroom teachers (Appendix C) in order to allow their students' participation, and for parents/guardians (Appendix D) to provide consent for their child's participation. Only those students whose parents provided written consent were permitted to participate in the study. Finally, Letters of Information were read to students prior to survey completion (for Pre-Program Letter of Information and Pre-Program Survey, see Appendix E; for Post-Program Letter of Information Reminder and Post-Program Survey, see Appendix F). Completion of the survey was accepted as student consent for participation. To ensure confidentiality, students were tracked with a de-identified code. All handwritten surveys were collected and stored in a sealed envelope until transcription. When not in use, hard copies were stored in a locked filing cabinet. Transcribed electronic files were encrypted and backed up in an encrypted online server.

**Data Collection.** Data were collected using quantitative surveys conducted one to three days prior to the Phase 1 in-school visit, and one to three days following the completion of the Phase 3 in-school session. As the primary researcher, I administered the surveys to ensure consistency. For each data collection phase, I arrived at the class at a pre-designated time agreed upon with the classroom teacher. Students were asked to clear their desks aside from a writing utensil, and surveys were distributed. Prior to beginning the pre-program survey, I read a Letter of Information to students, reminding them of the option to withdraw at any time. A shortened Letter of Information was read to students reinforcing this possibility prior to the post-program
survey. Students were guided in writing a de-identified code at the top of their survey, used to track responses before and after the program. Those students not participating in the survey were asked to use the time to complete other assignments, either at their desks or at a work station, quietly and independently as instructed by classroom teachers.

In the first data collection session, students were allowed to read and complete the survey independently. However, after this session, it became readily apparent that all students would benefit from having the questions read aloud and from more explicit explanation of the response method for each question. For subsequent data collection, I read all survey items aloud. Survey completion took approximately 20 minutes per session from distribution to collection.

**Survey Design.** The survey used consisted of a total of 23 items (for Pre-Program Survey, see Appendix E; for Post-Program Survey, see Appendix F). Of these, five items reflect environmental knowledge in accordance with the Grade 6 curriculum (see Appendix G). Ten items were included as part of the Children's New Ecological Paradigm Scale to measure environmental attitudes (see Appendix H; Manoli et al., 2007), while another five items were included to measure self-reported behaviour (see Appendix I; Stern et al., 2008). While a number of scales exist measuring various aspects of knowledge, attitude, and behaviour in adults, few scales have been developed for use with children of this age. Modification and validation of a new scale for children did not fall within a breadth appropriate for the level of this study, therefore requiring items to be identified and selected from age-appropriate, previously-validated resources wherever possible.

In order to adequately capture changes in knowledge through program participation, knowledge-based questions were directly linked to topics addressed in the program (Stern et al., 2008). Broad, curriculum-based true/false questions could not be found within the literature, so
questions were generated based on teaching resources and the Ontario Grade 6 Curriculum (Ontario Ministry of Education, 2007). While it is acknowledged that true/false questions carry a high probability of correct response through guessing, research suggests that the reliability of multiple choice or true/false questions is a function of the increasing number of questions, and increasing number of responses per question (Burton & Miller, 1999). It has been suggested that, when choosing item format and considering an increased number of questions versus an increased number of responses per question, it is best to opt for a higher number of questions with fewer possible answers; namely true/false questions (Burton & Miller, 1999). In the interest of expediency, acknowledgement of students’ familiarity with the true/false method, and for the sake of language simplicity in the case of language barriers, a true/false question framing was selected.

A review of the literature found five age and culturally appropriate measures of environmental attitudes, including the Children's Affective Attitude Toward Nature Scale (Cheng & Monroe, 2012), the Children's Attitude Toward the Environment Scale (Müller & Malkus, 1994), the Model of Ecological Values (2MEV; Bogner & Wiseman, 2006), the Children's Environmental Attitude and Knowledge Scale (CHEAKS; Leeming, Dwyer, & Bracken, 1995), and the Children's New Ecological Paradigm Scale (Children’s NEP; Manoli et al., 2007). The NEP scale is considered the appropriate scale to use given the direct inclusion of NEP Worldviews within the VBN model (P. C. Stern et al., 1993). Moreover, more support is lent to usage of the NEP scale, as the Children’s NEP is derived from the most widely used environmental attitude instrument for adults (Dunlap, van Liere, Mertig, & Jones, 2000; P. C. Stern, Dietz, & Guagnano, 1995). The Children's NEP was revised to a 10-item scale, and validated for use with children between the ages of 10-12 years in North America (Manoli et al.,
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2007), and thus expected to reflect comprehension and language considered appropriate for the age range included in this investigation. Authors of the Children's NEP claim it is the only measure of children's environmental attitudes designed and intended explicitly for replication (Manoli et al., 2007). Further support for its use in the current study is reflected in its accepted use in previous studies from Collado et al. (2013) and Karpudewan et al. (2015). Scores derived from the children's NEP scale (P. C. Stern et al., 1993) are intended to be comparable to scores from the original NEP scale for adults, lending to potential future applications for data collected in the current study. The Children's NEP scale, used to measure environmental worldview and attitudes, is rated along a 5-point Likert scale. One notable change made for the current study includes the expansion of the scale from five to seven points. This change was made with the intention of increasing variation in responses, deemed necessary to detect more subtle nuances of change that might arise in this short time span.

Behaviour items selected for the current survey have been gleaned from a previous study of the impacts of a residential environmental education program for children aged 9 to 13, conducted by M. Stern et al. (2008). While it is understood that self-report measures of behaviour are susceptible to more social desirability bias than direct observation, generalizability was considered important in the current study. The number of observations required to obtain sufficient generalizability would have exceeded the scope of this project. It is acknowledged that observation, or perhaps interviews or focus groups, may be appropriate in a future mixed-method study. Those items included in the current study have been modified for context appropriateness.

A series of demographic items were included primarily in order to assess overall demographics and ensure sample representativeness. Second, demographic variables were intended to be included in statistical analyses to detect differences in knowledge, attitude, or
behaviour changes between students of different backgrounds (see Appendix J). These demographic variables included gender and time spent in nature with family. A single qualitative item was also included asking students to identify three words that came to mind when they thought of the word "nature." This item was intended to support the quantitative analysis and allow students an opportunity to express their thoughts in an open-ended question. All items were reviewed by program organizers to confirm their suitability for use with program participants was in alignment with program content.

**Accounting for Social Desirability Bias.** It is acknowledged that the potential for social desirability bias is high in the current methodology. No technique can fully eliminate social desirability bias. The use of social desirability scales (Nederhof, 1985), while effective, was deemed inappropriate for the current study due to the need for conciseness. In the scope of this study, social desirability bias was best addressed by confidentiality, and increased social distance between the participants and the data collector facilitated through researcher data collection rather than teacher-facilitated data collection (Nederhof, 1985). It is also emphasized that this project measures self-reported behaviours, and that actual participant behaviour may differ.

**Quantitative Data Analyses.** Analyses of quantitative items for the current investigation were conducted using SPSS statistical analysis software. Initial descriptive statistic analysis (including frequencies, means, standard deviations, and sample size) was conducted to provide an overall summary of responses. Differences in previous experiences in nature between genders was considered using an independent sample t-test. As knowledge represents a test, scores were calculated as a cumulative score of correct answers, with a possible maximum score of five. Principal axis factoring (PAF) was conducted in order to determine factors within attitude and behaviour measures. Scores for attitude and behaviour were calculated based on these results, as
described below. Scree analysis was used to determine the appropriate number of factors (Cattell, 1966; Field, 2009; Vogt, 2011). These factors were assessed for internal consistency, and mean score across items within respective factors was calculated, representative of overall scores to be used with further analysis. As authors of the NEP call for its use as a unidimensional scale, a single score containing all 10 NEP items was also calculated and used in further analysis (Amburgey & Thoman, 2012; Dunlap et al., 2000; Manoli et al., 2007).

Finally, a series of repeated measures ANOVAs were conducted primarily to detect significant differences in knowledge, attitude factors and overall NEP scores, and behaviour before and after the program, but also to detect possible relationships between changes in these scores and gender or previous experiences in nature. Each of the three variables was analyzed in a separate test. Calculated knowledge, attitude, and behaviour scores were used as within-subjects variables, while gender and time spent in nature were used as between-subjects variables. Repeated measures ANOVAs used simple contrasts in order to specifically compare changes occurring over time. Where significant changes were identified, means were compared under a Bonferroni confidence interval adjustment per Field’s (2009) recommendation.

**Qualitative Data Analysis.** Qualitative data were aggregated across participants, but with separation of pre- and post-program responses maintained. Terms were coded for emergent themes, and terms within each theme were compared between the pre- and post-program data in order to detect changes in the terms students associated with nature.

