

The Pennsylvania State University

The Graduate School

Department of Recreation, Park, and Tourism Management

**NATURE CONNECTION, OUTDOOR PLAY, AND ENVIRONMENTAL
STEWARDSHIP IN RESIDENTIAL ENVIRONMENTAL EDUCATION**

A Dissertation in

Recreation, Park and Tourism Management

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

May 2011

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ABSTRACT

A lack of exposure to the natural world has led to a generation of children disconnected from nature. This phenomenon has profound negative implications for the physical and psychological well being of today's youth. Residential environmental education provides one avenue to connect children to nature. One purpose of this study was to investigate the role of Outdoor School, a residential environmental education program, on ecological knowledge, children's connection to nature, school belonging, outdoor play attitude, environmental stewardship attitude, outdoor play behavior, and environmental stewardship behavior, as reported by participants.

A quasi-experimental research design was utilized in the study. A total of 228 fifth grade students (156 treatment, 72 control) from central Pennsylvania participated. The results of the program evaluation indicated that Outdoor School was successful in achieving significant, positive gains in the areas of ecological knowledge, connection to nature, outdoor play behavior, and environmental stewardship behavior. No change was found from pretest to post-test in outdoor play attitudes, environmental stewardship attitudes, and school belonging.

Additionally, the study addressed gaps in the literature regarding the relationship between connection to nature, environmental stewardship, and outdoor play using two different approaches. An adaptation of the Theory of Planned Behavior (TPB) was used to predict outdoor play behavior in children. In this model, favorable attitudes, subjective norms, and perceived behavioral control lead to intentions to perform a given behavior. Intention to perform the behavior is the best predictor for behavior performance. For this

study, participants' feeling of connection to nature was added as an affective independent variable. This model explained 45% of the variance in outdoor play. The hypothesis that a connection to nature would be a significant predictor of both attitudes toward outdoor play was supported by testing of the model.

Finally, nature connection was tested as a full mediator of the relationship between outdoor play and environmental stewardship. There is support for the idea that direct experience in the outdoors facilitates environmental behaviors, but more research is needed to understand this relationship. Testing of the model failed to demonstrate that nature connection fully mediated the relationship between outdoor play and environmental stewardship; however, a feeling of connectedness to nature augmented the influence that outdoor play behavior exerts on environmental stewardship behavior.

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ACKNOWLEDGEMENTS

A special thank you is extended to the people who offered the time and effort to help me with this project. Thanks especially to Dr. Andrew Mowen for the encouragement and mentoring as my thesis chair. Thank you to Dr. Deb Kerstetter for allowing me to barge into your office unannounced and for being a model of the kind of teacher I hope to be. Thank you to Dr. Rama Radhakrishna for guiding me through the evaluation process and to Dr. George Vahoviak for sharing his passion for sustainability and the outdoors. Thanks also to Dr. Chris Uhl for leading by example and to Dr. Mary Beth Oliver for providing a roadmap to navigate the statistics terrain.

Several members of the Shaver's Creek community made completion of this thesis possible. Thank you to Ellen Will and Paul Brigman for allowing me to evaluate the Outdoor School program and for providing invaluable input. Thanks to everyone at the center for making such a special place and for welcoming me as family.

There are numerous friends and family members who helped me tremendously on my journey. Thank you to my parents, Don and Dee Andrejewski, as well as my in-laws Tom and Mary Jane Daley, for asking me about my research when more interesting conversation topics were readily available. Thanks also to my office mates, Nate Trauntvein, Libby Covelli, Robby Cooper, and Elizabeth Weybright. You are among the most generous souls I know and I view our friendship as the fun part of this shared journey. Finally, I dedicate this dissertation to my wife, Jennie Daley, whose support and kindness are constant reminders of what it means to be loved, and to my son, Leo, for rearranging my life and priorities so profoundly and perfectly.

Chapter 1

Introduction

Children and Nature

Children in the U.S. are spending less time engaged in outdoor activities (Clements, 2004; Hofferth & Sandberg, 2001; Pergams & Zaradic, 2006), a phenomenon thought to be impacting their physical, psychological, and environmental well-being (Kellert, 2002; Louv, 2005). Children who play outdoors and explore the natural world tend to be healthier physically and psychologically (Kahn, 2002). Without direct experience in nature, opportunities for creativity, problem solving, physical activity, and ethical development are diminished and degraded (Kellert, 2002; 2005). The benefits of outdoor experience are long-lived. Experiences in nature during childhood have been shown to contribute to the development of caring and grounded adults (Kahn, 2002). Furthermore, children who establish a personal relationship with nature are more likely to develop an appreciation of and care for the earth (Bunting & Cousins, 1985; Martin, 1999; Sobel, 1996, 2004). This bond is a precursor to environmental stewardship behaviors as an adult (Chawla, 1998).

The growth of media-based recreation experiences, which are based predominantly inside the home, has contributed to a generation of indoor children (Gaster, 1991; Pyle, 2002; Rideout, Foehr, & Roberts, 2010). At the end of the twentieth century, the amount of time the average American child consumed media each week was

equivalent to an adult workweek (Roberts, Foehr, Rideout, & Brodie, 1999), and recent reports point to an increase in that amount when media multitasking was taken into consideration (Rideout, Foehr, & Roberts, 2010). In addition to television, music, and movies, gaming has also coaxed children indoors. Approximately 50 percent of U.S. households with younger children have some type of video game console (Roberts & Foehr, 2008), and a Harris Interactive Poll found that 8 to 12 year old children spent 13 hours each week playing video games (Martin & Oppenheim, 2007).

In response, there has been a call for increasing the time youth spend communing with nature in free play (Louv, 2005; Pyle, 2002; Sobel 2004; White, 2004), in educational settings (Moore & Wong, 1997; Sobel, 1996; 2004; Van Matre, 1990), and in structured and unstructured recreation (Bixler, Floyd, & Hammitt, 2002; Phenice & Griffore, 2003). Providing for these experiences, however, presents a challenge for a variety of recreation organizations and businesses due to the changing nature of leisure behavior.

While parents do not necessarily want their children to play inside or spend so much time engaged in digital media, a perception of danger—stranger danger, fear of litigation, and physical harm—has led to a decrease in outdoor time (Clements, 2004; Louv, 2005). Clements' (2004) study of mothers in North America captured the changes that have taken place over just one generation. Whereas three-fourths of the mothers polled went outside to play every day when they were children, only a third of their children do (Clements, 2004). Even when kids are free to play outside, the radius that they are allowed to stray from the home during play has greatly decreased (Gaster, 1991; Louv, 2005; Sobel, 2004). Additionally, with two parents working and many children in

daycare or afterschool programs, the presence of a primary adult to watch over a child and guide their exploration of the natural world has greatly decreased (Kellert, 2002).

Less time outside corresponds with a decrease in direct experience with nature. Nature is emulated in the built environment and is shown on television (Pyle, 2002), but direct sensory experience with nature cannot be replicated by facsimile (Kellert, 2002). Hiking along a trail, engaging in awareness activities (with or without a guide), and simply exploring the edge of a manicured field offers children the chance to learn about the world at their own pace (Moore & Wong, 1997; Pyle, 2002; Sobel, 1996). Nature inspires creativity, problem solving, feelings of freedom, and connection to the environment (Louv, 2005; Moore & Wong, 1997; Nabhan & Trimble, 1994). There is also evidence for psychological, cognitive, and emotional benefits of spending time in nature, including restoration (Kaplan, 1995), concentration (Faber Taylor & Kuo, 2006), and care for other people (Kahn, 2002).

Childhood experiences in nature have been correlated with future environmental ethics (Chawla, 1998, 1999, 2007; Wells & Lekies, 2006). Those who actively pursue protection of the environment cite time spent in special, outdoor places with an influential adult as primary factors shaping their commitment to environmental causes (Chawla, 1999; Sobel, 1996). These significant life experiences are instrumental to the creation of an environmental ethic and the development of stewardship behaviors (Chawla, 2007; Wells & Lekies, 2006). Others have found that spending time in nature as a child is a factor in the development of a connection to nature, which in turn influences pro-environmental beliefs and behaviors as an adult (Clayton & Opatow, 2003; Kals, Schumacher, & Montada, 1999; Nisbet, Zelenski, & Murphy, 2008; Sobel, 1996).

The Role of Environmental Education

In an era when children's free time is moving indoors, school-based, structured environmental education provides a viable means to formally introduce a child to the wonders of nature. Some children will not have the opportunity to reap the benefits afforded by experiences in nature if the schools do not provide them. More than one-half of the treatment group in a study of at-risk sixth graders participating in Resident Outdoor Science Schools in California reported that the experience was the first time they spent time outdoors in a natural setting (American Institutes for Research, 2005). Providing a positive educational experience from which a child can develop a relationship with nature is a building block toward environmental appreciation: "The promotion of positive attitudes about the environment is essential if participants are to value the natural environment" (Mittelstaedt, Sanker, and VanderVeer, 1999, p.138).

In addition to attitude-based benefits of experience in nature, an emerging body of research has documented scholastic, social, and environmental benefits of environmental education (American Institute of Research, 2005; Dettman-Easler & Pease, 1999; Dresner & Gill, 1994; Lieberman & Hoody, 1998; Stern, Powell, & Ardoin, 2008). Dresner and Gill (1994) found that environmental education sites that integrate awareness of the natural environment, knowledge of environmental concepts and issues, and strategies to address environmental problems led to positive changes in participants' self-esteem, social well-being, and relationship with the natural world. Though some of the evidence supporting the benefits of environmental education is anecdotal (Fien, Scott, & Tilbury, 2001), multiple empirically sound reports document significant gains in the cognitive and

affective domains as a result of successfully integrating the environment into the classroom (American Institute of Research, 2005; Lieberman & Hoody, 1998; National Environmental Education Training Foundation, 2000).

However, more research is needed to investigate environmental education's impact on environmentally responsible behavior, the primary goal of environmental education since the field began (Hungerford & Volk, 1990; Smith-Sebasto & D'Costa, 1995). Historically, environmental educators latched onto the intuitively sound idea that increased knowledge and a change in attitude about the environment would lead to achievement of targeted stewardship behaviors, but the idea of a direct link between knowledge, attitude, and behavior has been challenged on multiple grounds (Armitage & Conner, 2001; Hungerford & Volk, 1990; Sia, Hungerford, & Tomera, 1986). According to Marcinkowski (2004), the continued popularity of the so-called K-A-B model (knowledge, attitudes, and behaviors) in program theory is "an indication that inadequate attention is being paid to prior research" (p.72). A more complete behavioral model drawn from the literature on behavior modification is therefore called for in this study. Furthermore, emergent affective constructs such as connection to nature (Kals, Schumacher, & Montada, 1999; Nisbet, Zelenski, & Murphy, 2008; Sibthorp, 2008) should be examined as predictors of responsible environmental behavior.

Need for Examination of Stewardship and Outdoor Play Outcomes

There has been a call for more stringent evaluation research in environmental education (Fien et al., 2001; Marcinkowski, 2004; NEETF, 2000). More rigorous

evaluations are needed in the areas of student achievement and life skills, as well as the knowledge, attitude, behavior relationship (Marcinkowski, 2004) if environmental education evaluations is to move beyond its “relatively immature state” (Fien et al., 2001, p. 380). This is not a new mandate. A 1981 nationwide study conducted to identify methods used to evaluate environmental education programs found that most of the evaluators focused on satisfaction of the participants and how well staff perform, rather than concentrating on how well program objectives and outcomes were being met (Chenery & Hammerman, 1985). A thorough, outcomes-based evaluation of an environmental education program will demonstrate not only whether or not something’s working, but also what is working best and what may need improvement (Windsor, Baranowski, Clark, & Cutter, 1994).

Beyond short-term programmatic outcomes, research is also needed to pinpoint the factors that lead to outdoor play and environmental stewardship. We know that there are positive outcomes associated with both childhood play and environmental behaviors (Frumkin, 2001; Louv, 2005); however, we lack an understanding of the factors that contribute to performing those actions using an approach that accounts for the multidimensionality of behavior. The Theory of Planned Behavior (TPB) (Ajzen, 1991) is a cognitive model of behavior that states that a given behavior is best predicted by intention to perform the behavior. Intention, in turn, is influenced by one’s attitude toward the behavior, the subjective norms related to performing the behavior, and how easy or difficult the action is perceived to be. An examination of the paths between attitudes, subjective norms, perceived behavioral control, intention, and behavior will

reveal the magnitude of influence each of these factors has on childhood outdoor play and environmental stewardship.

Though the TPB has been used successfully in hundreds of studies (see Armitage & Conner, 2001), it has come under criticism for disregarding affective influences on behavior (Ajzen, 2006; Hinds & Sparks, 2008). In the case of both outdoor play and environmental stewardship, the addition of nature connection, or one's feeling of connectedness to nature, is a logical affective behavioral predictor. Modifying the TPB to include nature connection as an antecedent variable will address this criticism.

In addition to gaining a better understanding of components that impact outdoor play and environmental stewardship behaviors, the relationship between these two outcome variables must also be examined. Retrospective studies have shown that children's outdoor experiences predict their environmentally responsible behaviors in adulthood (Chawla, 2006; Wells & Lekies, 2006), but there is a dearth of information on the relationship between outdoor play and environmental stewardship when they are measured concurrently. We know that experiences in the outdoors are necessary to develop a connection to nature (Louv, 2005), and that a connection to nature is a predictor of environmentally responsible behaviors (Nisbet et al., 2008). Therefore, nature connection may help explain the link between outdoor play experiences and environmental stewardship behaviors. A closer look at the influence of outdoor play and nature connection on environmental stewardship is warranted.

Purpose of the Study

The purpose of this study is three-fold: 1) to determine the effectiveness of Shaver's Creek Outdoor School, a four-day, three-night residential environmental education program in Central Pennsylvania, at meeting its goals; 2) to understand the role of affective and cognitive influences on children's outdoor play and environmental stewardship behaviors; and 3) to examine the influence of outdoor play on environmental stewardship using connection to nature as a mediator.

Specific Research Hypotheses

In light of the mixed evidence in support of EE programs, continued evaluation is needed to demonstrate program effectiveness (Fien et al., 2001; Marcinkowski, 2004). The outcomes of interest in the evaluative component of the study are ecological knowledge, children's connection to nature, school belonging, outdoor play attitude, environmental stewardship attitude, outdoor play behavior, and environmental stewardship behavior, as reported by participants. The following research hypotheses were tested in the evaluation component of this study:

H₁: Participants in Outdoor School will demonstrate significant, positive increases in scores of ecological knowledge as measured on pretest and post-test assessments.

H₂: Participants in Outdoor School will demonstrate significant, positive increases in scores of connection to nature as measured on pretest and post-test assessments.

H₃: Participants in Outdoor School will demonstrate significant, positive increases in scores of school belonging as measured on pretest and post-test assessments.

H₄: Participants in Outdoor School will demonstrate significant, positive increases in scores of outdoor play attitude as measured on pretest and post-test assessments.

H₅: Participants in Outdoor School will demonstrate significant, positive increases in scores of environmental stewardship attitude as measured on pretest and post-test assessments.

H₆: Participants in Outdoor School will demonstrate significant, positive increases in scores of outdoor play behavior as measured on pretest and post-test assessments.

H₇: Participants in Outdoor School will demonstrate significant, positive increases in scores of environmental stewardship behavior as measured on pretest and post-test assessments.