**Archived Data**

Further data were obtained from archived data collected annually by program staff for the purposes of program evaluation. Twelve schools that attended the program within the 2014-2015 academic year were randomly selected from the database. School and student identification were
numerically coded to ensure confidentiality. Questions in this data set consisted of a 10-item survey inquiring about the frequency of students’ environmental behaviours (Appendix K). Items were rated along a 3-point scale, where 1 represented Almost Never, 2 represented Sometimes, and 3 represented Most Times. Surveys were completed at each of the three phases of the program, allowing data to be compared across all three phases of the program.

**Ethics.** An amendment to the initial study design, approving the acquisition and use of archived data, was issued by Queen’s University’s General Research Ethics Board (Appendix L).

**Accounting for Social Desirability Bias.** While I could not collect these data personally, and therefore could not implement strategies to reduce social desirability bias, program administrators included one key method of validating the accuracy of student responses. After the program was complete, teachers were asked to rate changes (increase, no change, decrease) in students’ awareness/sensitivity to environmental issues, participation in school eco-initiatives, and frequency of informing others about environmental issues. Responses were summarized and provided by program staff for the purposes of comparison, as data were insufficient for quantitative analysis. While there may be potential for social desirability bias in these responses, they present a means of assessing accuracy of results. Therefore, teacher responses were qualitatively compared to results of quantitative analyses, as a means of proxy subject reporting (Nederhof, 1985), lending a superficial method of assessing alignment in the face of social desirability bias. As with the contemporary data, it is emphasized that these behaviours are self-reported and may differ from actual behaviour.

**Quantitative Data Analysis.** As with the contemporary data, analysis of archived data began with descriptive analysis, particularly consideration of means, standard deviations, and sample sizes. Principal axis factoring (PAF) was conducted in order to detect underlying factors
within the survey. These factors were assessed for internal consistency and a mean score across items within respective factors was calculated, representative of overall scores to be considered in a repeated measures ANOVA. The repeated measures ANOVA was conducted to detect for significant changes in self-reported behaviour frequency scores. The calculated mean score from factors identified via PAF were used as within-subjects variables with three time intervals. No between-subjects variables were available for inclusion. Simple contrasts were used to ensure phases were compared chronologically. Significant changes were considered using means under a Bonferroni confidence interval adjustment per Field’s (2009) recommendation.
Chapter 4

Results

Quantitative Results

Descriptive statistics. A total of 54 Grade 6 students participated in the current study. Of these, 48 completed the pre-program survey, and 36 completed the post-program survey. These students were recruited from two Grade 6 classes registered in the program, beginning in late 2015. Thirty-nine (72.2%) students were recruited from Class 1, while 15 (27.8%) were recruited from Class 2. Class 2 chose to withdraw from participation in the second phase of the study. This withdrawal was considered in the main component of statistical analysis, and any participants with missing data were excluded from comparative analysis.

Twenty-four (51.1%) of the participants identified as male, and 23 (48.9%) identified as female, representing an approximately equal distribution of males and females. When asked to indicate how often they spend time in nature, students provided an average rating of 2.96 (SD = .99), indicative of an average response of “Sometimes.” Responses to this item were normally distributed (see Table 1). There was no significant difference in previous time spent in nature between genders; t(45) = -1.33; p = .19. In order to ensure equal group sizes for subsequent analyses, the five-point scale used for time spent in nature was condensed to a three-point scale where Never and Rarely were combined, as were Often and Very Often.

Table 1.

<table>
<thead>
<tr>
<th>Time spent in nature</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>4</td>
<td>8.3</td>
</tr>
<tr>
<td>Rarely</td>
<td>10</td>
<td>20.8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>20</td>
<td>41.7</td>
</tr>
<tr>
<td>Often</td>
<td>12</td>
<td>25.0</td>
</tr>
<tr>
<td>Very often</td>
<td>2</td>
<td>4.2</td>
</tr>
</tbody>
</table>
Knowledge. Knowledge scores were calculated as a count of correct answers with a maximum possible score of 5. Both before and after the program, scores ranged from 0 to 5. Average scores increased from 2.67 (n= 48, SD= 1.45) before completion of the program, to 2.84 (n=36, SD= 1.69). Frequencies of correct and incorrect responses for both pre-program and post-program surveys are shown in Table 2. A repeated measures ANOVA comparing pre- and post-program knowledge scores found no significant change overall, nor a significant effect of gender or previous experiences in nature (see Table 3).

Table 2.

Responses to knowledge based true/false questions

<table>
<thead>
<tr>
<th></th>
<th>Pre-Program (n=48)</th>
<th>Post-Program (n= 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Correct</td>
<td>% Incorrect</td>
</tr>
<tr>
<td>Biodiversity means &quot;the number of species in an area.&quot;</td>
<td>35.4</td>
<td>27.1</td>
</tr>
<tr>
<td>My school has more biodiversity than a forest.</td>
<td>62.5</td>
<td>2.1</td>
</tr>
<tr>
<td>When the number of producers in an ecosystem goes down, so does the number of consumers.</td>
<td>47.9</td>
<td>2.1</td>
</tr>
<tr>
<td>I can reduce my negative impact on the environment by getting a drive to school.</td>
<td>72.9</td>
<td>4.2</td>
</tr>
<tr>
<td>If we can, it is better to Reduce or Reuse than it is to Recycle.</td>
<td>48.9</td>
<td>25.5</td>
</tr>
</tbody>
</table>
Table 3.

*Results of repeated measures ANOVA considering change in knowledge.*

<table>
<thead>
<tr>
<th></th>
<th>df1</th>
<th>df2</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1</td>
<td>23</td>
<td>1.47</td>
<td>.24</td>
</tr>
<tr>
<td>Time*Gender</td>
<td>1</td>
<td>23</td>
<td>.33</td>
<td>.57</td>
</tr>
<tr>
<td>Time*Experience</td>
<td>2</td>
<td>23</td>
<td>2.11</td>
<td>.14</td>
</tr>
<tr>
<td>Time<em>Gender</em>Experience</td>
<td>2</td>
<td>23</td>
<td>.17</td>
<td>.84</td>
</tr>
</tbody>
</table>

**Attitude.** Participant responses to individual NEP items for both the pre- and post-program survey have been summarized in Table 4. Participants rated responses along a 7-point Likert-type scale, where a rating of 1 indicated *Strongly Disagree*, and 7 indicated *Strongly Agree*. Prior to further analyses, specified items were reverse coded such that higher scores represented more positive environmental attitudes, and thus higher NEP scores. PAF was conducted using all 10 items of the NEP scale in order to detect factor loadings. However, the PAF could not be resolved, likely due to an insufficient number of responses. Two approaches were taken in order to pursue further analysis. First, three factors were used as described by Manoli et al. (2007). These factors included Rights of Nature, Eco-Crisis, and Human Exceptionalism (see Table 5). Second, a single overarching unidimensional NEP score was calculated incorporating all 10 items per the suggestions of Dunlap, et al. (2000) and Manoli et al. (2007). Internal consistency and descriptive statistics of each of the four scales is shown in Table 6. Note that internal consistency of the 7-point scale was low, and as such the scale was compressed to three points for all subsequent analyses (*Never/Rarely, Sometimes, Often/Very Often*). Further, specific items that might have contributed to low factor loading and internal consistency of the sub-scales were identified. Specifically, it appears that the items *Plants and animals have as much right as people to live, There are too many (or almost too many) people...*
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on Earth, and When people mess with nature it has bad results contributed to lack of clarity in factor loadings.

Table 4.

Summary of responses to NEP items

<table>
<thead>
<tr>
<th>Statement</th>
<th>Pre-Program (n=48)</th>
<th>Post-Program (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plants and animals have as much right as people to live.</td>
<td>6.50 1.19</td>
<td>6.48 .93</td>
</tr>
<tr>
<td>2. There are too many (or almost too many) people on Earth.</td>
<td>3.70 2.37</td>
<td>3.90 2.50</td>
</tr>
<tr>
<td>3. People are clever enough to keep from ruining the Earth.*</td>
<td>3.81 2.18</td>
<td>4.10 2.14</td>
</tr>
<tr>
<td>4. People must still obey the laws of nature.</td>
<td>6.52 1.19</td>
<td>6.65 .66</td>
</tr>
<tr>
<td>5. When people mess with nature, it has bad results.</td>
<td>5.96 1.44</td>
<td>5.71 1.85</td>
</tr>
<tr>
<td>6. Nature is strong enough to handle the bad effects of our modern lifestyle.*</td>
<td>3.73 1.91</td>
<td>3.13 2.15</td>
</tr>
<tr>
<td>7. People are supposed to rule over the rest of nature.*</td>
<td>2.34 1.80</td>
<td>1.55 1.15</td>
</tr>
<tr>
<td>8. People are treating nature badly.</td>
<td>5.47 1.77</td>
<td>5.42 2.09</td>
</tr>
<tr>
<td>9. People will someday know enough about how nature works to be able to control it. *</td>
<td>4.92 1.91</td>
<td>4.71 1.99</td>
</tr>
<tr>
<td>10. If things don't change, we will have a big disaster in the environment soon.</td>
<td>5.79 1.79</td>
<td>5.97 1.72</td>
</tr>
</tbody>
</table>

Note: 3 of the items had 1 or 2 missing responses
*item reverse coded prior to subsequent analysis.
Table 5.

Attitude scales within the New Ecological Paradigm as described by Manoli et al. (2007).

<table>
<thead>
<tr>
<th>Rights of Nature</th>
<th>Eco-Crisis</th>
<th>Human Exceptionalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plants and animals have as much right as people to live.*</td>
<td>2. There are too many (or almost too many) people on Earth.*</td>
<td>3. People are clever enough to keep from ruining the Earth.</td>
</tr>
<tr>
<td>4. People must still obey the laws of nature.</td>
<td>5. When people mess with nature, it has bad results.*</td>
<td>6. Nature is strong enough to handle the bad effects of our modern lifestyle.</td>
</tr>
<tr>
<td>7. People are supposed to rule over the rest of nature.</td>
<td>8. People are treating nature badly.</td>
<td>9. People will someday know enough about how nature works to be able to control it.</td>
</tr>
<tr>
<td>10. If things don't change, we will have a big disaster in the environment soon.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Internal consistency of scale would increase if item removed.

Table 6.

Internal consistency and summary of descriptives of attitude scales.

<table>
<thead>
<tr>
<th>Attitude Scale</th>
<th>Pre-Program Scores</th>
<th>Post-Program Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
</tr>
<tr>
<td>Rights of Nature</td>
<td>47</td>
<td>6.23</td>
</tr>
<tr>
<td>Eco-Crisis</td>
<td>45</td>
<td>5.26</td>
</tr>
<tr>
<td>Human Exceptionalism</td>
<td>48</td>
<td>3.85</td>
</tr>
<tr>
<td>Overall NEP</td>
<td>44</td>
<td>5.15</td>
</tr>
</tbody>
</table>

Note: Internal consistency reflects that of compressed 3-point Likert-type scale.

Each of the four attitude scales (unidimensional scale and three factors), was summarized to a single value, calculated as an average of item ratings. Each of the three scales, and the overarching NEP scale, were analyzed using repeated measures ANOVA in order to detect
changes over time, and to identify potential differences in effect based on gender. This analysis found no significant change in attitude towards the Rights of Nature, Eco-Crisis, Human Exceptionalism, or overall NEP over time. Of each variable, significant interactions between gender and time (Figure 5) were found for the factor of Human Exceptionalism. Effect of previous experience also approached, but failed to reach, significance on this factor (Figure 6). Namely, for gender, male students’ perceptions of Human Exceptionalism increased, indicating a more favourable or more integrated view of humans in nature. Female students encountered the opposite effect, decreasing in their Human Exceptionalism score, indicating a less favourable or less integrated view of humans in nature.

Table 7.

*Results of analysis for change in attitudes over time.*

<table>
<thead>
<tr>
<th>Factor</th>
<th></th>
<th>df1</th>
<th>df2</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall NEP</td>
<td>Time</td>
<td>1</td>
<td>14</td>
<td>1.68</td>
<td>.22</td>
</tr>
<tr>
<td></td>
<td>Time*Gender</td>
<td>1</td>
<td>14</td>
<td>1.58</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>Time*Experience</td>
<td>2</td>
<td>14</td>
<td>1.17</td>
<td>.34</td>
</tr>
<tr>
<td></td>
<td>Time<em>Gender</em>Experience</td>
<td>2</td>
<td>14</td>
<td>.18</td>
<td>.68</td>
</tr>
<tr>
<td>Rights of Nature</td>
<td>Time</td>
<td>1</td>
<td>16</td>
<td>.52</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td>Time*Gender</td>
<td>1</td>
<td>16</td>
<td>.30</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>Time*Experience</td>
<td>2</td>
<td>16</td>
<td>.31</td>
<td>.74</td>
</tr>
<tr>
<td></td>
<td>Time<em>Gender</em>Experience</td>
<td>2</td>
<td>16</td>
<td>.45</td>
<td>.65</td>
</tr>
<tr>
<td>Eco-Crisis</td>
<td>Time</td>
<td>1</td>
<td>17</td>
<td>2.76</td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td>Time*Gender</td>
<td>1</td>
<td>17</td>
<td>1.23</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td>Time*Experience</td>
<td>2</td>
<td>17</td>
<td>.67</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>Time<em>Gender</em>Experience</td>
<td>2</td>
<td>17</td>
<td>.39</td>
<td>.54</td>
</tr>
<tr>
<td>Human Exceptionalism</td>
<td>Time</td>
<td>1</td>
<td>18</td>
<td>.35</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td>Time*Gender</td>
<td>1</td>
<td>18</td>
<td>9.32</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>Time*Experience</td>
<td>1</td>
<td>18</td>
<td>3.54</td>
<td>.051</td>
</tr>
<tr>
<td></td>
<td>Time<em>Gender</em>Experience</td>
<td>1</td>
<td>18</td>
<td>2.28</td>
<td>.13</td>
</tr>
</tbody>
</table>
Figure 5. Change in Human Exceptionalism Rating by Gender

Figure 6. Change in Human Exceptionalism Rating by Previous Experience in Nature
**Efficacy of Outdoor Environmental Education**

**Behaviour – Contemporary data.** Newly collected behaviour data were rated along a 7-point Likert scale, where 1 represented a response of *Strongly Disagree* and 7 represented a response of *Strongly Agree*. Responses to pre- and post-program ratings are shown in Table 8.

Table 8.

*Descriptive analysis of responses to behaviour questions in survey data.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-Program (n= 48)</th>
<th>Post-Program (n= 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I turn the lights out when I leave a room.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>5.96</td>
<td>6.29</td>
</tr>
<tr>
<td></td>
<td>1.44</td>
<td>1.30</td>
</tr>
<tr>
<td>I am careful not to waste food.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>5.21</td>
<td>6.06</td>
</tr>
<tr>
<td></td>
<td>1.74</td>
<td>1.26</td>
</tr>
<tr>
<td>I am careful not to waste water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>5.77</td>
<td>6.35</td>
</tr>
<tr>
<td></td>
<td>1.64</td>
<td>1.05</td>
</tr>
<tr>
<td>I talk to my friends and family about the environment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>3.52</td>
<td>4.03</td>
</tr>
<tr>
<td></td>
<td>2.14</td>
<td>2.09</td>
</tr>
<tr>
<td>I would like to participate in an environmental project in my community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>4.70</td>
<td>5.06</td>
</tr>
<tr>
<td></td>
<td>2.18</td>
<td>1.90</td>
</tr>
</tbody>
</table>

PAF concluded that each of the five behaviour items loaded on a single factor (see Table 9). Internal consistency of this scale was .72 for the pre-program survey, and .75 for the post-program survey. Given these findings, an overall behaviour score was calculated as an average of ratings across the five items. Average behaviour scores across all students within this single scale were 5.04 (SD= 1.28) and 5.56 (SD= 1.11) for the pre- and post-program respectively. A repeated measures ANOVA found a significant change in self-reported behaviour over time; $F(1,22) = 11.55, p < .01$. No significant difference in behaviour change was found between genders or between students who had different amounts of previous experience in nature with their families (see Table 10).
Table 9.

*Factor loadings of behaviour items in survey data.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre-Program Factor Loading</th>
<th>Post-Program Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I turn the lights out when I leave a room.</td>
<td>.65</td>
<td>.46</td>
</tr>
<tr>
<td>I am careful not to waste food.</td>
<td>.64</td>
<td>.65</td>
</tr>
<tr>
<td>I am careful not to waste water.</td>
<td>.55</td>
<td>.36</td>
</tr>
<tr>
<td>I talk to my friends and family about the environment.</td>
<td>.53</td>
<td>.79</td>
</tr>
<tr>
<td>I would like to participate in an environmental project in my community.</td>
<td>.60</td>
<td>.83</td>
</tr>
</tbody>
</table>

Table 10.

*Results of repeated measures ANOVA for change in behaviour*

<table>
<thead>
<tr>
<th></th>
<th>df1</th>
<th>df2</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1</td>
<td>18</td>
<td>7.11</td>
<td>.02</td>
</tr>
<tr>
<td>Time*Gender</td>
<td>1</td>
<td>18</td>
<td>2.26</td>
<td>.15</td>
</tr>
<tr>
<td>Time*Experience</td>
<td>2</td>
<td>18</td>
<td>.10</td>
<td>.90</td>
</tr>
<tr>
<td>Time<em>Gender</em>Experience</td>
<td>2</td>
<td>18</td>
<td>.65</td>
<td>.53</td>
</tr>
</tbody>
</table>

**Behaviour – Archived data.** Archived data included a series of 10 items asking students to rate the frequency of various environmental behaviours at three separate times in the program. Ratings of 1 represented *Almost Never*, 2 represented *Sometimes*, and 3 represented *Most times* (see Table 11).