Additionally, there are gaps in the literature on the relationship between environmental stewardship and outdoor play in children, as well as the effect of nature connection on both play and environmentally responsible behavior. In order to address the gaps on understanding outdoor play, the following research hypothesis was tested:

H₈: There is a positive relationship between connection to nature, outdoor play attitudes, outdoor play social norms, outdoor play perceived behavioral control, outdoor play intentions and outdoor play behaviors (see Figure 1-1).

Our understanding of the determinants of environmental stewardship behaviors is also incomplete. This is a complex, multidimensional issue (Kaiser, 1998), and manifold constructs must be considered when trying to predict the performance of deeds that fall under the sphere of environmentally responsible behavior. Toward that end, the following research hypothesis was tested:

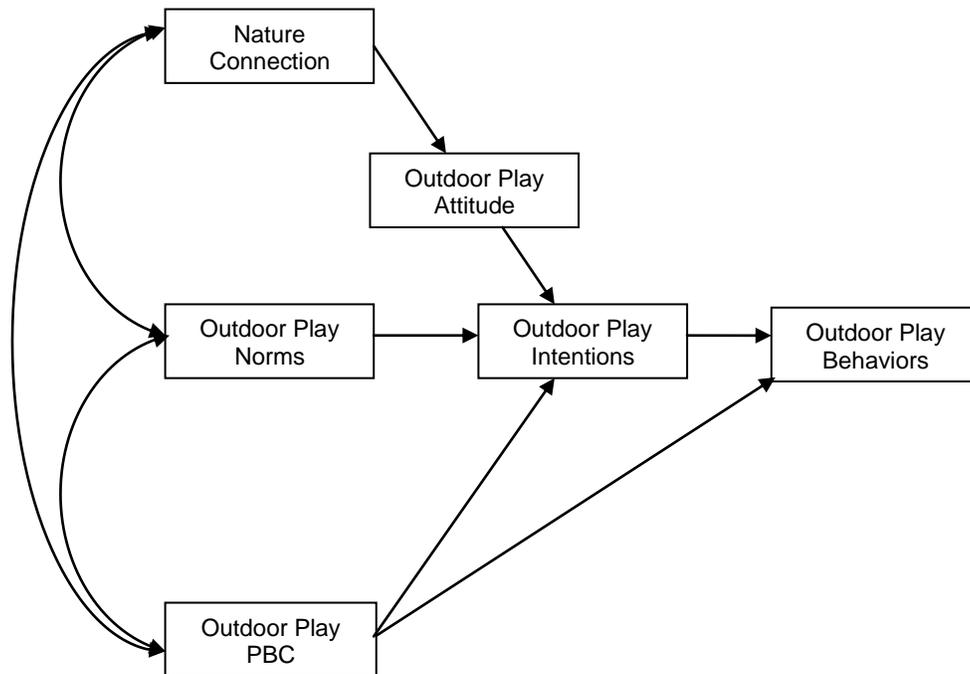


Figure 1-1. Proposed model of outdoor play behavior using an adaptation of the Theory of Planned Behavior.

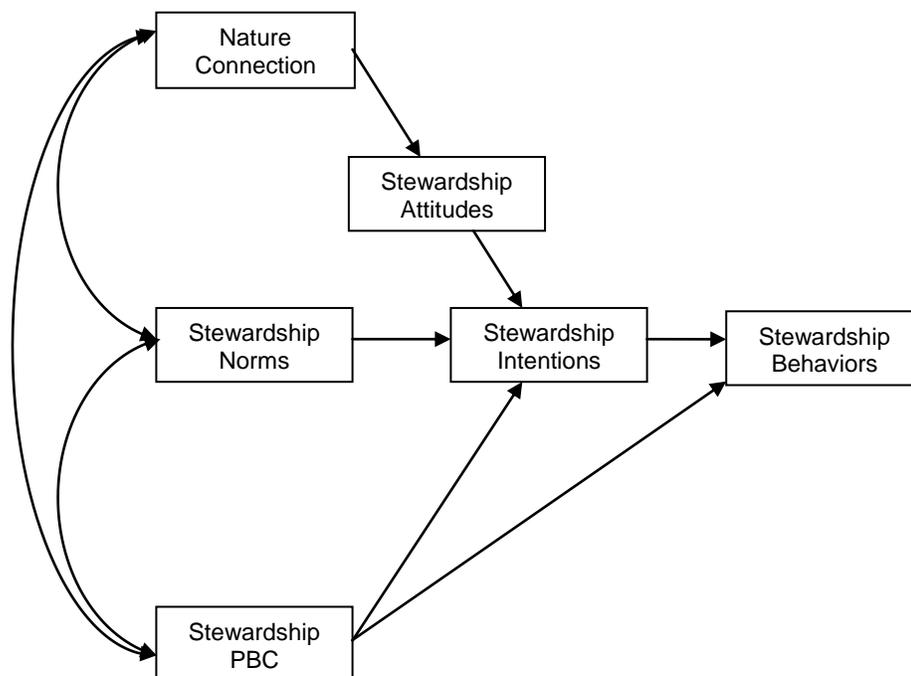


Figure 1-2. Proposed model of environmental stewardship behavior using an adaptation of the Theory of Planned Behavior.

H₉: There is a positive relationship between connection to nature, environmental stewardship attitudes, environmental stewardship social norms, environmental stewardship perceived behavioral control, environmental stewardship intentions and environmental stewardship behaviors (see Figure 1-2).

The idea that significant experiences in nature as a child provides the basis for environmental actions in adulthood is supported by retrospective studies (Chawla, 1999, 2006). It is logical, then, to assume that outdoor experiences play a role in the development of environmental stewardship behavior, but this connection needs further examination (Bixler et al., 2002). Perhaps there is another factor that helps explain the linkage between outdoor play experiences and environmentally responsible behavior. Nature connection, or one's feeling of connection to nature, is dependent upon time in the outdoors for its development (Pyle, 2002). It has also been shown to predict behaviors consistent with environmental protection (Nisbet et al., 2008). Therefore, nature connection may help explain the relationship. This study examined the relationship between these three variables by testing the following hypothesis:

H₁₀: Nature connection will mediate the effect between outdoor play and environmental stewardship behaviors (see Figure 1-3).



Figure 1-3. Model of nature connection as a mediator of stewardship.

Significance of the Study

This study will serve multiple purposes. First, it presents a valuable evaluation approach for both research and practical purposes. An increasing amount of scholarly research has shown the benefits of school-based environmental education; however, the effectiveness of residential environmental education at achieving its targeted goals remains inconclusive (Smith-Sebasto & Semrau, 2004). Findings from this study may provide evidence of the effectiveness of environmental education toward reaching program goals. The evaluation approaches used in the study can be replicated by program coordinators when they seek to assess their progress toward improving participants' ecological knowledge and behaviors. The study also seeks to clarify the influence of environmental education programming on a feeling of connection to nature and will examine residential environmental education's role in changing attitudes, behaviors, and feelings of school belonging.

Additionally, this study may contribute to our understanding of how participants' attitudes, feelings toward nature, social norms, perceived behavioral control and behavioral intentions influence their outdoor play behaviors. Outdoor activities have been identified as essential to the well-being of children (Frumkin, 2001; Kellert, 2002), and this study will use a multidimensional model to better understand the determinants of outdoor play in children. By better understanding factors that lead to outdoor play behaviors, recreation providers, teachers, and parents can more easily design programs that will lead to this outcome.

Finally, the study examines the possibility that nature connection mediates the influence of outdoor play on environmental stewardship. Outdoor play is a predictor of nature connection (Palmberg & Kuru, 2000) and nature connection is a predictor of environmental stewardship (Nisbet et al., 2008). As an affective measure nature connection can help explain the link between outdoor play and environmental stewardship that has been found elsewhere in the literature.

Definition of Terms

1. *Attitude*: Cognitive assessment of an attitude object, often useful in determining the object's usefulness or worth (Ajzen, 1991). Attitudes may be positive, negative or neutral, and they vary in intensity (Smith & Mackie, 2007). Behavioral attitudes are directly influenced by beliefs that performing the behavior will result in the desired outcome (Ajzen, 1991). Attitudes toward outdoor play and attitudes toward environmental stewardship were tested in this study.
2. *Connection to nature*: An affective measurement of one's relationship or feeling of community with the natural world (Mayer & Frantz, 2004). In this study, connection to nature demonstrates the affective component as a predictor variable on environmental stewardship and outdoor play.
3. *Environmental Stewardship Behavior*: Actions done to benefit the natural world or to reduce the impact on the environment. Traditionally, stewardship behavior is assessed with multiple constructs, including civic actions, purchasing behaviors,

and physical actions. Because this study's participants were children who cannot vote and do not make household decisions, many of the traditional measures were deemed unsuitable. In this study, the behaviors that indicate environmental stewardship water conservation, recycling, energy conservation, talking about the environment, and picking up litter. Environmental stewardship behavior is synonymous with environmentally responsible behavior, the term found most often in environmental education literature (Marcinkowski, 2004). Environmental stewardship behavior was selected because it is used in place of environmental literacy in Pennsylvania, where this study was conducted (Pennsylvania Center for Environmental Education, 2001).

4. *Outdoor Play Behavior*: Refers to activities that take place out-of-doors in either structured or unstructured environs, including spending time outside, playing outdoors, and exploring in nature.
5. *Perceived Behavioral Control*: The ease or difficulty a person attributes to performing a target behavior (Ajzen, 1991). The target behaviors in this study are outdoor play and environmental stewardship.
6. *Residential environmental education*: Environmental education programs housed at residential facilities in which participants spend at least one night on-site (Dettman-Easler & Pease, 1996). Students participate in outdoor, experiential activities, share meals, assume chores for the group, and learn to live cooperatively (Hammerman, 1980).
7. *Social Norms*: The way in which a person believes he or she will be perceived for performing a specific action. Social norms are influenced by how a person feels

significant relations (spouse, parents, friends, etc.) feel about the behavior in general (Armitage & Christian, 2003). The social norms in this study address outdoor play and environmental stewardship.

8. *Theory of Planned Behavior*: A cognitive model of behavior using intention as the predictor, which itself is predicted by attitude, social norms, and perceived behavioral control (Ajzen, 1991). This model has had a great deal of success predicting a wide variety of behaviors (Armitage & Conner, 2001). In this study nature connection was added as an affective predictor of attitudes. Two behaviors were assessed using the adapted model in this study: outdoor play and environmental stewardship.

Chapter 2

Review of the Literature

This chapter provides information relevant to the decline of children's experience in nature, discusses the importance of helping children connect with the natural environment, and describes a framework for promoting environmentally responsible behavior. This review looks at environmental education in general with a focus on residential environmental education's role in connecting children with the natural world, promoting healthy relationships, and working toward pro-environmental behavior.

Children's Outdoor Activity

In 2009 the average child aged 8 to 18 spent more than seven-and-a-half hours of each day engaged in entertainment media, including watching television, listening to music, and surfing the web (Rideout, Foehr, & Roberts, 2010). In contrast, children aged 9 to 12 spent less than one half hour engaged in outdoor activities (Hofferth & Sandburg, 2001). The essence of this difference is captured by Paul, a fourth grader from San Diego, who said, "I like to play indoors better, 'cause that's where all the electrical outlets are" (Louv, 2005, p. 10). Paul is not alone, and the pattern is trending upward. Researchers who have been studying media and youth for more than a decade felt that media use in

2005 was at an apex; they were surprised to find that children's time with media increased an hour a week in only five years (Rideout, Foehr, & Roberts, 2010).

The increase in time spent with electronic media negatively impacts school performance, perhaps because time spent watching television and playing video games displaces time engaged in scholastic activities (Sharif & Sargent, 2006). In much the same way, these activities are thought to shift time away from outdoor play activities (Hofferth & Sandberg, 2001). Eighty-five percent of mothers surveyed in a cross-sectional national survey believed that television viewing and computer game playing were the biggest impediments to their children's outdoor play (Clements, 2004).

This trend affects adults as well. Comparing data collected in 1987 with data collected in 2003, Pergams and Zaradic (2006) found that over a 16-year period the average person in the United States increased the amount of time he or she interacts with electronic media by 327 hours per year. This boost in time spent with electronic media, as well as the rise in inflation-adjusted oil prices, explains 97.5 percent of the variance in the decrease in visitation to National Parks since 1988 and may point to a cultural shift toward love of electronic media or "videophilia" (Pergams & Zaradic, 2006).

The change in how people interact with the natural environment can also be seen by examining changes in how children interact with their neighborhood space. Gaster (1991) interviewed 29 adults from one neighborhood in New York City to determine how children's use of outdoor, public space has changed over 3 generations. As the years passed, the age at which children were allowed to play unsupervised increased, the type and proximity of children's outdoor play became more restricted, and the amount of supervised, structured activities grew (Gaster, 1991).

This is a national trend. Clements (2004) surveyed 830 U.S. mothers of children between the ages of 3 and 12 from rural areas, suburbs, and cities, comparing the mothers' outdoor experiences with those of their children. Children are not spending as much time outside as they were in previous generations: "85 percent of the mothers agreed that today's children play outdoors less often than children did a few years ago. In fact, 70 percent of the mothers reported playing outdoors every day when they were young compared with only 31 percent of their children" (Clements, 2004, p. 72). Clements' (2004) results, though limited by parent report, support the idea that children spend less time outside, are playing less, and are leading less active lives. The survey responses did not vary a great deal between mothers living in rural and urban areas (Clements, 2004).

The reasons for this decline in outdoor activity are multifaceted (see Louv, 2005). An ethnographic study of "the Isaacs," a racially mixed public housing neighborhood in New York City, provides a window into this phenomenon. Over a period of three years, Wridt (2004) met with six senior citizens, seven adults in their thirties, and ten youth aged eleven to thirteen to analyze play trends across thirty year intervals. In the 1940s the street was a significant setting for play, where children could gain independence and have adventures while being supervised from the apartments above. However, traffic-related deaths, the creation of playgrounds, the passage of curfews, and laws against blocking sidewalks limited children's freedom to play even then. By the 1950s children moved off of the streets and into the adult-supervised parks. In the 1970s New York City's fiscal crunch was felt by all public works, and many city parks and playgrounds fell into disrepair. Adult supervision was no longer afforded by the city's budget and the parks

were not maintained; they quickly became the domain of drug dealers, addicts, and gangs. Parents restricted their children's freedom to play in parks and playgrounds, opting for indoor environs that were seen as safer. By 2000 children in the study rarely played in parks and playgrounds because of their perceived danger. Shopping, interacting with electronic media, and engaging in structured indoor activities dominated children's time (Wridt, 2004). The youngest generation is growing up in a plugged-in culture in which the "technological mediums of entertainment replace playtime activities in neighborhood parks" (Wridt, 2004, p. 99).

Wridt's (2004) study is important, because it demonstrates three of the main impediments to outdoor play—perceived danger, an increase in electronic media, and a lack of free play spaces—that are seen elsewhere (Kellert, 2002; Louv, 2005). Fear is a widely cited reason for the decline in children's outdoor play (Kellert, 2005; Louv, 2005; Sobel, 2004; Wridt, 2004). Even parents who valued time wandering out in nature in their own childhood as the source of their connection to nature prohibited the same freedom in the lives of their children because of fear of "stranger danger" (Louv, 2005). In fact, eight out of ten mothers cite crime and safety as reasons they restrict their children's outdoor play time (Clements, 2004). According to Chawla (2006), the age old command "Go play outside!" is a simplistic solution in a complex world: "This mobility requires access to a safe world of engaging affordances and graduated challenges that a child can master—not fast traffic or warring gangs outside the door." (p. 69).