PAF revealed one factor, with the item *I walk or cycle to school whenever possible* excluded due to low factor loading across all three phases of data (see Table 12). Factor loadings
across the three phases of the program provided a similar factor score. Internal consistency of this 9-item scale was .69, .71, and .78 at Phases 1, 2 and 3 respectively.

Table 11.

*Descriptive statistics for responses to behaviour questions in archived data*
Table 12.

Factor loadings of behaviour items in archived data

<table>
<thead>
<tr>
<th>Item</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I walk or cycle to school whenever possible.</td>
<td>.06</td>
<td>.24</td>
<td>.19</td>
</tr>
<tr>
<td>I bring a waste-free lunch to school or eat lunch at home.</td>
<td>.44</td>
<td>.48</td>
<td>.63</td>
</tr>
<tr>
<td>I take short showers rather than baths.</td>
<td>.37</td>
<td>.42</td>
<td>.54</td>
</tr>
<tr>
<td>I compost food waste rather than throw it in the garbage (when possible).</td>
<td>.38</td>
<td>.48</td>
<td>.58</td>
</tr>
<tr>
<td>I help my family choose locally produced food when shopping, or we grow it ourselves in our garden or on our balcony.</td>
<td>.38</td>
<td>.36</td>
<td>.39</td>
</tr>
<tr>
<td>I drink tap water and use a refillable water bottle whenever possible.</td>
<td>.50</td>
<td>.47</td>
<td>.45</td>
</tr>
<tr>
<td>I shut down electronic devices such as computers, video game systems, and stereo when I'm not using them.</td>
<td>.35</td>
<td>.37</td>
<td>.52</td>
</tr>
<tr>
<td>I put waste in the right place by sorting and disposing of all my unwanted items correctly.</td>
<td>.53</td>
<td>.65</td>
<td>.62</td>
</tr>
<tr>
<td>I use eco-friendly ways to keep warm or cool (sweaters, blinds, fans, etc.).</td>
<td>.60</td>
<td>.50</td>
<td>.60</td>
</tr>
<tr>
<td>I donate items I don't use or wear anymore to someone who can (games, clothes, etc.).</td>
<td>.51</td>
<td>.43</td>
<td>.40</td>
</tr>
</tbody>
</table>

Overall behaviour scores were calculated as an average rating across the nine items in the scale. A repeated measures ANOVA investigating change across the three phases detected sphericity between the phases; \( \chi^2 = 54.73, p < .001 \). As suggested in Field's (2009) SPSS Manual, values for Greenhouse-Geisser and Huynh-Feldt corrections were averaged to assess change over time as the assumption of sphericity was violated. Analysis found a significant change in behaviour ratings over the three phases of the program; \( F(1.61, 317.92) = 66.04, p < .001 \). Each subsequent phase showed more frequent positive environmental behaviour than the previous, and an overall increase in frequency of positive environmental behaviour (\( P2-P1 = .43; P3-P2 = .29; P3-P1 = .71 \)).
Qualitative Results

Analysis of words students associated with nature detected five distinct themes: Adjectives, Components of a Natural Setting, Educational Concepts, Wildlife, and Places/Activities. A summary of all terms, including counts, can be found in Appendix M.

Before delving into the nuanced details of each theme, it should be acknowledged that four terms were mentioned far more often than any others (>10 times). These popular terms included trees, plants, animal(s), and flowers. All other terms were identified 5 times or less.

Adjectives. Both before and after the program students identified descriptors of a natural setting. Both before and after, the terms beautiful, green, and fun were identified. When comparing the terms listed exclusively before the program (amazing, breezy, cool, exciting, friendship, healthy, love, lovely, natural, radiant, religious, serenity) to those listed exclusively after the program (abused, clean, dangerous, free, living, peaceful, quiet, vast, wild), there is a notable difference in the theme. Specifically, the descriptive terms identified before the program appear to be more abstract and positive descriptors compared to those identified after. This contrast is highlighted in the shift from terms like healthy and natural to abused and dangerous.

Components of a Natural Setting. The largest grouping of terms consisted of components of a natural setting. Both before and after the program trees, forests, flowers, plants, grass, water, habitats, peace, and fresh air were commonly identified. Terms identified prior to the program captured a range of components (earth, garden, leaves, outdoors/outside, oxygen, rock, seas, sticks, wood), while those identified after seemed to group together and were more specific (bushes, dirt/mud/soil, waterfalls, wildlife/life). Of interest is the appearance of references to soil, dirt, and mud after the program, all of which were absent before.
Wildlife. As with other categories, the term animal(s) was identified both before and after the program. However, prior to the program there was a clear focus on insects (bugs, insects, flies), not to overlook the single student who indicated he or she associated tigers with nature. After the program, students’ only reference to insects was the term butterflies. Further, students identified birds and more specifically chirping birds, accounting for the only phonetic descriptor provided.

Educational concepts. The theme of educational concepts focuses on biological concepts included in the Ontario Curriculum. Both before and after the program, students relayed concepts of environment, food, and habitat(s). Of particular note was the mention of the term ecosystem before the program, and its replacement with the term biodiversity after the program, aligning with the change between the Grade 5 and Grade 6 curriculum.

Places/Activities. The final theme identified shows the most extreme contrast between pre- and post-program responses. A variety of places and activities were identified before the program (adventure, cabin, camp/camping, games, garden, park, soccer, sports), but no places or activities were identified after the program.
Chapter 5

Discussion

This chapter reviews the findings regarding each measured variable (knowledge, attitudes, and self-reported pro-environmental behaviours) from both contemporary and archived data as independent entities. It then seeks to consider the implications of these results as they apply more broadly to models of pro-environmental behaviour. Finally, this chapter discusses qualitative findings, acknowledges study limitations, and identifies future directions for study.

Considering Knowledge, Attitudes, and Behaviour as Independent Variables

Knowledge. Comparison of knowledge scores before and after the program revealed no significant change in knowledge through participation in the program. However, when considering questions individually, some interesting observations can be made. Students appeared to struggle specifically with two of the five knowledge questions (*When the number of producers in an ecosystem goes down, so does the number of consumers* and *If we can, it is better to Reduce or Reuse than it is to Recycle*).

It is encouraging, however, that there was an increase in the proportion of students who correctly answered questions about biodiversity (*Biodiversity means the number of species in an area* and *My school has more biodiversity than a forest*). These are promising findings as the theme of biodiversity reflects grade-level curriculum subjects. Further, these questions may be considered to reflect issue-related knowledge as described by Wyles et al. (2013). Similarly, while a majority of students correctly responded to the item *I can reduce my negative impact on the environment by getting a drive to school* before the program, this already high proportion did increase after the program. This item may be considered to be reflective of action-related knowledge (Wyles et al., 2013). As Wyles et al. (2013) explain, both action-related and issue-
related knowledge are necessary to provide both awareness and ability to act. The importance of both action- and issue-related knowledge is echoed in the work of Kaplan (2000) who holds that issue-related knowledge alone may cause people to become overwhelmed, while action-related knowledge alone may be hindered by lack of motivation.

Overall, the proportion of correct answers did increase for each item, and overall scores did increase marginally. However, despite these findings, overall scores did not change to a significant degree.

**Attitudes.** As indicated in the methods (Chapter 3) above, PAF was intended to detect underlying factors in the NEP attitude scale but results were inconclusive. Possible reasons for these inconclusive results are explored in the limitations section below. However, in light of this challenge and in order to pursue further analysis, four values were calculated. These included scores for the three factors identified by Manoli et al. (2007): Eco-Crisis, Human Exceptionalism, and Rights of Nature; and a single overarching NEP value obtained through treatment of the NEP measure as a unidimensional scale (Amburgey & Thoman, 2012; Manoli et al., 2014). Eco-Crisis reflects one’s acknowledgement that nature is in jeopardy, Rights of Nature reflects the belief that natural systems have the same rights as humans, and Human Exceptionalism reflects the belief that humans are separate from and in control of nature. Together these three factors form the NEP scale. The internal consistency of each of these four scales was analyzed, and was consistently low. Three items were considered particularly problematic: *When people mess with nature it has bad results;* *There are too many (or almost too many) people on Earth;* and *Plants and animals have as much right as people to live.* As Kopnina (2012) suggests, it is possible that students may have struggled with the concepts of these questions due to the minimal experience on which to base opinions.
When analyzing NEP worldview and its subscales, no significant changes were found over time. However, two interaction effects were apparent in one of the subscales. First, there was a significant effect of gender on attitudes towards Human Exceptionalism. Namely, females increased in their attitudes towards human exceptionalism, suggesting their perception of human separation from nature increased, while males’ scores decreased reflecting a heightened belief that humans are a part of nature. Similar to these findings, there was also a significant effect of previous experience in nature on attitudes towards Human Exceptionalism. While students with low and high levels of previous experiences considered humans to be more a part of nature after the program, those with moderate levels of past experience saw humans as more separate from nature. Both of these findings are interesting, and unfortunately no evidence could be found within the literature to corroborate or explain the results. These results may provide an area for further consideration in the future.

One finding of interest, however, is the decrease in the standard deviation of responses to the item *People must still obey the laws of nature*. Not only did this deviation decrease after the program, indicating a higher level of agreement on ratings, it is also noticeably lower than deviations of any other item both before and after the program. The mean was also the highest of any question, indicating strongest agreement, suggesting that there is a strongly held consensus on the rights of plants and animals.

In all, no significant change in overall attitude or independent factors of environmental attitudes were found; the aforementioned near-significant effect of previous experience, and significant effect of gender on perspectives of Human Exceptionalism notwithstanding. However, it is worth noting that overall NEP was positive before the program and increased slightly after the program, suggesting that students do hold positive environmental attitudes, if
not strongly positive. It is possible that, with more participants or longer programming, a greater shift might become apparent.

**Behaviour.** By far the most exciting finding of the current study is the consistency of results between the two behaviour measures considered. Both the contemporary data and the supplemental archived data showed increases in self-reported pro-environmental behaviour. Contemporary data showed increases in means for each question after the program, indicating a stronger level of agreement with statements of personal engagement in pro-environmental behaviour. Further, standard deviations decreased on all items indicating an increased level of agreement between participants on their level of environmental behaviour. The item *I talk to my friends and family about the environment* had a lower mean than other items. It is possible that this item may represent more co-operative environmental engagement compared to other items measuring direct action (Jensen, 2002). That is to say, engagement in this behaviour may be more dependent on shared engagement with other people rather than something that is entirely independent and internally controlled.

PAF revealed that all behaviour items measured the same factor, suggesting they all represent aspects of environmental behaviour as intended. This unidimensional scale was found to have acceptable internal consistency. Analysis of a calculated behaviour score found a significant increase in behaviour scores over time, and no difference between male and female students. Archived data showed a significant increase in the frequency of self-reported behaviour for all items over time. Items related to money saving had the highest means in Phase 1, possibly reflective of students’ residence in low-income urban neighbourhoods and subsequent necessity of money-saving behaviour (Kahn & Friedman, 1995).
PAF revealed a single factor behaviour scale in which the item *I walk or cycle to school whenever possible* failed to correlate with other items. This finding suggests that this item is perhaps not related to environmental behaviour, but rather to some other construct. It is possible that walking or cycling to school may be more a factor of proximity to the school, perceptions of safety, or simply family routine. Analysis of archived data behaviour scores across each of the three phases revealed a significant increase in the frequency of self-reported behaviour both between Phase 1 and Phase 2, and between Phase 2 and Phase 3. These findings are corroborated by teacher perspectives reflecting increases in student “awareness/sensitivity to environmental issues,” “participation in school eco-activities,” and frequency of students “informing others about environmental issues” as described by program organizers. In tandem, both behaviour measures reflect a significant, positive change in behaviour. This finding comes from two independent measures, populations, and time frames, which indicates consistency in the program’s ability to facilitate more environmentally responsible behaviours.

The VBN Model of Environmentalism depicts pro-environmental behaviour as a result of values, beliefs (knowledge), New Ecological Paradigm Worldview (attitudes), and one’s personal moral norms. (P. C. Stern, 2000). The current results in which behaviour changed without change in knowledge or attitude conflict with this model. A number of previous studies have explored the prevalence of knowledge (Boyes & Stanisstreet, 2012; Costanzo, Archer, Aronson, & Pettigrew, 1986; Finger, 1994; Haines, Kuruvilla, & Borchert, 2004; Pfeffer & Sutton, 1999; van Kerkhoff & Lebel, 2006) or attitude (Aschemann-Witzel & Aagaard, 2014; Newton & Meyer, 2013; Padel & Foster, 2005; Wilcock, Pun, Khanona, & Aung, 2004) change without subsequent behaviour change, generally attributed to barriers to action (Aschemann-Witzel & Aagaard, 2014; Baker, Davis, & Weaver, 2014; Corbett, 2005; Courtenay-Hall &
In fact, these approaches were the basis of the current study. However, as my findings suggest, knowledge or attitudes may not be necessary for generating changes in self-reported behaviour (Hawthorne, Stanley, & Smylie, 2008).

VBN focuses very strongly on what can be considered internal variables, or one’s beliefs, attitudes, and personal norms. However, as presented in Figures 3 and 4, external variables may contribute to behaviour regardless of one’s knowledge or attitudes (Kollmuss & Agyeman, 2002). While researchers often cite attitudes as the most important determinant of pro-environmental behaviour, they acknowledge that there are other factors that can impact behaviour (Bogner, 1998; Bogner & Wiseman, 2006; P. C. Stern, 2000). Boyes and Stanisstreet (2012) suggest that a student’s beliefs can have little effect on action if social pressures are sufficiently high. TPB details the role of social norms and perceived behavioural control in light of situational factors in driving behaviour irrespective of one’s beliefs or attitudes (Ajzen, 1985; Ajzen & Fishbein, 1980). It has been suggested that, rather than maintaining separation of VBN and TPB, a more comprehensive model may be obtained through their integration (De Groot & Steg, 2007; Kaiser, Wölfing, & Fuhrer, 1996). Two possible integrations are shown in Chapter 2 (Figure 3 and Figure 4). Not only may internal and external pressures interact, they may act entirely irrespective of each other in order to generate behaviour (Kollmuss & Agyeman, 2002). As acknowledged, external variables would have been beneficial to the current study, but were excluded primarily due to a lack of age- and culturally-appropriate measures.

It appears that, through the program and concurrent in-school activities, students were exposed to sufficient differences in social normative pressures so as to adopt new, more environmentally responsible norms (Aronson, 1990). The most important conclusion here is that,
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While knowledge or attitudes may contribute to pro-environmental behaviours, they are not the only route to behavioural change and may be entirely unnecessary if other pressures are sufficiently high, as depicted by TPB. In the future, it is important to consider integrated models of pro-environmental behaviour.

Considering Changes in Students’ Perceptions of Nature

While the overarching quantitative findings discussed above point to lack of change in knowledge and attitudes, and subsequent change in behaviour, qualitative findings identified some subtle changes in the way that students perceived nature. Qualitative analysis revealed five types of terms: adjectives, components of a natural setting, places/activities, wildlife, and biology concepts. Most students connected with the physical attributes of the natural environment, very often indicating that when thinking of nature they related it to images of trees, plants, and animals. While these common terms captured a broad concept of nature among the masses of students, some interesting impressions arose in a small set of terms that were identified only once or twice within the data. It is important to bear in mind that the most notable shifts in theme are found in these less commonly identified terms, and therefore can be considered suggestive or informative at best. These findings cannot be considered substantial enough to draw broad conclusions, but suggest that possible shifts in associations with nature may occur through the program.

First, when identifying adjectives, a small subset of terms draws specific regard. That is, prior to the program the terms natural and healthy were identified. Contrast these with the terms abused and dangerous. This difference is reflective of increased environmental concern and awareness of the potential risks present in nature. Perhaps more importantly, these descriptions may reflect issue-related awareness of consequences (Wyles et al., 2013). This increase in
awareness is echoed more subtly in the overall tone of the descriptors provided before the program, when terms were comparatively more positive and abstract. While still predominantly positive, the tone after the program appears to reflect feelings of awe and a sense of awareness.

In terms of wildlife before the program, there was a notable focus on insects, which is not particularly surprising from students raised in an urban setting, as it is likely they come into contact with insects more often than any other form of wildlife. After their outdoor education experience, however, students’ only mention of insects focused on butterflies, possibly inspired by construction of a butterfly garden as a sustainability project. What is perhaps more interesting is one student’s specification of chirping birds. This response represents the only phonetic descriptor identified either before or after the program, and suggests a new sensory environmental awareness.

Components of a natural setting that drew specific attention were dirt, mud, and soil. Reflecting on the anecdote of my own experience presented in the introduction of this document, in which students came to their field trip reluctant to get dirty and leaving with far less concern, the identification of these terms makes some sense. Taken together, the identification of these terms draws to mind the novelty of dirty/messy play for students in the outdoor education setting.

Before the program, students identified a number of places or activities that they associated with nature, but there was a noticeable absence of these terms after the program. It seems that perhaps, before attending the outdoor education centre, terms might have reflected the ways that urban students could engage in nature in an urban setting, with emphasis on terms that reflect the separation of nature and home (Fisman, 2005).

Finally, a small subset of students identified specific biological concepts; namely ecosystems and biodiversity. This is a promising finding, possibly hinting towards more
knowledge change than was captured in the quantitative questions above, as the term *ecosystem* is indicative of Grade 5 level curriculum, and *biodiversity* reflects awareness of Grade 6 curriculum content and therefore new knowledge.