It is important to point out that children are still outside playing: "Children still *do* [author's emphasis] play in the streets and in parks and playgrounds. However, today's children are generally *playing differently in different spaces* and have *less free time* than

when older adults and seniors were young” (Wridt, 2004, p.101). It is precisely these differences that are worrisome to some scholars. Less time outdoors has been associated with a decrease in the concern and care young people have for the environment (Orr, 1994; Pyle, 2002; Sobel, 1996); an increase in the number of psychotropic medications prescribed to youth (Louv, 2005; Tucker, 2006); and a lack of free play (Burdette & Whitaker, 2005). Free play has cognitive, social, and emotional benefits, and the outdoors is where free play is most likely to occur (Burdette & Whitaker, 2005).

To make a more cogent argument about the consequences of this trend, Louv (2005) posited the term “nature-deficit disorder,” which—since publication of his groundbreaking book *Last Child in the Woods*—has become a buzzword for lack of contact with the natural world. The term is not a medically supported diagnosis, but rather serves as a heuristic, describing the multitude of changes that result from a disconnection with nature. According to Louv (2005), “Nature-deficit disorder describes the human costs of alienation from nature, among them diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses” (p. 34).

Importance of Childhood Contact with Nature

The importance of children’s contact with nature extends beyond play. Nature offers experiences necessary for children’s physical and mental well-being (Chawla, 2006; Kahn, 2002; Kellert, 2002). Negotiating the terrain and exploring one’s environment nurtures cognitive development, supports emotional maturation, and strengthens evaluative performance through problem solving and decision making

(Kellert, 2005; Nabhan & Trimble, 1994). Proximity to and time in green spaces also provides psychological benefits. Wells (2000) followed 17 children aged 7 to 12 who moved from relatively barren urban housing to greener homes with the assistance of a public housing program. Those children whose homes afforded the highest increase in natural views and more natural yards recorded the highest levels of concentration after the move (Wells, 2000). Faber Taylor, Kuo, and Sullivan (2001) found that for children with AD/HD a greener play space correlated with a lower rating of AD/HD symptoms, according to parent report. The researchers also found that the aftereffects of activities in green settings reduced symptoms of AD/HD more than those in non-green settings (Faber Taylor et al., 2001).

Kellert (2005) divides children's experience of nature into three distinct categories: direct, indirect, and vicarious (or symbolic). Direct contact with nature "refers to interaction with largely self-sustaining features and processes of the natural environment" (Kellert, 2005, p. 65), is often spur-of-the-moment, and takes place in areas mostly devoid of the human element. Indirect contact occurs in areas that are highly managed and controlled, such as zoos, nature centers, and museums, and may include domesticated animals and household plants. Vicarious or symbolic experience involves "image, representation, or metaphorical expression of nature" (Kellert, 2005, p. 66). Books, magazines, films, television, radio, and stories are forms of symbolic contact. As screen time increases, vicarious contact is making up more of children's experience of nature (Clements, 2004; Pergams & Zaradic, 2006); however, these experiences are not enough to provide the benefits of nature reviewed above (Chawla, 2006; Kellert, 2002; Pyle, 2002). While all forms of contact with nature are valuable in their own right, only

direct experience provides the “intimacy, adventure or surprise, all of which (and much more) provide the basis for substantive development” (Kellert, 2005, p. 85).

Possibly tied to the decrease in direct experience with nature, children today know less about their local environment (Nabhan & Trimble, 1994; Orr, 1994; Sobel, 1996). An innovative study compared British children’s knowledge of natural and human-created objects to test this idea (Balmford, Clegg, Coulson, & Taylor, 2002). The authors asked 109 British schoolchildren aged 4 to 11 to identify 20 flash cards—10 common species of wildlife drawn randomly from a set of 100 cards and 10 *Pokemon* (a popular children’s game and cartoon television series) character cards drawn from a set of 150. The authors found that by age eight children were able to identify *Pokemon* cards more accurately (78 %) than organisms as common as oak trees (53 %) (Balmford et al., 2002). Their familiarity with the game characters was more pronounced than their familiarity with nature. On the positive side, the report demonstrated that children, who were able to identify nearly 80 percent of a sample of 150 *Pokemon* characters, are capable of learning about a wide variety of creatures (Balmford et al., 2002).

Foundations of Environmental Education

The definition of environmental education has been a contested topic since the inception of the word (Weilbacher, 1991). According to Disinger (1983), the term was first used at a meeting of the International Union for the Conservation of Nature and Natural Resources in 1948 to describe a melding of the social sciences and the natural sciences in education. It first appeared in scholarly literature in the late 1950s, but was

used as a synonym for the extant conservation education rather than the conceptualization of a new field (Disinger, 1983). It was not until 1969 that environmental education came to be defined as a term with its own meaning and goals distinct from those that came before it (Disinger, 1983; Stapp et al., 1969).

Environmental education is an outgrowth of the nature-based traditions of scholarship that preceded it (Armitage, 2009; Roth, 1978). Among the antecedents of environmental education, three consistently receive the most attention: nature study, conservation education, and outdoor education (Hammerman, 1980; Nash, 1976; Weilbacher, 1991). Nature study was an approach to outdoor learning championed as early as 1891 by Wilbur Jackman in *Nature Study for the Common Schools* (Armitage, 2009; Hammerman, 1980; Nash, 1976). Liberty Hyde Bailey, who founded the American Nature Study Society in 1908, promoted nature study as an informal process of learning about the world through observing and making connections without the use of reference materials resulting in “a living sympathy with everything that is” (Bailey, 1904, p. 11). Nature study was influential in education into the 1930s, but was superseded by resource-based conservation education by the Second World War (Armitage, 2009).

Conservation education developed in response to the growing environmental problems faced by the United States (e.g., the Dust Bowl) and a depleted resource base (Nash, 1976). Conservation education focused on renewable resources and took a scientific, resource management approach to protecting the natural world (Roth, 1978). It relied on formalized science for its theories and slowly worked its way into the school curriculum. For some, conservation education remains synonymous with environmental

education, but conservation education's heavy reliance on the natural sciences denies both its nature study lineage and linkage with the social sciences (Disinger, 1983).

Outdoor education, which grew out of the school camping movement of the 1920s and 1930s, incorporated components of nature study and conservation education into experience-based outdoor learning (Hammerman, 1980). Outdoor education was promoted as both a method and an area of study. As a method, outdoor education did not seek to replace other subjects, but rather advocated for the use of the outdoors to enhance school curriculum (Ford, 1981; Hammerman, Hammerman, & Hammerman, 1985). As a subject area, outdoor education placed emphasis on relationships between people and nature utilizing outdoor, experiential learning (Priest, 1986). One definition, which some say encompasses too much to serve as a useful classification (Van Matre, 1990) but has lasted nonetheless, states that outdoor education is "education in, for, and about the outdoors" (Donaldson & Donaldson, 1958, p. 63).

Other movements that were either influential or concurrent with EE include resource-use education, progressive education, resource management education, population education, general or multi-disciplinary education, citizenship education, and global education (Disinger, 1983).

By the 1960s, leaders in both outdoor education and conservation education were aware of the need to address environmental issues in their educational approaches. Early attempts to define this emerging field were given voice through the publication of *Environmental Education*, the first journal dedicated to the field of EE (Hungerford, 2010). In the first issue of the journal, Stapp and colleagues (1969) wrote an influential definition that would inform much of what was to follow: "Environmental education is

aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution” (p. 1). This definition was problem-focused and had three main pillars: knowledge of environmental problems, awareness of how to solve these problems, and motivation to work toward a solution. Other early definitions pushed for an appreciation of nature, direct experience with the outdoors, an awareness of interdependence, a conservation ethic, and environmental literacy (Hungerford, 1980; Roth, 1978).

In 1972 recommendation 96 of the United Nations Conference on the Human Environment in Stockholm Sweden supported environmental education as a means of addressing the world’s environmental problems (UNESCO/UNEP, 1976). Drawing upon the spirit of that conference, the International Environmental Education Workshop took place for ten days in Belgrade, Yugoslavia in October 1975, concluding with a call for “a new global ethic” and a document that would influence environmental education to the present day (UNESCO/UNEP, 1976). The Belgrade Charter stated that the goal of environmental education was “to develop a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones” (UNESCO/UNEP, 1976, p. 2). This goal could be met via educational initiatives that result in increases in awareness toward issues, knowledge of the environment, attitude of concern, skill for solving problems, ability to evaluate problems and associated solutions, and participation in enacting those solutions (Hungerford, 1980).

A meeting two years later in Tblisi, Georgia, in the former Soviet Union, added to the Belgrade Charter:

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to the changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values. (UNESCO, 1978, p. 24)

The Tblisi Declaration outlined five objectives for environmental education: awareness of the environment and associated problems; knowledge of ecological processes and environmental problems; attitudes of concern and motivation to work toward change; skills to identify and solve environmental problems; and participation at all levels of work toward solving environmental dilemmas (UNESCO/UNEP, 1978). Both the Belgrade Charter and the Tblisi Declaration recognized the interdependence of human and ecological community and encouraged responsible behavior that would result in the health of both.

Hungerford, Peyton, and Wilke (1980) led a concerted effort to firm up the foundation of environmental education, especially for educators and curriculum developers. Their efforts centered on defining what environmental education is and what environmental educators should know or do in accord with the Belgrade Charter and Tblisi Declaration. Their contribution was to bring environmental solutions, rather than simply awareness and knowledge, into the foreground. According to the authors, the

ultimate goal for environmental education was “to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of environment” (Hungerford et al., 1980, p.44). Four sub-goals supported this overarching goal: ecological foundations, conceptual awareness, investigation and evaluation, and environmental action skills.

These goals were designed to apply to any person, of any age, in both formal and non-formal settings. The authors also made a distinction between ecology and environmental education, supported the use of related methodologies (e.g., outdoor education, environmental interpretation, outdoor recreation) to achieve these goals, and assumed that some level of environmental connectedness is a prerequisite to achieving the goals. (Hungerford et al, 1980).

Issue-oriented environmental education came in response to the explosion of environmental issues that grew out of rapid post-war growth and industrialization (Nash, 1989). The new focus on human systems was a departure from nature study, conservation, and outdoor education; the people living on the land were now getting as much attention as the land itself. For some, the inclusion of issue investigation felt more like activism than education (Hug, 1977). There ensued some confusion about exactly what environmental educational was, to the point where classifying the term led to frustration and a feeling of “definitional dementia” (Van Matre, 1990; Weilbacher, 1991).

More recently, two philosophies that have been adopted by those in the environmental education community are ecological literacy and place-based education. Ecological literacy promotes the understanding of the systems that support life on earth

(Orr, 1994) and continues the tradition of educating for pro-environmental, sustainable behavior. The aim of this education is to help students understand where they are, in terms of geography, community, history, and the systems (natural and human) that guide them (Orr, 1992). A person with a strong understanding of the local and global systems that support life knows how to “live well in one’s place” (Orr, 1992, p. 126) ultimately acting in a manner consistent with sustainability. Place-based education uses the tradition of experiential learning in the students’ home environment to teach about principals of ecology and community (Sobel, 1996). Place-based education encourages experiential understanding of these things through mapping, field visits, community service, and reflection (Sobel, 1996). According to Orr (1992), place presents an opportunity to engage people with both nature and community, and to tie in the systems thinking that will reveal the interactive parts inherent in a community. This is similar to place identity in terms of the affective attachment one feels to a place (Gruenewald, 2008). Place also presents an excellent opportunity for education that has substance and meaning (Kahn, 2002; Sobel, 1996).

Residential Environmental Education

Contemporary residential environmental education (EE) continues the school camping tradition of providing on-site, overnight experience-based education programming that began as early as 1930, the year that outdoor education luminary L.B. Sharp published “Education and the Summer Camp” (Hammerman, 1980). Known variously as school camping, camping education, residential outdoor education, or

residential environmental education (Hammerman, 1980), these programs use the outdoor classroom to enhance the scholastic curriculum in line with school standards (Chenery & Hammerman, 1985; Ford, 1981). Residential EE programs take place at residential facilities (including campgrounds, nature centers, and conference centers) where teachers and students “participate in small informal groups on a twenty-four-hour-a-day basis; sharing food, shelter, work, and leisure in a cooperative milieu with concern for one another’s needs” (Hammerman, 1980, p. *x*). Earlier definitions required a three-day, two night minimum for a program to be considered residential (Chenery & Hammerman, 1985), but more recent uses of the concept allow a one-night stay to fall under the auspices of residential EE (Dettman-Easler & Pease, 1996).

Hammerman (1980), in his definitive history of residential outdoor education, outlines the first 50 years of these programs. As early as the 1940s advocates of school camping incorporated school curricula in areas of conservation education, group socialization, and living skills. School camping moved from summer-only programs to operating during the school year, and by the 1950s the words camp and camping were removed from programs in favor of outdoor school or outdoor laboratory (Hammerman, 1980). The use of manuals and handbooks also grew in this period to aid teachers with preparation and to help meet school standards (Ford, 1981). The growth of residential outdoor education programs mirrored those of outdoor education in general in the 1950s and 1960s. Outdoor education reached a new level of maturity at this time, and federal funds aided in the development of residential centers focused on teaching conservation, natural history, and ecology. The 1970s saw outdoor education stepping into new

territory and expanding its scope to include the budding fields of adventure education and environmental education (Hammerman, 1980).

This foray into EE shifted the focus of the residential experience. A 1972 joint report from the National Education Association and National Park Service (as cited by Hammerman, 1980) delineated the changing terminology of residential outdoor education to environmental education:

A one-week resident educational environment-centered camp for fifth and sixth graders is becoming a regular part of many school curriculums.

These resident camps started out originally in school camping and outdoor education programs. Many of these programs still maintain the name of outdoor education, but much of what has been incorporated into them today is called environmental education... The change in terminology from outdoor education to environmental education seems to be symbolic of the subtle change in emphasis from a focus on the natural environment to a broader consideration of man's total environment, including population, pollution, transportation, etc. (p. 10).

Much like nature study expanded to include environmental problems and issues, outdoor residential education also broadened its focus to include the environment in its totality.

As the nation recognized the need to address environmental issues within its educational system, the outdoor school presented an excellent platform from which to deliver that curriculum (Roth, Cantrell, & Bousquet, 1980). According to the teachers who bring students to these programs, residential EE provides valuable experience for

students to learn concepts about nature while in nature (Dettman-Easler & Pease, 1996, 1999). Additionally, the residential environmental education educators reap their own rewards from engaging in the experiential, outdoor learning process (Hug, 1995).