Overall, qualitative findings suggest new knowledge and environmental awareness, and an overall shift in students’ perceptions of nature. Further, after the program some students acknowledged human abuse of nature, suggesting increased awareness of environmental problems. Qualitative findings described herein hint at more complex and subtle changes not detected by the quantitative analysis, and call for further investigation in the future.

**Limitations**

**Recruitment.** Contemporary data collection was undertaken with awareness of possible recruitment challenges. These challenges specifically consisted of recruitment difficulties due to Job Action at the provincial and municipal education levels, and concerns over possible lack of parent consent. While parent consent did not limit recruitment, Job Action and its associated constraints did indeed limit the number of schools that could be approached and that chose to participate in the study. A total of 9 schools were contacted; however, only 2 opted to participate, and of these, one was unavailable to participate in the second phase, contributing to an unequal sample size before and after the program.

It is important to acknowledge that the contemporary study design failed to include random selection at any level. An alternative design might have included random recruitment to an outdoor education program, rather than recruitment from existing registrants. While this strategy was considered, it seemed far more appropriate to partner with an existing program that incorporated the desired factors rather than design an entirely new program for the scope of this project. The number of schools participating in the program was not sufficiently high to allow for
random selection, so the best possible option was to recruit all schools participating within study timelines. All schools participating within the given time period were contacted in hopes of obtaining a robust sample.

Finally, it should be acknowledged that this study might have suffered from opt-in bias, emphasized by pressures and impediments to participation. This bias should have been limited with individual student participation thanks to the funding associated with program participation and thus alleviation of financial barriers. However, time constraints might have reinforced barriers at the school level, leading to opt-in bias at the school level. Only those schools most committed to research or with particular interest in the environment might have chosen to allocate already constrained time to participate, which might have had some influence on results. While the impediments caused by Job Action could not be avoided, attempts to strengthen results were made through obtaining archived data.

**Survey Design and Implementation.** Through design, conduct, and analysis of survey data, a small number of trade-offs and challenges became apparent in both the contemporary and archived collection methodologies. These trade-offs and challenges are discussed in detail here, in order of knowledge, attitude, survey behaviour, and archived behaviour.

Most generally, it would have been beneficial to include more knowledge questions. However, concessions had to be made in the interest of being concise. Students might have also struggled with the wording of two of the five questions, which might have had an impact on results. Aside from these minor concerns, questions regarding the validity of knowledge questions to the program and VBN model arise. With regard to the program, it is possible that the program did not teach the specific content of the questions included in the survey. It is
possible that knowledge did increase, but that knowledge in these specific questions did not, as a different set of questions might have better reflected program content.

Alternatively, when considering the VBN model, knowledge questions were included as a measure of beliefs about environmental consequences and personal responsibility. First, it is possible that knowledge was not an appropriate proxy for beliefs, despite its prevalence and common regard as such within the literature (Carrier, 2009; Duerden & Witt, 2010; Finger, 1994; Fisman, 2005; Goodwin et al., 2010; Karpudewan et al., 2015; Leeming et al., 1995; Leeming, Porter, Dwyer, Cobern, & Oliver, 1997; M. Stern et al., 2008; Wyles et al., 2013; Zsóka, Szerényi, Széchy, & Kocsis, 2013). Despite this application in previous literature, knowledge may not be an appropriate measure in substitute for belief, and does not fit within VBN if it does not specifically apply to behaviour. It may have been more appropriate to specifically ask about the consequences to valued things, the actions one can take, and if the students take those actions. It is possible that the current study assessed these concepts to some degree, but that these types of knowledge need to be addressed more explicitly in the future. If knowledge is continued to be used as a proxy for beliefs, it seems appropriate that, under VBN, questions specifically assess issue-related knowledge as a measure of beliefs about consequences, and action-related knowledge as a measure of personal ascription of responsibility (Wyles et al., 2013).

Alternatively, future research could benefit from development of explicit belief scales, or modification of existing scales, such as the Awareness of Consequences Scale (Ryan & Spash, 2012) for use with children.

When considering attitude items, two key weaknesses become apparent. First is the small number of participants and the effect this small sample size had on resolution of factor analysis. The literature suggests that a population of 50 is the minimum sample size appropriate to result
in an Exploratory Factor Analysis (Principal Axis Factoring in the current study; de Winter, Dodou, & Wierigna, 2009). Further, it is possible that students struggled to understand the response method for a 7-point Likert-type scale pinned at three points. Students tended to respond only in labelled columns, particularly in the first data collection session. This trend became apparent in transcription so that use of the response method was better explained in subsequent sessions. This poor understanding might have masked correlations between items and therefore factor loadings. It is important to note that this combination of insufficient response rate and lack of clarity may have been resolved in the post-program data collection phases had both classes participated, as students appeared to make more appropriate use of the intermediate response options in the post-program survey.

Internal consistency of the NEP scales used in this study was quite low, and far lower than those reported in the original paper from Manoli et al. (2007). This may have been a result of lack of clarity or low response rate in the current study, but may also point to potential problems with the Children’s NEP Scale. While I am not prepared to fully discount the use of the Children’s NEP Scale in the future, based on the results of this single small study, reassessment and potential revision of the scale will be considered prior to its use in any future studies.

Although use of NEP was justified, particularly by its direct inclusion in VBN, it should be noted that the scale does bear criticism, and that other measures might have been more appropriate in measuring attitude, especially if the intent was to measure attitudes generally without explicit consideration of VBN. Kopnina (2012) indicates that children do not always know about the concepts, or can’t fathom the implications of the concepts, and that the NEP should at the very least be accompanied by qualitative data. Riley Dunlap, one of the NEP developers, has recently
acknowledged that some items may need updating, while maintaining that the scale as a whole remained relevant and useful (Dunlap, 2008).

Finally, as with knowledge, it is important to acknowledge that, while certainly valid to VBN, it is possible that the NEP scale was not valid to the program, specifically as a measure of cognitive attitudes. It is possible that other more affective attitude scales, such as the Children’s Connection to Nature Scale (Cheng & Monroe, 2012), 2-MEV (Model of Ecological Values; Bogner, 1998; Bogner & Wiseman, 2006), or the Emotional Affinity for Nature Scale (Müller, Kals, Pansa, & Malkus, 2009) might have been more appropriate.

It is possible that the attitude and both behaviour scales were susceptible to social desirability bias. In the contemporary survey data, this possibility could have been better accounted for through use or incorporation of a proxy subject (Nederhof, 1985) or through use of a mixed-method design with observations and/or interviews. The archived data did include some corroboration of findings through teacher responses. However, the archived data survey was completed on the same page in a workbook, such that students could see their previous response(s) when completing Phases 2 and 3. This proximity was likely to increase bias in responses and lead to inflation of positive scores in the later phases. It is most important to note that, despite the possible problems with the two behaviour measures, consistency between the two measures is a promising finding and lends support to the overall conclusion.

**Future Directions**

Bearing in mind the findings and limitations of the current study some future directions have been identified. Most directly is the re-investigation of the current research questions using a revised and improved study design. Ideally, in the future, it would be interesting to reassess these results using a mixed-method design, incorporating both an improved and possibly more
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comprehensive quantitative survey, and qualitative methods to assess attitude and behaviour change – perhaps direct observation and interviews. Use of a proxy subject would further strengthen results and help to account for any response bias.

Of interest in the current study is the apparent role of gender, and perhaps past experience in nature, as factors influencing students’ perceptions of Human Exceptionalism. To date, no evidence from the literature can corroborate or explain these findings. As such, this area warrants further consideration and investigation in the future.

Future studies may also benefit from explicit consideration of affective and cognitive attitudes towards nature. As discussed above, the use of NEP was justified in the current study, but use of a more affective attitude scale might have returned different results. Unfortunately, this is only conjecture without investigation.

Finally, it is important to acknowledge the multitude of scales intended for use with adults that would have been beneficial in this study if adapted for use with children. Some of these included the Awareness of Consequences Scale (Ryan & Spash, 2012) measuring beliefs; the Oneness Belief Scale (Garfield, Drwecki, Moore, Kortenkamp, & Gracz, 2014), Connectedness to Nature Scale (Mayer & Frantz, 2004), Affective Connection to Nature Scale (Hinds & Sparks, 2008), Nature Relatedness Scale (Nisbet et al., 2011), Environmental Identity Scale (Clayton & Opotow, 2003), Measure of Inclusion of Nature in Self (P. W. Schultz, 2002), Emotional Affinity Toward Nature Scale (Kals et al., 1999), Environmental Motives Scale (Bruni, 2012), and Environmental Attitudes Inventory (Milfont & Duckitt, 2010) measuring attitudes; and finally the Pro-Environmental Behaviour Scale (Markle, 2013). Despite their potential use, adaptation of scales fell outside the scope of the current study. Regardless, it is worth considering adapting these scales for use in the future, as they could certainly contribute to
more comprehensive investigation of motivators for pro-environmental behaviour. Perhaps in-depth consideration of these scales could return a wide-scale program evaluation tool for outdoor education programs.