Evaluation of Residential Environmental Education Programs

Evaluation in residential outdoor and environmental education has become more sophisticated in the last decade, though there is still room for improvement (Fien, Scott, & Tilbury, 2001). Study designs have progressed from focusing on the number of students served and satisfaction with the program to measuring residential EE's influence on various outcomes, including academic performance and stewardship behavior (Marcinkowski, 2004). Chenery and Hammerman (1985) found that evaluations of residential EE conducted in the early 1980s most often assessed satisfaction, how well the program was performing, and student attitudes toward the environment and toward one another. Later studies evaluated programs on their effectiveness in meeting the recommendations of the Tblisi Intergovernmental Conference—awareness, knowledge, attitudes, skills, and behavior (1976), though the focus remained mainly on attitudes and values rather than on civic participation (Bogner, 1998; Jordan, Hungerford, & Tomera, 1986).

Awareness and Knowledge

A good deal of research points to environmental education's effectiveness at increasing knowledge (Hungerford & Volk, 1990; Iozzi, 1989; Lieberman & Hoody, 1998; NEETF, 2000; Sobel, 2004). In an attempt to ascertain the effects of environment-based education in a variety of school districts, the State Education and Environmental Roundtable identified 40 schools across 12 states that used the "environment as the integrating context (EIC) in school curricula" and measured student performance on standardized tests (Lieberman & Hoody, 1998, p. 8). Students in these schools gained significantly not only in science, but also in social studies, reading, and math (Lieberman & Hoody, 1998). Residential EE has demonstrated similar gains. A study of four elementary schools attending Residential EE programs in California found that participation resulted in an increase in science scores of twenty-seven percent from pretest to post-test (AIR, 2005). This increase was maintained six-to-ten weeks later (AIR, 2005). Similarly, a recent study of participants in a residential EE program in Great Smoky Mountain National Park found that students' environmental awareness and knowledge increased from pre-test to post-test. These gains, however, were not maintained at a three-month follow-up (Stern, Powell, & Ardoin, 2008).

Increases in student academic performance are often accompanied by increases in development of problem-solving skills, critical thinking, and decision-making (Lieberman & Hoody, 1998). Teachers in California reported that students in general displayed better problem solving skills, more motivation to learn, and improved classroom behavior (AIR, 2005). High school students in Florida who had an

environment-based curriculum also demonstrated gains in critical thinking skills, an ability the researchers believed may be a better indicator of program success than test scores (Ernst & Monroe, 2004). Critical thinking is a prerequisite to much of the analysis, synthesis, and evaluation required of students higher up in Bloom's taxonomy of learning (Paul, 1985).

Though knowledge of ecology and environmental issues has not been found to have a linear effect in predicting pro-environmental behavior, it remains an important variable in evaluating the effectiveness of programs and establishing rapport with the natural world (Bogner, 1998; Hungerford & Volk, 1990; Kruse & Card, 2004). Being able to demonstrate that one's program results in an increase in student knowledge has also become an increasingly important factor in having schools attend environmental education programs, especially when the knowledge gained is aligned with state and national education standards (AIR, 2005; Lieberman & Hoody, 1998; Stern et al., 2008). Additionally, though there may not be a direct link between knowledge and behavior, we cannot dismiss the logical notion that we must be familiar with and gain knowledge about something before we will demonstrate positive attitudes or engage in protective behaviors toward that object (Bogner, 1998).

Attitude

In the tradition of social psychology, an attitude is a cognitive assessment of an attitude object (Ajzen, 1991; Smith & Mackie, 2007). The objects about which we form our attitudes may take the form of oneself, other individuals, ideas, actions, events,

places, and things. Essentially, if you can conceptualize something, you can have an attitude about it. Attitudes are directional—meaning one’s assessment of the attitude object is either positive, neutral, or negative—and they function along a continuum of intensity, from strong to weak (Smith & Mackie, 2007). Measurement of attitudes is most often based on self-report using an attitude scale to assess the strength and direction of a study participant on the attitude object. Researchers also use observations, such as frequency counts, to determine attitudes (Smith & Mackie, 2007).

Attitudes have long fascinated psychologists, and their utility as a construct has been the subject of much debate (Ajzen, 1991). It is thought that people form attitudes because they are useful when learning about an object, appraising its usefulness in a given situation, and establishing whether it will help us achieve our goals (Ajzen & Driver, 1992). Attitudes also have a social function when holding a particular attitude, such as that toward a college football team, may affirm one’s status in a group and allow for self-expression (Smith & Mackie, 2007). Situational factors also influence one’s attitude toward an object.

Three types of information influence attitudes: What people know about the attitude object, what they feel about the object, and the information they have about the past and current interactions with the object (Smith & Mackie, 2007). What people know and believe about an object falls into the cognitive domain (Ajzen, 1991). Traditionally, attitude has been conceptualized as a cognitive evaluation of the attitude object on a scale of good to bad (Ajzen, 1991), but more recent work has led to the introduction of affect into how attitudes are formed. Affective information relates to how people feel about the attitude object, an area that has growing popularity as a component of attitude formation

(Kals, Schumacher, & Montada, 1999). According to Smith and Mackie (2007), affective reactions to sensory experiences may influence a person's attitude via evolutionarily adaptive traits, such as pleasure over pain. Behavioral experience with the attitude object is also a strong determinant to his or her evaluation of that object. A person's performance of a behavior is likely correlated with a positive evaluation of that behavior as an attitude object (Ajzen, 1991). In other words, what people think, what they feel, and what they have learned via experience are likely to be consistent with their attitudes toward an object.

Lastly, attitudes are known to be influenced by how salient information is on a particular attitude object (Armitage & Conner, 2003). The situation, experience with the object, and the object's particular purpose each exert some influence on attitude toward an object (Smith & Mackie, 2007). Attitudes, which can be formed very early in life, may be carried well into adulthood (Eagles & Muffit, 1990) and may impact behaviors (Shepard & Spelman, 1985).

The effect of residential EE programs on shaping positive attitudes toward the environment have been mixed, which is consistent with evaluation in environmental education as a whole (Hungerford & Volk, 1990). Shepard and Spelman (1985) did not find differences in attitude toward the environment for students enrolled an outdoor education component of a 4-H program versus those who did not participate in outdoor education, except for those children who participated in a longer version of the outdoor program. Likewise, Smith-Sebasto and Cavern (2006) compared the use of pre-trip and post-trip activities on environmental attitudes and found that only those students receiving both modes of reinforcement demonstrated a change in environmental attitudes.

Smith-Sebasto and Semrau's (2004) evaluation of a residential EE program's effect on changing participants' attitudes toward the environment found no significant difference between treatment and control group on environmental attitudes using the *Children's Attitudes Toward the Environment Scale* (Musser & Malkus, 1994). Similarly, Kieffer (1992) found no change from pretest to post-test in attitudes toward the environment as measured by the Millward-Ginter Outdoor Attitude Inventory. Kieffer's results are of special significance, because she examined the same program—Shaver's Creek Outdoor School—under evaluation in the present study.

Elsewhere, however, EE has demonstrated a positive impact on environmental attitudes. Researchers looking at the effects of residential EE on participants' attitudes toward wildlife found significantly more positive attitudes for those participants who attended the residential programs than those who received in-class instruction (Dettman-Easler & Pease, 1999). Likewise, Mittelstaedt and VanderVeer (1999) found a significant increase in attitudes toward the environment from pretest to post-test as assessed by the Millward-Ginter Outdoor Attitude Inventory. A study of children in an outdoor ecology program in the Bavarian National Forest Park supported the idea that residential programs can shift attitudes toward the environment (Bogner, 1998). Multiple studies also support the notion that a longer program is more effective in shaping attitude (Bogner, 1998; Shepard & Speelman, 1985; Stern, Powell, & Ardoin, 2008). There is some evidence that sensitization to pro-environmental attitudes limits the effectiveness of these programs (Shepard & Speelman, 1985). First-time participants seem to show more change in attitudes toward pro-environmental behavior (Kruse & Card, 2004). Other

factors, including relations with the EE staff members, the instrument used, and the design of the program can influence attitude development (Kieffer, 1992).

Behavior

The ultimate goal of environmental education is pro-environmental behavior (Hungerford & Volk, 1990; UNESCO/UNEP, 1978). Early theory in environmental education posited that educators could change behavior by making people more knowledgeable about the environment and associated issues, which in turn would increase awareness and motivation to act (Ramsey & Rickson, 1976). Research has shown that a linear process from knowledge to awareness to action is not supported (Hungerford & Volk, 1990). That is not to say there is no effect, but rather that behavior is influenced by a number of other factors making its prediction quite difficult (Ajzen, 1991; Hungerford & Volk, 1990).

As is the case with attitudes, residential EE has at times successfully influenced pro-environmental behavior. Students who receive instruction regarding both environmental issues and action strategies are more likely to report participating in environmental behaviors than those who receive no instruction on action strategies (Jordan, Hungerford, & Tomera, 1986). According to Jordan et al. (1986), “a residential environmental education program may be a good setting in which to provide those first-hand experiences which can motivate students to become involved and participate in those actions of which they were already aware” (p. 20). Participants at a nature camp demonstrated this by speaking to family members about sustainable behaviors and

engaging in them at home (Dresner & Gill, 1994). According to Dresner and Gill (1994), the bond with the environment established while at camp translated to stewardship behaviors, which parents of the participants confirmed in the program evaluation. Parents of students who participated in a California residential outdoor science school also reported that children's pro-environmental behaviors increased after participation in the program (AIR, 2005).

Researchers operationalize pro-environmental behavior somewhat inconsistently. Those following the lineage of environmental education focus on environmental issues, problem solving, and action strategies (see Hungerford & Volk, 1990), whereas others promote a generalized notion of care for the environment most often called "stewardship" (Dresner & Gill, 1994; Stern et al., 2008). Establishing what constitutes pro-environmental behaviors presents some difficulty when trying to measure program effectiveness. Some of the actions that characterize environmentally responsible behavior are beyond the ability of some residential EE participants. For example, Kruse and Card (2004) named recycling, improving habitat, financial donations, purchasing decisions, talking with others, and letter writing as indicators of pro-environmental behavior for participants aged 10 to 18. While older adolescents have a degree of control over most of these actions, the ability and willingness of a ten or eleven year-old to engage in these behaviors may be difficult. Factors external to the program, including family dynamics, geographic locale, and municipal regulation (e.g., no recycling facilities), may limit stewardship behaviors.

School Belonging

Improved interpersonal relationships are rooted in the tradition of outdoor education: “Students from many a classroom have returned from such experiences with a stronger sense of purpose, firmer loyalties, greater respect for one another, and improved relationships with their teacher” (Carson, 1980, p. x). While the focus of many residential programs has shifted focus to the human relationship with the environment, the relationship of participants to one another and participants to teachers continues today. Increases in self-esteem, confidence, and cooperation are common findings (AIR, 2005; Dettman- Easler & Pease, 1996; Dresner & Gill, 1994; Smith-Sebasto & Walker, 2005). Residential EE programs allow teachers to establish an out-of-class bond with students and let students view their teachers differently (Dettman- Easler & Pease, 1996; Hug, 1995; Smith-Sebasto, 2007). Teachers also note cooperation on group projects and closer bonds between students that come about after the program (Dresner & Gill, 2004).

Nature Connection

Recent attention has focused on the human relationship (and lack thereof) with nature, (Louv, 2005); however, measuring the human-nature bond and its influence on our actions has proven difficult (Martin, 2007; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2008; Schultz, 2000). One promising area that has emerged in the literature can be termed *nature connection*.

Traditionally, social scientists have used research from attitudes, persuasion, commitment, normative influences, and incentives in specific environments to guide their

understanding in the area of human-nature connection and its influence on environmentally responsible behavior (Mayer & Frantz, 2004). More recent approaches look at global issues and include culture, empathy, and identity in their frameworks (Nisbet, Zelenski, & Murphy, 2008). Schultz (2000), for example, argued that a reduction in one's perceived separation of self and nature will lead to greater concern for the environment. The *Inclusion of Nature in Self Scale* clustered people into egoistic, social-altruistic, and biospheric value orientations, extending the value-based theory of environmental concern (Schultz, Shriver, Tabanico, & Khazian, 2004). The more people identified themselves as interconnected with nature, the more likely they were to hold biospheric (earth-centered) concerns.

Mayer and Frantz (2004) examined the modern notion of self and connectedness with nature on the affective domain using the *Connectedness to Nature Scale* (CNS). CNS measures one's feeling of emotional connectedness to nature and supports the idea that nature connection is a predictor of environmentally responsible behavior (Mayer & Frantz, 2004). Whereas the CNS focuses on one domain, Nisbet, Zelenski, and Murphy's (2008) *Nature Relatedness Scale* (NRS) measured appreciation of nature and all living things in three separate areas, cognitive, affective, and experiential. This more holistic scale showed strong correlations between nature relatedness and motivations to protect nature (Nisbet et al., 2008). Great strides have been made in the endeavors to accurately describe and measure nature connection, but more research is needed to get at just how these relationships develop (Martin, 1999).

Working from existing nature connection scales, as well as the work of Kals, Schumacher, and Montada (1999), Sibthorp (2008) developed the *Affinity for Nature*

Scale, which is an outgrowth of youth-oriented outcome measures developed previously for the American Camping Association (Ellis & Sibthorp, 2006). Affinity for nature is defined as having feelings of emotional attraction toward nature. The domains represented in the ten-item scale are general feelings of attraction to nature, feelings of freedom in nature, feelings of comfort in nature, and feelings of oneness with nature (Sibthorp, 2008). Because this scale is age-appropriate for elementary school students, has a high reliability, and demonstrated content validity when compared to existing measures, it is a good starting point to measure nature connection with residential EE samples.

The Influence of Outdoor Play and Connection to Nature on Environmental Stewardship

A variety of studies have linked connection to nature with environmentally responsible behaviors (Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2008; Schultz, Shriver, Tabanico, & Khazian, 2004). Others have made the connection between outdoor play behavior and pro-environmental attitudes and behaviors as an adult (Chawla, 1998; Ewert, Place, & Sibthorp, 2005; Wells & Lekies, 2006). There are few studies, however, that have examined the effect of connection to nature and outdoor play on environmental stewardship in children. A notable exception is Stern, Powell, and Ardoin's (2008) study of a residential EE center in the Great Smoky Mountain National Park, which included concurrent measures of nature connection, play, and stewardship.

The promotion of an environmental stewardship is a core goal of environmental education (Hungerford, Peyton, & Wilke, 1980; UNESCO, 1976) and any factors that are

associated with environmentally responsible behavior are of interest. The idea that an increase in time outdoors will lead to increases in both connection to nature and stewardship behaviors is an increasingly popular notion (Louv, 2005), but it lacks empirical support. Understanding the relationship between outdoor play behaviors, connection to nature, and environmental stewardship is therefore an important endeavor.

Theoretical Perspective

The Theory of Planned Behavior (TPB) provides a useful framework for examining the connection between attitudes about nature and behaviors regarding the environment. The TPB is an extension of the Theory of Reasoned Action (Ajzen & Fishbein, 1977), a cognitive model of human behavior in which behavior is influenced by attitude as well as an individual's subjective norms. In this model, the relationship between attitudes and norms is mediated by intention to engage in the target behavior (Armitage & Christian, 2003). The creators of this model found that the best predictor of behavior is intention, which itself is predicted by attitude toward the behavior and the subjective social norms of the individual (Ajzen & Fishbein, 1977). The Theory of Reasoned Action has demonstrated predictive validity in a variety of contexts, including predicting seat belt use, smoking cessation, engagement in leisure activities, compliance with outdoor recreation regulations, and even condom use (Fishbein & Manfredo, 1992).