**Lingering Questions**

In Chapter 1, the question of whether or not apparent changes in attitude and behaviour observed through the program could be repeated, quantified, and rendered sustainable was posed. While the current findings suggest that behaviour changes are repeated and can be quantified, the question remained the extent to which the results of this study are sustainable. While the immediate impact of outdoor education is important to understand, environmental protection and recovery will require ongoing efforts at all levels of society. It is therefore important to understand if current results can be sustained, and what (if anything) is necessary to sustain them. Assessment of this question will require an in-depth longitudinal study.

Second, while individual behaviour is important, wide-scale behaviour change is necessary to enact the degree of change necessary for environmental protection and recovery. This necessity prompts the question of how population-wide behaviour can arise, which can be extended to consider not only government and organization environmental responsibility, but also politically active public behaviour to pressure such responsibility. Research has shown that individuals often become disillusioned because of the scale of environmental problems (Kaplan, 2000; Kollmuss & Agyeman, 2002). Our current findings suggest that social normative pressures may help to sustain individual behaviour. It is then perhaps a ‘chicken-and-egg’ question of whether or not it is more effective for individual or small group action to pressure the larger populace, or rather wide-scale external pressures from government or organizations are more effective in reaching the individual.
Conclusion

To summarize, the current study found that the program did not enact significant change in knowledge or attitudes, but did conclude with change in behaviour, verified from two independent data sources. While there are many possible explanations for this finding, it seems reasonable that the identified behaviour change might have been linked to external causes; most likely a shift in awareness of social normative pressures. These findings demonstrate that prolonged and classroom-integrated outdoor education experiences can have positive impacts on students’ self-reported environmentally responsible behaviour, and provides support for the continued use of such programs in the effort to encourage increased pro-environmental behaviour.
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References


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Appendices

Appendix A: Queen’s General Research Ethics Board Clearance

Ms. Brittany Harding
Master’s Student
Faculty of Education
Queen’s University
Duncan McArthur Hall
511 Union Street West
Kingston, ON, K7M 3R7

GREB Ref #: GEDUC-784-15; Romeo # 6016245
Title: "GEDUC-784-15 Pro-environmental Behaviour, Attitudes, and Knowledge: A Comparative Study of Two Outdoor Education Models"

Dear Ms. Harding:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "GEDUC-784-15 Pro-environmental Behaviour, Attitudes, and Knowledge: A Comparative Study of Two Outdoor Education Models" for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

Jean Stevenson, Ph.D.
Chair
General Research Ethics Board

c: Dr. Don Klinger, Faculty Supervisor
Dr. Liying Cheng, Chair, Unit REB
Ms. Erin Wicklam, c/o Graduate Studies and Bureau of Research
Appendix B: Letter to Principals

Dear [Principal's name],

I am contacting you with an invitation to contribute to a research project regarding the positive impacts of outdoor education on students. This investigation is being undertaken through a partnership with the [Redstart Conservation Areas] and myself, Brittany Harding (Master of Education, Candidate). Your school has been identified as eligible for the current study thanks to your school’s upcoming participation in [Program].

Specifically, the current study will assess the changes that occur in students' environmental knowledge, attitudes, and behaviour through participation in one of two outdoor education programs conducted by the RCA. Eligible participants from your school include Grade 6 students of classes participating in [Program]. Data will be collected on two occasions, once before and once after students' participation in [Program], at times agreed upon with classroom teachers. Each session is expected to take approximately 30-45 minutes.

Information obtained from the current study is intended to inform future development of these programs in hopes of improving student learning and experience. Further, it will contribute to a broader understanding of the positive impacts of outdoor education for environmentally sustainable attitudes and behaviours developed in childhood. Specifically, it will allow you better understanding of the benefits afforded to your students through participation in RCA programming. Perhaps most importantly, your participation will serve to inform you and your staff in the benefits afforded to your students through this educational experience.

It should be noted that your school's participation in the current study, or lack thereof, will not impact your students' educational experiences, or your relationship with the RCA. RCA staff will be unaware of which program registered schools have agreed to participate in the current study. If you should choose to participate, your school's, teachers’, and students’ identities will be protected to the fullest extent possible.

I will arrange a time with your secretary to speak with you by phone over the upcoming weeks, and look forward to the opportunity to working with you. Should you wish to contact me directly with any questions or concerns prior to this time, I can be contacted by email at 9bah@queensu.ca.

Thank you for your time and consideration.

Regards,

Brittany A. Harding
Queen's University
Master of Education Candidate
BScH (Biology), B.Ed
Appendix C: Letter of Information/Consent for Teachers

LETTER OF INFORMATION/CONSENT FORM

Pro-environmental Behaviour, Attitudes, and Knowledge:
A Comparative Study of Two Outdoor Education Models

This research is being conducted by Brittany A. Harding (Master of Education, Candidate) under the supervision of Dr. Don A. Klinger in the Faculty of Education at Queen's University in Kingston, Ontario. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen's policies.

Purpose of this study
The current study will seek to understand the impacts that outdoor education programming has on environmental knowledge, attitudes, and behaviours of children. Previous research has demonstrated that outdoor education programming, such as the program your class will be attending, have positive impacts on different measures of environmentalism. In order to better understand the relationship between outdoor education and environmentalism, the current study intends to compare the impacts of two outdoor education models organized by the [Redstart Conservation Areas].

What will this study require?
If you agree to allow your class to participate in the current study, your students will be asked to complete a short survey on two occasions. These will be approximately 1 to 3 days before your class' completion of Phase 1, and 1 to 3 days following your class' completion of Phase 3 of the Program. Surveys will be conducted by the researcher at a time agreed upon with you. Survey completion will require approximately 30-45 minutes on each occasion. Your commitment to your class' participation will require your assistance in arranging a time for survey completion.

Is participation voluntary?
Your class' participation in the current study is entirely voluntary. Refusal to participate in this research will not impact your class' experience in The program in any way.

There are no known physical, psychological, economic, or social risks associated with this study. You may withdraw your class from the study at any time with no negative consequences. If you withdraw your class from the study, you may request to have any previously collected data destroyed.
What will happen to my class’ responses?
Your class' survey responses will be completed on paper. Codes will be used to maintain your students' privacy, while allowing the researcher to track changes before and after program completion. Confidentiality will be protected to the fullest extent possible. No data will contain yours, your students’, or your school's names. Once completed, responses will be collected by the researcher and stored in a locked cabinet. Data will be manually input to statistical analysis software by the researcher, and stored in encrypted electronic files pending analysis. Paper copies of surveys will be kept for up to 1 (one) year following completion, while electronic copies will be stored for up to 5 (five) years for use in subsequent research.

What if I have concerns?
Any questions about study participation or a request to withdraw from the study may be directed to Brittany A. Harding at 9bah@queensu.ca, or to the study supervisor Dr. Don A. Klinger at klingerd@queensu.ca (613-533-6000 x77273). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board of Queen's University at chair.GREB@queensu.ca (613-533-6081).

Please sign and return the section below to the researcher. Retain the information above for your records.

I have read the statements above and have had any questions answered. I hereby provide consent for my class’ participation in this study.

Signature:____________________________

Date: ________________________

Email address: ____________________________
Appendix D: Letter of Information/Consent for Parents/Guardians

LETTER OF INFORMATION/CONSENT FORM

Pro-environmental Behaviour, Attitudes, and Knowledge: A Comparative Study of Two Outdoor Education Models

This research is being conducted by Brittany A. Harding (Master of Education, Candidate) under the supervision of Dr. Don A. Klinger in the Faculty of Education at Queen's University in Kingston, Ontario. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen's policies.

Purpose of this study
The current study will seek to understand the impacts that outdoor education programming has on environmental knowledge, attitudes, and behaviours of children. Previous research has demonstrated that outdoor education programming, such as the program your child will be attending, have positive impacts on different measures of environmentalism. In order to better understand the relationship between outdoor education and environmentalism, the current study intends to compare the impacts of two outdoor education models organized by the [Redstart Conservation Areas].

What will this study require?
If you agree to allow your child to participate in the current study, your child will be asked to complete a short survey before and after they participate in the program. Surveys include a total of 23 questions, reflecting demographic information, environmental knowledge, intentions for positive environmental action, and questions intended to measure children's attitudes about the environment.

Surveys will be conducted in your child's classroom in the days immediately prior the start, and immediately following the completion of the class' the program. Survey completion is intended to take approximately 30-45 minutes on each of these two occasions, for a cumulative 60-90 minutes of commitment.
Is participation voluntary?
Your child's participation in the current study is entirely voluntary. Refusal to participate in this research will not impact your child's experience in the program in any way.

There are no known physical, psychological, economic, or social risks associated with this study. Further, your child may refuse to answer any question within the surveys. You may withdraw your child from the study at any time with no negative consequences. If you withdraw your child from the study, you may request to have any previously collected data destroyed. Should you wish to withdraw your child from the current study, you may contact the researcher at 9bah@queensu.ca.