The Theory of Reasoned Action was created to measure behavior in situations in which performance of the target behavior was under volitional control of the performer (Ajzen, 1991). The theory does not account for one's perceived ability to perform a task,

nor does it account for external factors that may assist or constrain the task performance. The TPB, an adaptation of the original TRA model, accounted for the idea of perceived behavioral control (Ajzen, 1991, 2002). Perceived behavioral control (PBC) refers to the ability a person believes he or she possesses to perform the target behavior. Along with attitude and subjective norms, PBC is modeled as a predictor of intention. (Ajzen, 1991, 2002). Figure 2-1 shows the model of the Theory of Planned Behavior (Ajzen, 1991).

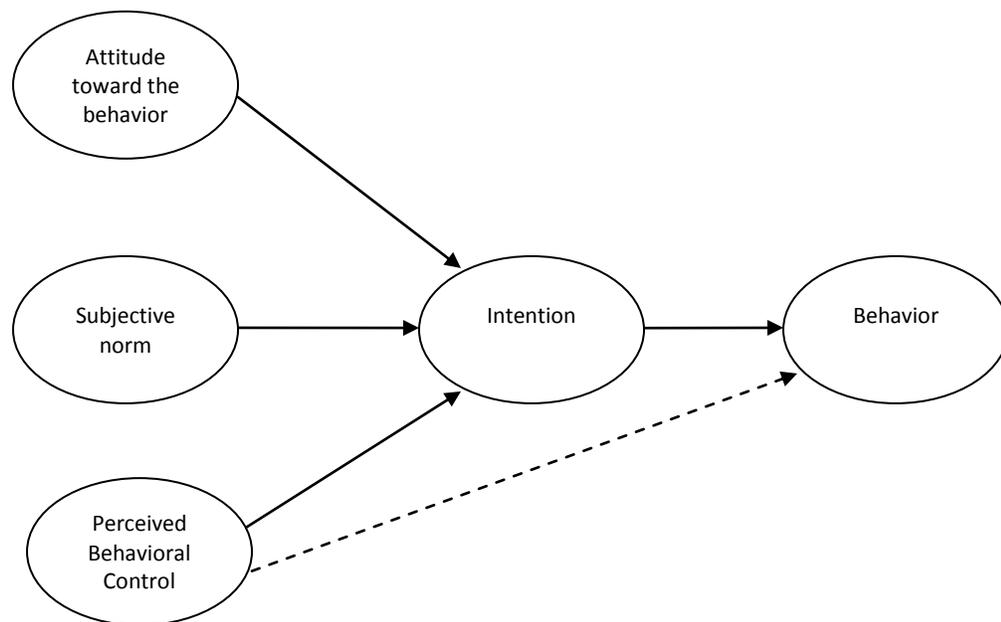


Figure 2-1. The Theory of Planned Behavior (Ajzen, 1991).

Behavior in this model is an observable performance of the targeted outcome. Intention is defined as readiness to engage. Intention is dependent upon three factors. The first is attitude toward the behavior. The next is one's subjective norm. The subjective norm is how one perceives he or she will be viewed by significant others (spouse, best friend, parent, child, etc.) for performing the behavior. Like attitudes, the subjective norm

is predicated on beliefs one has about how these significant others feel about the behavior in general (Armitage & Christian, 2003; Ajzen, 1991). PBC is the idea that one can or cannot perform the target behavior. It owes much to Bandura's (1986) theory of self-efficacy (Ajzen, 2002). Much like attitude and subjective norms, PBC is a predictor of intention. PBC is influenced by beliefs that there are external items that will either assist or constrain the person's ability to perform the task. Testing of the TPB led to the understanding that PBC has both a mediated effect (through intention) and a direct effect on behavior (Armitage & Conner, 2001). Actual behavioral control (rather than perceived) has been shown to influence both behavior and PBC (Ajzen, 2002).

Recent environmental behavior studies using the TPB have included an affective component, as well as other factors thought to influence behavior. Hinds and Sparks (2008) included measures of affect and identity in an attempt to predict environmentally responsible behaviors. Affect was operationalized as emotional affinity toward the natural world (Hinds & Sparks, 2008). Building upon Stern's (2000) Value-Belief-Norm theory, Hinds and Sparks' (2008) model placed both affect and identity as distal from behavior, influencing beliefs, which in turn influence attitude and norms. Using a five-step hierarchical regression, they found that affect accounted for a significant amount of the variance in intention to engage in pro-environmental behaviors when it was added to the model. Environmental identity, perhaps because it was highly correlated with affect, influenced intention weakly and negatively (Hinds & Sparks, 2008).

Other modifications of the TPB have included the addition of a cultural construct to assess the influence of values on behavior. Oreg and Katz-Gerro (2006) used a sample from 27 countries to ascertain how cultural differences in environmental values would

predict pro-environmental behavior. The authors operationalized pro-environmental behavior as response to perceived threats, level of responsibility, and willingness to sacrifice, as found in the literature on values (Stern & Dietz, 1994). The authors found significant positive relationships between environmental values and intentions to engage in environmental behaviors, mediated through attitudes and subjective norms (Oreg & Katz-Gerro, 2006).

The modifications made to the TPB are attempts to include all of the influences on behavior in one model. Much like Ajzen added perceived behavioral control to the TRA, newer models are adding variables such as culture, values, and affect. A model that attempts to account for all internal variables of behavior change (e.g., attitude, self-efficacy, knowledge, affect, personal responsibility, and personal values) and external variables (e.g., norms, environmental factors that constrain or assist, cultural values, social networks) may be too unwieldy to be of practical value (Clayton & Myers, 2009); however, recent research demonstrates the utility of including affect and possibly identity into the model (Hinds & Sparks, 2008; Oreg & Katz-Gerro, 2006). Because the TPB was designed as a cognitive model, it does not capture the emotional ties to nature that are emerging as indicators of environmentally responsible behavior. An adaptation to the model that includes an affective component is therefore warranted.

Summary of the Literature Reviewed

The literature reviewed in this chapter discussed changes in children's experience with the natural world and described the role of environmental education in addressing

issues related to outdoor experiences and environmental stewardship. The review included literature from a variety of fields, including environmental education, sociology, youth development, nature connection, outdoor recreation, and psychology with a focus on the Theory of Planned Behavior (TPB).

The literature supports the notion that there is a decline in outdoor, nature-based activity for children. The time children dedicate to engaging with electronic media, which most often occurs indoors, outpaces the amount of time they are in school, let alone outside (Hofferth & Sandburg, 2001; Rideout et al., 2010). This is a phenomenon seen in both rural and urban areas in different geographical areas. The disappearance of direct experience with natural, outdoor settings is leading to a generation estranged from nature (Kellert, 2002; Pyle, 2002), which is having profound negative impacts on today's youth. Sedentary, indoor lifestyles have led to an increase in obesity and attention disorders (Louv, 2005). Nature-based activities, on the other hand, provide physical activity, mental restoration, creativity, and increased concentration.

Environmental education provides a means to reconnect children to the nature. EE's roots include nature study and school camping, both of which promoted nature-based educational activities via direct experience in the outdoors (Hammerman, 1980). More recently, place-based education methods have begun using the local environment, teaching participants about their homes and helping to develop an ethic of care for the natural and built world all around them (Sobel, 1996). Likewise, residential EE provides multiple-day programming that allows students to learn about and bond with nature while in nature. Though the literature is not always consistent, EE programs have demonstrated

the ability to increase environmental awareness, ecological knowledge, pro-environmental attitudes, and pro-environmental behaviors.

Nature-based experiences have been linked to a connection to nature, which itself influences environmental stewardship (Kals et al., 1999; Mayer & Frantz, 2004; Nisbet et al., 2008). Nature connection is operationalized as one's feeling of attachment with nature and is most often seen as a component of the affective domain (Mayer & Frantz, 2004; Nisbet et al., 2009). The emergence of reliable and valid scales available in the literature has made measuring feelings of connection to nature possible.

In addition to a feeling of connection to nature, direct experience in the natural world as a child has also been linked and future care for the environment (Chawla, 2007; Phenice & Griffore, 2003; Wells & Lekies, 2006). The loss of direct experience in nature has some wondering where the next generation of environmentalists will come from (Louv, 2005). Most of the literature focuses on the influence of childhood experiences in nature on adult behavior. There is a need to examine the role of outdoor experiences on environmental stewardship concurrently. Furthermore, it is possible that the strength of outdoor play on environmentally responsible behaviors could be explained by something else, such as nature connection. Because nature connection grows out of outdoor experience, and environmental stewardship is predicted by nature connection, a testing of nature connection as a mediator of outdoor play's influence on environmentally responsible behavior is appropriate.

Explaining why children may engage in outdoor experiences or stewardship behaviors remains a gap in the literature. In order to test these ideas, the Theory of Planned Behavior (TPB) was adopted as a framework. The TPB is a cognitive model in

which attitudes, social norms, and perceived behavioral control influence behavioral intentions, which in turn predicts actual behaviors (Ajzen, 2002). The model, which can be seen in Figure 2-1, is appropriate to try to explain outdoor play and environmental stewardship behaviors amongst Outdoor School participants. In order to address the affective component of behavioral decision-making (Kals et al., 1999), nature connection has been added as a predictor distal to behavior.

Chapter 3

Methods

The purposes of this study were to assess program outcomes, address behavioral theory, and investigate the relationship between outdoor experience, nature connection, and environmental stewardship. The first component of this study examined the effects of a residential environmental education (EE) program on outcomes identified as valuable by program coordinators, teachers, principals, and other Outdoor School stakeholders. The second component examined the relationship between nature connection, attitudes, subjective norms, perceived behavioral control, intentions and behaviors related to both outdoor play and environmental stewardship. The third and final component investigated the role of nature connection as a mediator between outdoor play and environmental stewardship. This section describes the methods utilized in this study, including the evaluation design, sample and background information of participating schools, data collection strategies, analytical strategies, and ethical considerations.

Study Design

The study employed a quasi-experimental, non-equivalent control-group design during the spring of 2010 with pretest and post-test appraisals, using the findings to address both evaluation and theory-testing questions as completely as possible (Creswell, 2009). The evaluation of Outdoor School, a residential EE program, focused on both

immediate and short-term (4-week) outcomes. The theory-testing component used an adaptation of the Theory of Planned Behavior (TPB) to assess attitudes, subjective norms, intentions, and behaviors related to engaging in nature and performing environmentally responsible behaviors. To measure these components, participants were administered a questionnaire one week prior to the Outdoor School experience, which was constructed and pilot-tested by the researcher. Post-test questionnaires were administered in two phases: Variables related to behavioral intention, ecological knowledge, and school belonging were assessed one week after the program; constructs relevant to the TPB and connection to nature were assessed four weeks after the program. A non-randomized, purposefully selected control group answered survey questions identical to those answered by the treatment group.

The research design for this study was guided by the research questions, the author's familiarity with the Outdoor School program and experience as a researcher, and the audience for whom the research instrument was written (Creswell, 2009). Each of these factors played a role in selecting the most appropriate design for this multifaceted study. There are three distinct components. Part of the research deals with the effectiveness of Outdoor School at meeting programmatic goals. Another relates to the relationship how connection to nature, attitudes, social norms, perceived behavioral control and intentions influence outdoor play and stewardship behaviors. Lastly, there is the question of whether outdoor play behaviors predict environmental stewardship behaviors. All of these questions lend themselves to a quantitative approach (Creswell, 2009).

Sampling

This study used a purposive sampling technique for both the treatment and control groups. The treatment group comprised students attending Outdoor School in the spring of 2010. Three fifth grade classes from Mifflin County, Pennsylvania, schools were identified as appropriate for the study. The students were asked to volunteer as study participants and consent forms were signed by a guardian prior to the start of Outdoor School.

Mifflin County is located in rural central Pennsylvania, 110 miles northwest of Baltimore, Maryland. Females make up 51.5 % and males 48.5 % of the population of the 46,062 county residents. The vast majority of the population is White (97.6%); 0.8 percent identify as Hispanic, 0.7 percent as Black, and 0.6 percent report two or more races. Nearly 11 percent of residents over the age of 25 hold a bachelor's degree or higher, about half of the state average (US Census Bureau, 2008).

Mifflin County is home to eight elementary schools, each of which has an established history of attending Outdoor School. Pertinent background information about various aspects of each participating school was collected, including total number of students, number of students receiving free and reduced lunch, gender, and race (see Table 3-1). Though these schools represented a convenience sample, which limited the generalizability of the study (Orcher, 2005), the information collected was used to contextualize the findings.

Table 3-1. Background characteristics of participating schools

	Total Number of Students (K-5)	SES (free and reduced lunch)	Gender (school wide)	Race
School 1	516	48.6% Free 10.3% Reduced	53.7% Male 46.3% Female	93.6% White 4.1% Black 2.1% Hispanic 0.2% Asian
School 2	300	31.3 % Free 11.3% Reduced	53.3% Male 46.7% Female	98% White 1.7% Black 0.3% Hispanic
School 3	504	31.9% Free 10.9% Reduced	54.6% Male 45.4% Female	95.2% White 3.6% Black 1.2% Hispanic 0.2% Asian
Pennsylvania Average	—	31.6% Free 7.2% Reduced	48% Male 52% Female	75% White 17% Black 6% Hispanic 2% Asian

(U.S. Census, 2008)

Study Recruitment Procedures

In the months prior to data collection, meetings with teachers and the assistant superintendent of the Mifflin County School District were held to explain the parameters of the study, describe exactly what would be asked of teachers and students, and allow for any questions. Once the school administrators and teachers granted permission to conduct the research, a description of the study, which discussed the purposes of the

research and the details of test administration, was sent to the home of each student attending Outdoor School. Students were asked to participate in the study and a parent or guardian was asked to provide consent for his or her child's participation in line with the recommendations of the Pennsylvania State University Office of Research Protections Institutional Review Board.

Program Design and History

Shaver's Creek Outdoor School is a four-day, three-night residential EE program that relies on nature-based experiential learning techniques to teach children about the interrelatedness of the natural and built environments. The bulk of Outdoor School's hands-on scholastic curriculum focuses on environmental and ecological subject matter; however, cultural history, teambuilding, and community meetings are also integral to the Outdoor School experience.

The mission of Outdoor School is to provide "participating Pennsylvania elementary students [with] quality outdoor experiences that nurture the knowledge, skills, and values necessary to actively improve their quality of life" (Shaver's Creek Environmental Center, 2007). The stated programmatic goals in the instructor handbook provide more proximal outcome objectives: to gain an understanding of the earth's natural systems; to allow participants to understand the relationships between human lifestyle choices and their effects; to practice stewardship behaviors leading to positive changes in values and behavior; to provide a supportive atmosphere that allows a person's self-image and confidence to grow; to offer positive group experiences; and to

create an awareness in teachers of the outdoor environment as a resource for accomplishing educational goals (Shaver's Creek Environmental Center, 2007).

Each year Outdoor School serves more than 500 children. Students arrive on Tuesday and live in a cabin with a counselor (normally a Penn State undergraduate student) until their departure on Friday. A typical day involves morning showers, breakfast in the main cafeteria, a morning lesson, lunch, cabin time, an afternoon lesson, solo spots, free time activities, cabin clean-up and dinner prep, dinner, exploring the night, a campfire, cabin time, and lights out. Duties as cafeteria helpers (known as "hoppers" at Outdoor School) or washroom cleaners are assigned by cabin group. Students are responsible for keeping their cabins clean and tables tidy. Singing, playing the group mystery game "Cosmic Secret," and encouragement to leave "zero food waste" punctuate each meal.

Instruction at Outdoor School generally takes place out-of-doors in learning groups. Learning groups, which are created by the visiting teachers prior to the students' arrival, comprise different members than cabin groups in order to maximize interactions and reduce the formation of cliques. The lessons are led by Learning Group Leaders, interns or staff members from Shaver's Creek Environmental Center who adhere to a set curriculum using a multitude of environmental education concepts and techniques. The concepts taught during Outdoor School lessons include the following: 1) natural cycles, such as water, soil, and nutrients; 2) resources, which focuses on what plants and animals need to survive; 3) animal adaptations, which are taught using live reptiles, amphibians, and birds; and 4) "Then and Now," an interpretive lesson that compares human life in the nineteenth century with life today. Teachers typically accompany learning groups during

lessons and activities. Notes from the “Phantom Inspector,” which are found on the trail or in the lunchroom, help prepare each group for the day’s activities while lending an air of mystery to each new experience.

In addition to structured activities and academic lessons, Outdoor School offers a wide variety of social experiences. Through interaction in cabin and learning groups, problem solving during teambuilding sessions, setting the tables for meals, playing during free-time activities, working toward resolution of a problem in a community meeting, singing songs during campfire, and dancing in a hoedown, students socialize and work with numerous peers during their stay. Additionally, Outdoor School is the first experience away from home for some students; this represents a personal challenge that allows these children to experience significant growth and independence (Shaver’s Creek Environmental Center, 2007).

Though its program offerings were not as comprehensive as in its current iteration, Outdoor School has been offered to Pennsylvania students for more than a half-century. As early as 1956, the Pennsylvania State University sponsored a residential outdoor education program in which students spent at least one night on-site learning in and about the natural world (Shaver’s Creek Environmental Center, 2007). To better serve the community, Stone Valley Outdoor School established an ongoing residential outdoor education program in 1967 for schools and institutions in Pennsylvania. Since 1978 Outdoor School has been coordinated by of Shaver’s Creek Environmental Center, the university-affiliated nature center at Penn State (Shaver’s Creek Environmental Center, 2007).

Instrumentation

Working backward from Outdoor School's stated programmatic goals, an initial list of evaluation outcomes was determined. Program stakeholders—including Outdoor School coordinators, teachers, and school administrators—offered input into the variables to be analyzed. The constructs examined on the program evaluation component of the study were ecological knowledge, connection to nature, school belonging, outdoor play attitudes, environmental stewardship attitudes, outdoor play behaviors, and environmental stewardship behaviors. In addition to examining the impact of the program on participants, the study investigated the role of various predictors on outdoor play and environmental stewardship behavior. Items used in the instrument were pilot-tested with a sample of 12 youth who attended Outdoor School in the spring of 2009 and 24 youth who attended Outdoor School early in the spring of 2010. Changes to the final instrument were guided by the feedback received from the pilot tests. In addition to variables related to the evaluation and theory-testing, demographic variables were collected.

Evaluation Constructs

An instrument appropriate to youth aged 10-12 was created to assess the latent constructs that make up the study evaluation. Reliable and validated scales—including the *Children's Environmental Response Inventory (CERI)* (Bunting & Cousins, 1983, 1985); the *Children's Attitudes Toward the Environment Scale (CATES)* (Musser & Malkus, 1994); the *Children's Environmental Attitude and Knowledge Scale (CHEAKS)* (Leeming, Dwyer, & Bracken, 1995); and indices used by Stern, Powell, and Ardoin

(2008) in their Great Smoky Mountains Institute at Tremont study—provided items used to assess ecological knowledge, connection to nature, attitudes, and behaviors. Each of these original scales has been validated as appropriate and meaningful for youth. In addition, Outdoor School staff and Pennsylvania state-certified elementary school teachers provided information used to create new items.

Ecological Knowledge

Participants were asked 10 knowledge questions aligned with the Pennsylvania Department of Education Academic Standards for Environment and Ecology to assess their cognitive understanding of the natural environment. The items were designed with each of the four main programmatic topic areas—animal adaptations, cycles, cultural history, and resources—in mind. The questions assessed knowledge of topics such as the water cycle, characteristics of an amphibian, photosynthesis, and the respiration. The first five items were asked in a multiple choice format; each question had four choices in the response set. Items 6 through 10 were true/false questions. The questions were examined by an Outdoor School program coordinator for program relevance and by two masters-level Pennsylvania science educators for face validity and standards alignment. Table 3-2 displays the 10 ecological knowledge items and the associated state standard for each item.

Table 3-2. Ecological Knowledge items and associated academic standard

Variable	Survey Item	PA E&E* Standard
1	Green plants are able to capture light energy from the sun and convert it to food through what process? (photosynthesis)	4.1.4.C; 4.4.3.C
2	An Eastern screech owl can turn its head around approximately how far? (270 degrees)	4.5.4.D
3	Which of the following is NOT a characteristic of an amphibian? (uses claws to dig holes)	4.5.4.D
4	Look at the [water cycle] diagram below. Which of the following is represented by number 2? (condensation)	4.2.5.A
5	Where do most plants in Pennsylvania get their nutrients? (soil)	4.4.5.C
6	Plants take in oxygen and animals breathe in carbon dioxide to stay alive. (false)	4.1.4.A
7	A raptor's feet are called talons. (true)	4.5.4.D
8	The natural environment where a living thing can find food, water, and shelter in an arrangement that meets its needs is called a biotic index (false)	4.1.5.C; 4.5.3.D
9	Most of the earth's water is located in rivers. (false)	4.2.4.A
10	Green plants are producers and most animals are consumers. (true)	4.1.5.A; 4.4.5.A

* Pennsylvania Department of Education Academic Standards for Environment and Ecology

Nature Connection

Nature connection is defined as an affective judgment of an individual's feeling of oneness with nature (Mayer & Frantz, 2004). Nature connection was assessed with 10-items adapted from Mayer and Frantz's (2004) *Connectedness to Nature Scale (CNS)*. The *CNS* contains 14 items intended to measure an individual's relationship with nature in the affective domain (Mayer & Frantz, 2004). The *CNS* has demonstrated reliability

and predictive validity, but it was developed for use with adults. The vocabulary required is simply beyond the grasp of the average 10 year old, making the instrument unsuitable for use with children.

In order to make the scale usable for the study sample, the wording of the items was altered. Using the Flesch-Kincaid readability calculator as a guide, the items were adapted to a fifth grade reading level. After changes in the readability level were completed, the items were administered to a group of students attending Outdoor School in the fall of 2009 (n=12). Items that elicited questions or needed clarification were altered or removed from the instrument. For example, consider item 12 on the original scale: *When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature* (Mayer & Frantz, 2004, p. 513) was altered to *When I think of my place on Earth, I think I place myself at the top of all life in nature*. Even after making the statement readable, the meaning of the statement still eluded participants. Therefore, this item was removed. Table 3-2 lists the original items in the CNS and the associated items that were administered to the participants in the study. It is quite possible that the simplification of the items will result in a reduction in measurement precision, but item comprehension is an appropriate tradeoff (Creswell, 2009). The new scale is called *The Children's Connection to Nature Scale (CCNS)*.

The CCNS was used in the study as a predictor of attitudes toward outdoor play and attitudes toward environmental stewardship. Connection to nature's role as a mediator of the influence of outdoor play on environmental stewardship was also examined. Connection to nature items were rated on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree).

Table 3-3. Items in the Children's Connection to Nature Scale and their source items.

	Original Item in the Connectedness to Nature Scale (Mayer & Frantz, 2004)	Adapted item in Connection to Nature Scale for Children
1.	I often feel a sense of oneness with the natural world around me.	I feel a sense of oneness with the natural world around me.
2.	I think of the natural world as a community to which I belong.	The natural world is a community to which I belong
3	I recognize and appreciate the intelligence of other living organisms	I can see intelligence in other living things
4.	I often feel disconnected from nature	I feel connected to nature
5.	When I think of my life, I imagine myself to be part of the larger cyclical process of living.	*
6.	I often feel a kinship with animals and plants.	I feel a kinship with animals and plants.
7.	I feel as though I belong to the Earth as equally as it belongs to me.	*
8.	I have a deep understanding of how my actions affect the natural world.	I feel that what I do affects the natural world
9.	I often feel part of the web of life.	I feel like I am part of the web of life
10.	I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.	I feel that all living things, human and nonhuman, share a common life force
11.	Like a tree can be part of a forest, I feel embedded within the natural world.	I feel part of the natural world, like a tree in a forest
12.	When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.	*
13.	I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.	When I think of life on Earth, I think other species are just as important as humans
14.	My personal welfare is independent of the welfare of the natural world.	*

* Item removed from the scale

School Belonging

Consistent with the programmatic goal of developing healthy relationships between teachers and students, school belonging was assessed before and immediately after participation in Outdoor School. Hug's (1995) study on Outdoor School's role in teacher development described the social benefits and feelings of belonging witnessed by pre-service teachers. The six items comprising the School as Community Scale are used from the Center for Information and Research on Civic Learning and Engagement (Chi, Jastrzab, & Melchior, 2006). Items included statements such as, *Most students seem to care about each other, even people they do not know well*. Items were rated on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree).

Attitude

Attitudes are cognitive assessments of attitude objects (Ajzen, 1991). Two sets of attitude items were included in the evaluation. Attitudes toward outdoor play were assessed with four items, including statements such as *I'd rather play video games than play outside*. Items for this scale were adapted from similar evaluations in residential EE (Stern, Powell, and Ardoin, 2008) and afterschool programming (Lewis, 2009).

Environmental stewardship attitude was assessed with five items adapted from the *Children's Attitudes Toward the Environment Scale (CATES)* (Musser & Malkus, 1994) and the *Children's Environmental Attitude and Knowledge Scale (CHEAKS)* (Leeming,

Dwyer, & Bracken, 1995). Example items include *I'd rather turn off the lights than leave them on when I leave a room*. Items were rated on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree). The attitude items were also used in the theory-testing component of the study as predictors of environmental stewardship and outdoor play

Behaviors

Outdoor play and environmental stewardship behavior were assessed on both the pretest and post-test administrations of the survey. Participants were asked to think about the previous week and to rate how strongly they agreed with the task object. Responses were rated on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree). Dependent-samples *t* tests were used to examine differences from pretest to post-test. Outdoor play behavior included items such as, *In the last week I played outside with my friends*. Examples from environmental stewardship behavior included, *In the last week I recycled items at home*. These items may not perfectly capture outdoor play and stewardship behavior; however, they are closely tied in with the Outdoor School curriculum and the existing literature on behaviors (Leeming, Dwyer, & Bracken, 1995; Sia, Hungerford, & Tomera, 1986). The behavior items were also used in the theory-testing component as predictors of environmental behavior and outdoor play, as well as in the mediation model.

Theory-Testing Constructs

The Theory of Planned Behavior (TPB) was used as the theoretical framework for this analysis. The TPB has four main components that are antecedents to behavior. Most proximal is intention, which itself is predicted by attitude, norms, and perceived behavior control. While the TPB and its predecessor, the Theory of Reasoned Action, are not perfect models, they account for many of the personal influences that research has shown to impact behavior (Ajzen, 2002). Recent research recommends the addition of an affective component to predict behavior (Hinds & Sparks, 2008; Kals, Schumacher, & Montada, 1999; Sibthorp, 2008). In this case, nature connection was added to the model as an affective predictor of distal to behavior. The use of path analysis to test the models allowed us to see the predictive validity and to alter the paths as needed. Finally, the models make intuitive sense, which is important when discussing findings with stakeholders. The TPB guided the development of items used to assess attitudes, social norms, perceived behavioral control, intentions, and reported behaviors of the participants on stewardship behavior and time spent outdoors. Items were written consistent with the constructs of the TPB. Attitudes and behaviors were used in both the evaluation and theory-testing components of the study. The remaining constructs are discussed below.

Social Norms

Subjective social norms relate to how a person believes he or she will be perceived for performing a specific action by significant others in his or her life

(Armitage & Christian, 2003). Participant social norms were rated on a Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree). Following the guidelines set by Ajzen (1991) and work done by Lewis (2009), respondents were asked to assess the attitudes and behaviors of important people in their lives, operationalized as “my friends,” “people who care about me,” and “the people I live with.” Both outdoor play social norms (e.g. *People who care about me encourage me to play outdoors*) and environmental stewardship social norms (e.g. *My friends think it is important for me to pick up trash when we see it lying on the ground*) were assessed in this study.

Perceived Behavioral Control

Perceived behavioral control denotes the ease or difficulty a person believes he or she will have executing a behavior in order to achieve a desired outcome (Ajzen, 2002). An outgrowth of Bandura’s (1986) self-efficacy theory, perceived behavioral control is what separates the Theory of Planned Behavior from its predecessor, the Theory of Reasoned Action. Both outdoor play perceived behavioral control (e.g. *I can be outdoors on most days, even if it is hot or cold outside*) and environmental stewardship perceived behavioral control (e.g. *I could take a shorter shower to save water if I wanted to*) were assessed on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree).

Intentions

Participants were asked to rate four outdoor play behavioral intention items and four environmental stewardship behavioral intention items on the likelihood they would engage in these behaviors in the next week. The items were rated on a seven-point Likert-type scale that ranged from 1 (Strongly Agree) to 7 (Strongly Disagree). One example from the environmental behavior set of items is, *In the next week I will turn off the lights when I leave a room*. Intentions were assessed only once, at the one-week post-test administrations of the survey.

Data Collection

Both the evaluation and theory-testing goals of this study guided the protocol for the data collection. The timing of survey administrations, which can be seen in Table 3-3, was selected to measure the short-term outcomes of Outdoor School, as well as to accommodate the TPB and mediation models.

Though only pretest and post-test data were collected, the survey instruments were administered in the students' home schools at three time points. The pretest survey was given on the Thursday before the students in each school were scheduled to attend Outdoor School. The pretest was administered to four different groups in consecutive weeks, beginning in the last week of April 2010 and concluding during the third week of May 2010. The initial post-test, which contained only school belonging, ecological knowledge, and behavioral intention items, was administered one week after each school returned from their Outdoor School experience. Theoretically, intentions to engage in a

given behavior are the best predictor of that behavior (Ajzen, 2002). By measuring behavioral intentions immediately after the program and then measuring actual (self-reported) behaviors three weeks later, a more accurate look at the predictive validity of the behavioral intentions was afforded than if behavior and intention were measured simultaneously. Ecological knowledge and school as community items were selected for the initial post-test to cut down on the number of items on the final test administration, thereby reducing the time commitment needed to complete it. The second post-test measured nature connection, attitudes, social norms, perceived behavioral control, and behaviors related to both outdoor play and environmental stewardship three weeks after Outdoor School. The second half of the post-test was given during four consecutive weekends in May and June.

The survey instruments were kept as short as possible to minimize the burden of testing on participants while ensuring adequate data to address the key research questions. The Pennsylvania System of School Assessment (PSSA) tests were administered to students during the spring months, shortly before the participants attended Outdoor School. The decision to break the post-test into separate chunks was made at the request of school teachers and administrators, who were concerned about test fatigue.

Table 3-4. Student data collection details.