What will happen to my child's responses?
Your child's survey responses will be completed on paper. Confidentiality will be protected to the fullest extent possible. No data will contain your child's name or the identity of your child's school. Codes will be used to maintain your child's privacy, while allowing the researcher to track changes before and after program completion. Once completed, responses will be collected by the researcher and stored in a locked cabinet. Data will be manually input to statistical analysis software by the researcher, and stored in encrypted electronic files pending analysis. Paper copies of surveys will be kept for up to 1 (one) year following completion, while electronic copies will be stored for up to 5 (five) years for use in subsequent research.

What if I have concerns?
Any questions about study participation or a request to withdraw from the study may be directed to Brittany A. Harding at 9bah@queensu.ca, or to the study supervisor Dr. Don A. Klinger at klingerd@queensu.ca (613-533-6000 x77273). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board of Queen's University at chair.GREB@queensu.ca (613-533-6081).

Please sign below to provide consent for your child's participation in the current study. Return the section below the dotted line to your school. Retain the information above for your personal records.

I have read the statements above and have had any questions answered. I hereby provide consent for my child's participation in this study.

Child's Name: ________________________________
Parent/Guardian Signature: ________________________________
Date: ________________________________
Appendix E: Student Letter of Information and Pre-Program Survey

Letter of Information

Hello!

My name is Brittany Harding, and I am a student at Queen's University. I am doing a research study about the effects of outdoor education on kids your age. It is important for people to understand how outdoor education programs, like the one your class is visiting on your field trip, can benefit kids and the environment. We really want to know how well the programs teach you about the environment, and if they change your feelings about it.

On the next page is a short survey that will ask you questions about yourself and your experiences in nature, followed by some True-False Questions, and some questions about your feelings about the environment. It should take about 15 minutes to complete.

**Please answer honestly! Your parents and teachers will not see your responses.** How you answer these questions will not hurt your grades in anyway. Your name won't be attached to your answers at any time, in order to protect your confidentiality.

**Please do NOT write your name anywhere on the page!** I will direct you in writing a code at the top of the page that will be used instead.

You are being asked to participate because your Principal, teachers, and parents/guardians have provided permission. Your privacy will be maintained to the highest level possible.

If you are not comfortable answering any question in the survey, it is okay to leave it blank.

If you do not want to participate in the study at all, you can turn your blank survey in at any time, or wait quietly while the rest of your class completes it.

If you complete the survey, and decide later that you don't want your answers included in this study, please speak to your teacher or your parents, who can contact me directly.

If you have any questions at any time during the survey, please raise your hand and I will come to you. If you have questions later, your teacher and parents can contact me directly to answer your questions.

Thank you for your time,

Brittany A. Harding
ID Code: 

What I Know and How I Feel about the Environment  
Pre-Trip

Section 1: Your background  
The first section of the survey will ask a couple questions about you. Please select the answer that applies to you.

1. Gender  
   Male       Female

2. How often do you spend time in nature with your family?  

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
</table>

3. What are three words that come to mind when you think of the word nature.

___________________ _______________ _______________

Section 2: True of False Questions  
These 5 questions are True or False. Please answer to the best of your ability. If you don't know an answer, don't guess. Please select "I don't know".

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<th></th>
<th>True</th>
<th>False</th>
<th>I don't know</th>
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<td>True</td>
<td>False</td>
<td>I don't know</td>
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<tr>
<td>2. My school has more biodiversity than a forest.</td>
<td>True</td>
<td>False</td>
<td>I don't know</td>
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<tr>
<td>3. When the number of producers in an ecosystem goes down, so does the number of consumers.</td>
<td>True</td>
<td>False</td>
<td>I don't know</td>
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<tr>
<td>4. I can reduce my negative impact on the environment by getting a drive to school.</td>
<td>True</td>
<td>False</td>
<td>I don't know</td>
</tr>
<tr>
<td>5. If we can, it is better to Reduce or Reuse than it is to Recycle.</td>
<td>True</td>
<td>False</td>
<td>I don't know</td>
</tr>
</tbody>
</table>
**Section 3: Feelings about the environment**

This last set of questions will ask for your opinion about a statement. Check the box that rates your level of agreement with the opinion given in the sentence.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Neither Agree or Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
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<tr>
<td>2. I am careful not to waste food.</td>
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<td>3. I am careful not to waste water.</td>
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<tr>
<td>4. I talk to my friends and family about the environment.</td>
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<td>5. I would like to participate in an environmental project in my community.</td>
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<td>6. Plants and animals have as much right as people to live.</td>
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<td>10. When people mess with nature, it has bad results</td>
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<td>13. People are treating nature badly.</td>
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<td>14. People will someday know enough about how nature works to be able to control it</td>
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<tr>
<td>15. If things don't change, we will have a big disaster in the environment soon.</td>
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Appendix F: Student Letter of Information Reminder and Post-Program Survey

ID Code: _______________________

What I Know and How I Feel about the Environment Post-Trip

Hi!
Many of you previously completed a survey about your knowledge and feelings about the environment. Today we will be completing a very similar survey.

Like last time, your questions will be kept totally confidential. Your parents and teachers will not see your responses. Please answer honestly. Please answer all questions to the best of your ability, and feel free to leave any question blank.

Thank you again for your time,
Brittany A. Harding

**Section 1: What is nature?**
What are three words that come to mind when you think of the word *nature*.

__________________  ___________________  ___________________

**Section 2: True of False Questions**
These 5 questions are True or False. Please answer to the best of your ability. If you don't know an answer, don't guess. Please select "I don't know".

<table>
<thead>
<tr>
<th>Question</th>
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</tr>
</tbody>
</table>
Appendix G: Knowledge Survey Questions

1. Biodiversity means "the number of species in an area". (T)
2. My school has more biodiversity than a forest. (F)
3. When the number of producers in an ecosystem goes down, so does the number of consumers (T).
4. I can reduce my negative impact on the environment by getting a drive to school. (F)
5. If we can, it is better to Reduce or Reuse than it is to Recycle. (T)

Appendix H: New Ecological Paradigm Worldview (Attitude) Survey Questions

1. Plants and animals have as much right as people to live.
2. There are too many (or almost too many) people on Earth.
3. People are clever enough to keep from ruining the Earth.*
4. People must still obey the laws of nature.
5. When people mess with nature it has bad results.
6. Nature is strong enough to handle the bad effects of our modern lifestyle.*
7. People are supposed to rule over the rest of nature.*
8. People are treating nature badly.
9. People will someday know enough about how nature works to be able to control it.*
10. If things don't change, we will have a big disaster in the environment soon.
*item reverse coded

Appendix I: Self-Reported Behaviour Questions (Contemporary Data)

1. I turn the lights out when I leave a room.
2. I be careful not to waste food.
3. I am careful not to waste water.
4. I talk to my friends and family about the environment.
5. I would like to participate in an environmental project in my community

Appendix J: Demographic questions.

1. Gender (M/F)
2. How often do you spend time in nature with your family?
   - Never
   - Rarely
   - Sometimes
   - Often
   - Very often
Appendix K: Self-Reported Behaviour Questions (Archived Data)

1. I walk or cycle to school whenever possible.
2. I bring a waste-free lunch to school or eat lunch at home.
3. I take short showers rather than baths.
4. I compost food waste rather than throw it in the garbage (when possible).
5. I help my family choose locally produced food when shopping, or we grow it ourselves in our garden or on our balcony.
6. I drink tap water and use a refillable water bottle whenever possible.
7. I shut down electronic devices such as computers, video game systems and stereos when I’m not using them.
8. I put waste in the right place by sorting and disposing of all my unwanted items correctly.
9. I use ecofriendly ways to keep warm or cool (sweaters, blinds, fans, etc.).
10. I donate items I don’t use or wear anymore to someone who can (games, clothes, etc.).
Appendix L: Ethics Amendment to Include Archived Data

October 09, 2015

Ms. Brittany Harding
Master’s Student
Faculty of Education
Queen’s University
Duncan McArthur Hall
511 Union Street West
Kingston, ON, K7M 5R7

Dear Ms. Harding:

RE: Amendment for your study entitled: GEDUC-784-15 Pro-environmental Behaviour, Attitudes, and Knowledge: A Comparative Study of Two Outdoor Education Models; ROMEO# 6016245

Thank you for submitting your amendment requesting the acquisition of an archived data set, collected by the [redacted] in previous years for program evaluation purposes. All identifiers will be removed from the data set by the [redacted] before it is sent to you. Data will be stored in an encrypted electronic file, and analyzed using SPSS.

By this letter you have ethics clearance for these changes.

Good luck with your research.

Sincerely,

Joan Stevenson, Ph.D.
Chair
General Research Ethics Board

cc: Dr. Don Klinger, Supervisor
## Efficacy of Outdoor Environmental Education

### Appendix M: Summary Qualitative Results

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86
### EFFICACY OF OUTDOOR ENVIRONMENTAL EDUCATION

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