School	Attended	April	May	June
School 1	Week 1	P ₁ X	P ₂ P ₃	
School 1	Week 2		P ₁ X P ₂	P ₃
School 2	Week 3		P ₁ X P ₂	P ₃
School 3	Week 4		P ₁ X P ₂	P ₃
School 4 (control)	n/a		P ₁	P ₂
School 5 (control)	n/a		P ₁	P ₂

P₁ = Pretest; P₂ = Post-test 1; P₃ = Post-test 2
 X = Attended Outdoor School

Study Timeline

This study proposal was submitted in March 2010 to the Pennsylvania State University Internal Review Board. Additionally, permission was requested from the Mifflin County School District assistant superintendent, school principals, and classroom teachers to obtain permission to work with students of the schools slated to attend Outdoor School in the spring of 2010. Of the five schools scheduled to participate in Outdoor School in the spring of 2010, three were chosen for inclusion in the study. Data collection began with the first school in April 2010 and concluded with the final post-test assessment in June 2010. Data entry concluded in July 2010 and data analysis was

completed in September 2010. A comprehensive final report was prepared for Outdoor School administrators and school officials in December 2010 (see Table 3-5).

Data Analysis

Data analysis was conducted in three phases. In the first phase the evaluation constructs were examined for significant difference from pretest to post-test. The next phase looked at the relationships of the constructs of the Theory of Planned Behavior. Finally, the mediation model was tested. Table 3-6 displays the constructs examined and data analysis methods used for each component of the study.

Table 3-6. Data analysis plan for each phase of the study

	Evaluation	Theory of Planned Behavior	Mediation
Constructs Examined	Ecological Knowledge Nature Connection School Belonging Outdoor Play Attitude Outdoor Play Behavior Environmental Stewardship Attitude Environmental Stewardship Behavior	Nature Connection Outdoor Play Attitude Outdoor Play Social Norms Outdoor Play Perceived Behavioral Control Outdoor Play Intentions Outdoor Play Behavior	Nature Connection Outdoor Play Behavior Environmental Stewardship Behavior
Method of Analysis	Paired t-test	Regression/SEM	OLS Regression
Software Utilized	PASW 18.0	AMOS 5.0	PASW 18.0
Survey Administration	Pretest & Post-test	Post-test only	Pretest only

Reliability and Validity

Reliability and validity of the instrument scales were measured by computing Cronbach's alpha coefficients for each of the constructs using PASW Statistics 18. An alpha coefficient of .60 was considered adequate in this study (Vaske, 2008).

Evaluation of the Intervention

For the purpose of examining whether baseline differences existed between the treatment and control groups, independent-samples *t* tests were run on demographic variables and six of the seven evaluation constructs using pretest measures. (Environmental stewardship demonstrated inadequate reliability and was not tested.) In order to gauge the effectiveness of the program on participant change, dependent-samples *t*-tests were run using PASW 18.0 on six indexed variables: ecological knowledge, connection to nature, school as community, outdoor play attitude, outdoor play behaviors, and stewardship behaviors. Additionally, a dependent *t*-test was run on the five items associated with environmental stewardship attitude (see Table 4-11). Cohen's *d* values were used to demonstrate effect sizes. Cohen's *d* values represent the amount of variance in the dependent variable (the post-test) explained by independent variable (the pretest) (Vaske, 2008).

Path Analysis of the TPB Constructs

Understanding human behavior is a complex endeavor (Ajzen, 1991). The TPB states that the best predictor of behavior performance is intention to perform the stated behavior (Armitage, 2005). The intention to perform the behavior—in this case outdoor play or environmental stewardship—is more likely if the individual holds a positive attitude toward the behavior, if the behavior falls within the social norms of the person's family and friends, and if the person believes he or she is capable of successfully performing the behavior (Ajzen & Driver, 1992; Armitage, 2005). Based on recommendations from the literature (Hinds & Sparks, 2008; Kals et al., 1999), connection to nature was added as a predictor of attitudes. Additionally, a direct effect from perceived behavioral control to behavior was placed in the model. Because children have greater restrictions placed on them by the adults in their lives, perceived behavioral control is predicted to have a direct influence on behavior.

Connection to nature, attitudes, norms, perceived behavioral control, and behavior variables were collected on pretest and four-week post-test assessments. Intentions were assessed at only one point, during the one-week post-test administration. Behavior was assessed by asking participants whether they had engaged in a specific behavior in the last week. Four behavioral statements pertained to outdoor play; five statements pertained to environmental stewardship. The intention items asked participants about their behavioral intentions in the upcoming week and corresponded to the behavior items. The decision to assess the intentions prior to the behaviors was based on limitations stated in other studies (Hinds & Sparks, 2008). Doing so, however, presented its own set of

questions regarding when to assess the other variables in the model. Because the TPB aims to predict behavior, I opted to measure the antecedent variables at the same time as the behavior variables.

A structural equation path analysis was used to test the predictive validity of the models. Path analysis is a subset of Structural Equation Modeling (SEM), in which the model is proposed (based upon theory and empirical studies) and tested for maximum likelihood estimation. A model is a statistical statement about the relationships between variables (Byrne, 2001; Sobel, 1982). Though there may be good fit for a model, its specification must be guided by theory (Kline, 2005). SEM provides increased explanatory power and controls for measurement better than ordinary least squares regression (Kline, 2005).

For this study, the independent variables (children's connection to nature, outdoor play norms, and outdoor play perceived behavioral control) are considered exogenous variables. The causes of exogenous variables are not specified, and SEM allows the exogenous variables to covary. The dependent variables are known as endogenous variables (outdoor play attitude, outdoor play intentions, and outdoor play behavior). The causes of endogenous variables are accounted for within the model (Kline, 2005).

The parameter estimates of the model are determined using maximum likelihood (ML) estimates. This is an iterative process in which a set of parameters is estimated and a "fit function" is determined. Using this function, a second estimate is made to make the fit smaller. This is repeated until the size of the fit function cannot be reduced (Kline, 2005). This iterative process continues until the estimated variance/covariance matrix is as close as possible to the observed variance/covariance matrix from the data set (Byrne,

2001). When the iterations are complete, one compares the estimated variance/covariance matrix with the observed matrix using fit indexes, which are based on the chi-square test. The models in this study were measured for goodness of fit using the chi-square statistic divided by the degrees of freedom ($CMIN/df$), the Comparative Fit Index (CFI), and the Goodness of Fit Index (GFI). These fit indices are set from a range of 0 to 1, with coefficients above .90 seen as acceptable. Additionally the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were reported. Each of these measures is seen as a close fit with a p value below .05 (Kline, 2005).

AMOS allows the researcher to modify the model based on parameter estimates and modification indices. Similar to multiple regression path analysis, if parameter estimates are not significant, a path can be removed and the model retested. Modification indices suggest paths to add to the model to improve the model's fit (Kline, 2005). Dropping or adding additional paths to the model must be supported with theory (Kline, 2005).

Testing the Mediation Model

Baron and Kenny's (1986) landmark article on mediation stated that, "a given variable is said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion" (p. 1176). The four-step process described by Baron and Kenny (1986) was used to establish mediation using ordinary least squares regression. The following conditions are required to determine mediation: a) the predictor

variable must significantly influence the criterion variable; b) The predictor variable must significantly influence the mediator variable; and c) the mediator variable must significantly influence the criterion variable (Vaske, 2008; Vaske & Kobrin, 2001). If the predictor variable no longer has a significant effect when the mediator variable is in the model, full mediation is established. If the effect of the predictor variable is reduced when the mediator is added to the model, partial mediation is established (Baron & Kenny, 1986; Vaske, 2008).

Chapter 4

Results

The first objective of this research was to evaluate Outdoor School, a residential EE program, on seven outcome measures: ecological knowledge, connection to nature, school belonging, outdoor play attitudes, environmental stewardship attitudes, outdoor play behavior, and environmental stewardship behavior. Pretest and post-test data were compared to examine the impact of the Outdoor School on programmatic goals. The second aim of the study was to examine a theoretical model of outdoor play and environmental stewardship behavior based on the Theory of Planned Behavior. The constructs tested in the model were connection to nature, attitudes, social norms, perceived behavioral control, behavioral intentions, and behaviors of both outdoor play and environmental stewardship. The final intention was to investigate nature connection's role as a mediator of outdoor play's influence on environmental stewardship. This chapter reports the results from the data analysis of all three components of the study.

Descriptions of the sample are presented first, including youth demographics and information about the schools. Reliabilities of the constructs used in the evaluation are presented next, followed by comparisons between treatment and comparison schools, and the evaluation findings. Reliabilities of constructs used in the Theory of Planned Behavior investigation and results of the path analysis follow. Lastly, the findings of the mediation model testing are presented.

Participant Demographics

Two-hundred-sixteen fifth grade students from three schools in Mifflin County, Pennsylvania, were eligible to participate as the treatment group in the study. Of the 216, 179 youth (82.9%) participated in the pre-test measures. About half of the 37 students who did not participate did not submit signed consent forms, and were therefore excluded from the study group. 18 participants were absent on the date of the pretest administration, so no baseline measurements were collected for these participants. Due to absence from school during one of the post-test administrations or incomplete data (skipping one or more entire sections), fewer post-test measures were collected. In sum, 156 of the original 179 participants completed all of the test administrations satisfactorily, a total attrition rate of 14.7%. A non-equivalent matched control group sample (Creswell, 2009) was drawn from two schools in separate counties adjacent to Mifflin County. Seventy-eight participants from Juniata and Centre Counties completed pretest measures. Of these pre-test, control group participants, 6 students did not complete post-test surveys, for an attrition rate of 7.7% and a final working control group sample of 72. Table 4-1 and Table 4-2 present the participation in the study by school.

Demographic information on the participants is delimited to those who completed all three test administrations (n=156). A demographic description of the sample is illustrated in Table 4-3. The participants' ages were between 10 and 12 years, with a mean of 10.8 years. The gender of the sample was split nearly evenly, with a slight majority favoring females (51.6%).

Table 4-1. Participation in the study by treatment schools.

School	Completed Pre-test (N)	Completed Post-test 1 (N)	Completed Post-test 2 (N)	Final Working Group*
School 1	59	52	54	51
School 2	37	36	36	35
School 3	83	74	73	70
Total	179	162	163	156

* completed all test administrations

Table 4-2. Participation in the study by control schools.

School	Completed Pre-test (N)	Completed Post-test 1 (N)	Completed Post-test 2 (N)	Final Working Group*
School 4	37	33	33	33
School 5	41	39	39	39
Total	78	72	72	72

* completed all test administrations

Participants were asked to describe their race by choosing from the following six demographic choices drawn from the 2000 U.S. Census: Asian, Black/African American, Hispanic/Latin, Native American/American Indian, White/Caucasian, and Other. Based on pilot studies with students of a similar age, the researcher instructed participants to skip the question if they did not know how to answer. Participants may have had some difficulty interpreting the correct response for the ethnicity questions. Whereas the National Center for Education

Statistics (NCES) (2010) reported that Mifflin County School District students were 97% white, the sample was only 70% ($n = 109$) white. Although less than one-hundredth of one percent of the Mifflin County School District under-18 residents identified as Native American/American Indian alone and only one percent identified as more than one race in 2000, 15 participants (9.6%) in the treatment sample described themselves as Native American. This may have been an issue with terminology. Nine participants left the item blank and seventeen listed “other” as their choice.

Table 4-3. Description of the sample.

Variable	Percentage	<i>N</i>
<i>Gender</i> (n=156)		
Male	48.1	75
Female	51.9	81
<i>Age</i> (n=156)		
10	24.4	38
11	70.5	110
12	5.1	8
<i>Race/Ethnicity</i> (n=147)		
Asian	1.3	2
Black/African-American	1.3	2
Hispanic/Latino	1.3	2
Native American	9.6	15
White/Caucasian	69.9	109
Other	10.9	17
Missing	5.8	9

Reliability Analysis of Evaluation Constructs

Scale reliabilities of the study constructs pertinent to the evaluation were assessed by analyzing their internal consistency using Cronbach's alpha scores for each of the constructs. Internal consistency was measured using the pretest scores from both the treatment and control groups (n=228). The majority of the constructs had adequate ($\alpha > .60$) to good reliability ($\alpha > .80$) (Vaske, 2008).

Children's Connection to Nature

Children's connection to nature was measured with a reduced version of the *Connectedness to Nature Scale* (Mayer & Frantz, 2004), which was adapted for use with elementary school students. The original scale, which was intended for adults, was beyond the comprehension of fifth-grade students. The adapted scale used less complex language and four fewer items than the original, but retained the aim of capturing respondents "levels of feeling emotionally connected with the natural world" (Mayer & Frantz, 2004, p. 503). The scale contains 10 items scored on a 7-point scale. A higher score indicates more connection with nature. Overall, participants scored the items relatively highly (see Table 4-4), suggesting that on average the participants felt a high level of connection with nature. The lowest rated item, *I feel part of the natural world, like a tree in a forest*, had an average mean of 5.44. The highest rated item, *When I think of life on Earth, I think other species are just as important as humans*, had an average mean of 6.14. The children's connection to nature scale demonstrated good reliability (α

= .84). All of the item-total correlations in the scale were above .4, indicating a good fit for each item with the overall construct (Vaske, 2008).

School Belonging

School belonging was assessed with the six-item School as Community Scale (Chi, Jastrzab, & Melchior, 2006). The scale measured students' appraisal of community, respect, and care in the school setting. Though the original scale demonstrated adequate reliability ($\alpha = .76$), two items had item-total correlations below the .40 cutoff (Vaske, 2008). The item, *Students have a chance to discuss issues at this school*, was dropped from the scale, because the Pearson correlation coefficient between the item and the sum of scores was below .40. Next, the item, *Students can talk with teachers in this school if something is bothering them*, was dropped from the scale, because the item total statistics indicated that the Cronbach's alpha of the scale would improve if the item were deleted. The four-item scale demonstrated adequate reliability ($\alpha = .78$). The item-total statistics once again indicated that dropping an item would improve the reliability of the scale, so *Teachers at this school won't let students make fun of other students*, was removed. The reduced scale retained the themes of respect (*Most students at this school treat each other with respect*), caring (*Most students seem to care about each other, even people they do not know well*), and community (*Students feel like they are an important part of this school*) that were present in the original six-item scale. These three items demonstrated good reliability ($\alpha = .80$). Means, standard deviations, and item total correlations for school belonging are presented in Table 4-5.

Table 4-4. Reliability analysis of Nature Connection.

Survey Item	<i>M</i>	<i>SD</i>	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Children's Connection to Nature (n=228)					.84
I feel connected to nature	5.89	1.43	.58	.82	
I feel that what I do affects the natural world	5.53	1.81	.48	.84	
I feel like I am part of the web of life	5.46	1.69	.47	.84	
I feel that all living things, human and nonhuman, share a common life force	5.98	1.28	.55	.83	
I feel a sense of oneness with the natural world around me	5.54	1.48	.62	.82	
I feel part of the natural world, like a tree in a forest	5.44	1.65	.61	.82	
When I think of life on Earth, I think other species are just as important as humans	6.14	1.18	.46	.84	
The natural world is a community to which I belong	6.12	1.20	.57	.83	
I feel a kinship with animals and plants	5.90	1.40	.61	.82	
I can see intelligence in other living things	5.95	1.39	.49	.83	

Table 4-5. Reliability analysis of School Belonging.

Survey Item	<i>M</i>	<i>SD</i>	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
School Belonging (n=228)					.80
Most students at this school treat each other with respect	4.76	1.63	.69	.67	
Most students seem to care about each other, even people they do not know well	4.76	1.58	.70	.66	
Students feel like they are an important part of the school	5.46	1.48	.55	.82	

Attitudes

Attitudes in this study refer to the positive or negative valuation of the participant on performing a specific behavior (Ajzen, 1992). The Outdoor Play Attitude scale consisted of four items adapted from items used by a previous residential EE evaluation (Stern et al., 2008). The scale, which measured preferences for outdoor play and exploring in nature over indoor activities, displayed adequate reliability ($\alpha = .74$). The highest rated item (*I would rather play outside than inside*) provided a global measure of preference for outdoor play. The mean ($M = 6.39$, $SD = 1.13$) was quite high for this item. The other three outdoor play attitude items (see Table 4.6) placed playing outside or exploring nature in opposition to three popular, media-based, indoor activities: watching television, playing video games, and being on the computer (Rideout et al., 2010). The reverse coded items *I'd rather be on the computer than play outside* ($M = 5.38$, $SD = 1.90$) and *I would rather watch TV than play outside* ($M = 5.65$, $SD = 1.62$) had both the lowest means and the largest standard deviations. It is not clear whether the directionality of the questions impacted the measurement, but that is a possible limitation to this scale (Vaske, 2008). The specificity of the indoor-based activities (*e.g.*, being on the computer) may also account for the lower means on the detailed items.

The Environmental Stewardship Attitude scale consisted of 5 items and demonstrated poor reliability ($\alpha = .42$). The individual items were created to measure how favorable participants' attitudes were toward environmentally responsible behaviors, including recycling, talking to family members about the environment, conserving water,

Table 4-6. Reliability analysis of Outdoor Play and Environmental Stewardship Attitude

Survey Item	<i>M</i>	<i>SD</i>	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Outdoor Play Attitude (n=224)					.74
I would rather play outside than inside	6.27	1.27	.49	.72	
I would rather watch TV than play outside	5.66	1.68	.50	.71	
I'd rather explore nature than play video games	5.44	1.68	.67	.61	
I'd rather be on the computer than play outside	5.18	1.88	.52	.70	
Environmental Stewardship Attitude (n=226)					.42
I'd rather throw cans and bottles in the trash than recycle	5.49	2.20	.14	.44	
I would rather leave the water running when I brush my teeth than shut it off	4.98	1.65	.25	.35	
I'd rather turn off the lights than leave them on when I leave a room	5.74	1.85	.29	.31	
I'd rather talk with my friends and family about the environment	6.29	1.33	.19	.39	
I'd rather fill up my plate than only put as much food on as I know I can eat	4.87	2.07	.25	.34	

conserving energy, and not wasting food. Items were generated from the literature (Hungerford & Volk, 1990; Sia et al., 1986; Stern et al., 2008), as well as from input from program staff. The item, *I'd rather talk with my friends and family about the environment* ($M = 6.29$, $SD = 1.33$), demonstrated the highest average score.

Two of the environmental attitude items can be viewed as “double-barreled” questions, which may have confused the participants. The recycling item asked respondents to consider disposing of both cans and bottles, rather than one or the other. The item forced the respondent to answer in a way that would indicate that the action taken with cans is the same as the action taken with bottles. Similarly, the item on talking about the environment asks students about talking with friends and family. The discourse a fifth-grade student has with friends may be different from conversation he or she has with family members, but the item did not account for that distinction.

Behavior

Behavior is a person's observable response with respect to a given target (Ajzen, 2006). The Outdoor Play Behavior Scales consisted of four items ($\alpha = .71$) measuring participants' outdoor actions over the previous week. The Outdoor Play Behavior Scale measured outdoor play, nature exploration, and play outdoors regardless of the weather in the last week. The highest-rated item was *In the last week I played outside with my friends* ($M = 6.03$, $SD = 1.56$). The item *In the last week I explored in a natural area* was the lowest rated environmental intention ($M = 5.07$, $SD = 1.96$). This difference in these

two items may indicate that participants perceive a distinction between playing outdoors and exploring in nature.

The Environmental Stewardship Behaviors scale consisted of five items ($\alpha = .63$) measuring participants' engagement in environmentally responsible behaviors over the past week. Reducing water usage when taking a shower ($M = 6.40, SD = 1.23$) and turning out lights when leaving a room ($M = 6.50, SD = 1.08$) were rated very highly. Willingness to talk about the environment, however, was scored much lower with a greater dispersion ($M = 3.97, SD = 2.08$). Table 4-7 demonstrates the results of the reliability analysis of both outdoor play and environmental stewardship behavior scales.

Table 4-7. Reliability analysis of Behavior

Survey Item	<i>M</i>	<i>SD</i>	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Outdoor Play Behavior (n=227)					.71
In the last week I spent time outside even when I could have been playing video games or watching TV	5.97	1.56	.47	.66	
In the last week I played outside with my friends	6.03	1.56	.55	.62	
In the last week I explored in a natural area	5.07	1.96	.53	.63	
In the last week I went outdoors even if the weather wasn't great	5.45	1.89	.45	.67	
Environmental Stewardship Behavior (n=224)					.63
In the last week I turned off the water when I brush my teeth	6.40	1.23	.29	.62	
In the last week I recycled items at home	5.08	2.06	.54	.49	
In the last week I turned off the lights when I left a room	6.49	1.08	.28	.63	
In the last week I talked with my family about the environment	3.97	2.08	.46	.55	
In the last week I picked up trash that was lying on the ground	5.33	1.81	.40	.57	

Ecological Knowledge

The ecological knowledge section of the survey consisted of five multiple choice and five true/false items developed by the researcher to test the participants' knowledge of Pennsylvania environment and ecology. These 10 items measured cognitive outcomes, which were relevant to the program as well as to the curricular standards of Pennsylvania fifth grade students. The items were examined for face validity by two masters-level elementary science educators to ensure that each question's content was aligned with the Pennsylvania Department of Education Academic Standards for Environment and Ecology. The ecological knowledge index was computed as a summative scale; the number of correct answers out of ten represented each individual's ecological knowledge. The items were coded as either 0 (incorrect) or 1 (correct).

The participants' pretest scores reflected a wide range of baseline knowledge. The lowest two scores were from the multiple choice section of the study. The first item was a question about animal adaptations (pretest $M = .23$, $SD = .42$) and the second pertained to the water cycle (pretest $M = .23$, $SD = .46$). The five multiple choice items also demonstrated a significantly lower mean ($M = 2.44$, $SD = 1.05$) than the true/false items ($M = 3.37$, $SD = 1.27$) at baseline, indicating that the true/false questions were perhaps too easy.

Testing Baseline Differences Between Treatment and Control Groups

Consistent with the data analysis plan, independent samples *t*-tests were conducted on five evaluation indices (ecological knowledge, connection to nature, school belonging, outdoor play behavior, and environmental stewardship behavior) to examine differences in baseline measurements between the treatment and control groups. In order to avoid a Type I error, a Bonferroni correction (Tabachnick & Fidell, 2007) was used to reduce the level of significance from .05 to .01 (.05/5). Table 4-8 illustrates the testing of differences of the pretest measurements. Of the variables examined, only ecological knowledge approached significance $t(226) = 2.11, p = .04, d = .29$.

Table 4-8. Independent *t* tests of baseline characteristics of treatment and control groups.

Scale	Treatment (n=156)	Control (n=72)	<i>t</i>	<i>df</i>	<i>p</i> *	<i>d</i>
Ecological Knowledge	5.81 (1.69)	5.26 (2.05)	2.11	226	.04	.29
Nature Connection	5.76 (.89)	5.67 (1.05)	.73	226	.47	.10
School Belonging	5.00 (1.29)	4.95 (1.26)	.26	226	.80	.04
Outdoor Play Behavior	5.60 (1.25)	5.59 (1.31)	.06	226	.95	.01
Stewardship Behavior	5.35 (1.08)	5.47 (1.08)	-.78	226	.44	.11

Numbers in parentheses are standard deviations.

*Level of significance = $p < .01$

Evaluation of Program Effectiveness

One of the objectives of this study was to examine changes in participants' self-assessment of constructs related to the programmatic goals before and after participation in Outdoor School. In order to test the first six hypotheses in this study, dependent-samples *t* tests were run using PASW 18.0 on six indexed variables: ecological knowledge, connection to nature, school as community, outdoor play attitude, outdoor play behaviors, and stewardship behaviors. Dependent *t* tests were also run on the five items associated with environmental stewardship attitude. Table 4-9 illustrates the summary statistics for the index comparisons. Effect sizes are presented as Cohen's *d* values (Dunlop, Cortina, Vaslow, & Burke, 1996). The level of significance for the dependent-samples *t* tests was set at .01 (original α/n , which in this case was .05/5) to avoid inflating the alpha using Bonferroni methods of correction (Tabachnick & Fidell, 2007). Additionally, the post-test scores of all of the evaluation constructs for the control and treatment groups were compared using independent *t*-tests. As was the case with the dependent samples *t*-test, the level of significance was set at .01 to avoid Type I error.

Ecological Knowledge

H₁: Participants in Outdoor School will demonstrate significant, positive increases in scores of ecological knowledge as measured on pretest and post-test assessments.

A paired-samples *t* test was conducted to examine differences in ecological knowledge from the pretest and post-test survey administrations. The results indicated that there was a significant difference in the total ecological knowledge scores for the

pretest ($M = 5.81, SD = 1.69$) and post-test ($M = 6.92, SD = 1.77$) conditions; $t(155) = -7.71, p < .001, d = .64$. These results showed a 19.1% increase in ecological knowledge scores and a medium effect using Cohen's d . The control group showed no significant differences from pretest ($M = 5.26, SD = 2.05$) to post-test ($M = 5.53, SD = 2.10$); $t(71) = -1.50, p = .07, d = .13$. An independent-samples t -test confirmed a significant difference between the post-test score of the treatment group ($M = 6.92, SD = 1.77$) and that of the control group ($M = 5.53, SD = 2.10$); $t(226) = 5.22, p < .01, d = .69$. Therefore, the hypothesis that there is a significant, positive increase between assessments of ecological knowledge taken before and after Outdoor School was supported. The academic components of the Outdoor School curriculum appear to be effective in educating the participants about the ecology of central Pennsylvania, as assessed by a one-week timeframe.

Connection to Nature

H₂: Participants in Outdoor School will demonstrate significant, positive increases in scores of children's connection to nature as measured on pretest and post-test assessments.

In order to examine changes from pretest to post-test on connection to nature, a dependent-sample t test was run on the mean scores of the Children's Connection to Nature Scale (CCNS). The treatment group demonstrated a significant gain in the CCNS scores from the pretest ($M = 5.76, SD = .89$) and post-test ($M = 6.01, SD = .96$); administrations; $t(155) = -4.03, p < .001, d = .27$. The control group showed no

significant differences from pretest ($M = 5.67$, $SD = 1.05$) to post-test ($M = 5.66$, $SD = 1.12$); $t(71) = .10$, $p = .46$, $d = .01$. In order to compare differences in post-test scores of the treatment group ($M = 6.01$, $SD = .96$) and that of the control group ($M = 5.66$, $SD = 1.12$), an independent t -test was run; $t(226) = 2.46$, $p = .01$, $d = .33$. There is support for the hypothesis that there is a significant, positive gain in connection to nature after participation in Outdoor School. The program appears to have demonstrated success in achieving its goal of helping participants develop a personal relationship with nature; however, while statistically significant, the strength of the increase from before to after the program ($d = .27$) is relatively modest. Likewise the strength of the difference between the post-test scores of the treatment group and the control group, while significant, is modest as assessed by Cohen's d .

School Belonging

H₃: Participants in Outdoor School will demonstrate significant, positive increases in scores of school belonging as measured on pretest and post-test assessments.

In order to examine changes in feelings of school belonging, differences in the reduced, three-item School as Community Scale were examined. There were no significant differences found from pretest ($M = 5.00$, $SD = 1.29$) to post-test ($M = 5.13$, $SD = 1.11$) conditions; $t(155) = -1.08$, $p = .14$, $d = .11$. The control group also showed no significant differences from pretest ($M = 4.95$, $SD = 1.26$) to post-test ($M = 5.13$, $SD = 1.33$); $t(71) = -.50$, $p = .07$, $d = .14$. A comparison of the post-test scores of the treatment and control groups also indicated no significant difference. Therefore, the hypothesis that

participants would show a significant, positive change in measures of school belonging was not supported. Possible reasons for this include a lack of time for the changes to develop within the period of test administrations and issues with construct validity. These issues are discussed in further detail in the discussion section of this document. Though there is a great deal of evidence that Outdoor School aids in the development of care and respect (Hug, 1995), the findings from this evaluation did not support that assessment when using the School as Community scale as the measure of school bonding.

Outdoor Play Attitude

H₄: Participants in Outdoor School will demonstrate significant, positive increases in scores of outdoor play attitude as measured on pretest and post-test assessments.

For this study, differences in outdoor play attitude from pretest to post-test were tested using a dependent-samples *t* test on the Outdoor Play Attitudes scale. There were no significant differences found from pretest ($M = 5.82$, $SD = 1.18$) to post-test ($M = 5.74$, $SD = 1.18$); $t(155) = 1.07$, $p = .14$, $d = .07$. Interestingly, the control group showed a near-significant, positive change in outdoor play attitude from pretest ($M = 5.09$, $SD = 1.19$) to post-test ($M = 5.29$, $SD = 1.16$); $t(71) = -2.09$, $p = .02$, $d = .17$. The treatment group's lack of change from pretest to post-test was similar to other EE studies measuring environmental attitudes (Hungerford & Volk, 1990; Musser & Malkus, 1994; Smith-Sebasto & Semrau, 2004), including a previous study of Outdoor School (Kieffer, 1992). Possibly the high average pretest score (5.86 out of 7.0) precluded much change between the two test administrations for the treatment group. It is also important to note that there

was a significant difference in outdoor play attitude between the control and treatment groups both at the pretest and post-test, as shown in Table 4-10. Results from both test administrations show significantly higher mean scores for the treatment group. Though it is beyond the scope of this study, these differences may indicate that the preparatory activities leading up to the Outdoor School experience influence a positive predisposition toward outdoor play.

Environmental Stewardship Attitude

H₅: Participants in Outdoor School will demonstrate significant, positive increases in scores of environmental stewardship attitude as measured on pretest and post-test assessments.

The scale for environmental stewardship was not reliable, so each of the items that made up the proposed scale was examined with a paired *t*-test. The first statement attempted to capture participants' attitude toward recycling with the statement, *I'd rather throw cans and bottles in the trash than recycle*. (A higher score indicated a more negative attitude toward recycling, so this item was recoded.) No significant differences were found from the pretest ($M = 5.65$, $SD = 1.98$) to the post-test ($M = 5.63$, $SD = 1.82$); $t(154) = .24$, $p = .46$, $d = .01$. As mentioned above, this statement presumes that respondents would dispose of cans the same way they would dispose of bottles. This may have had an impact on the item scores. The second item, which was also reverse coded so that a higher score would be consistent with environmentally responsible behavior, assessed attitudes toward water conservation: *I would rather leave the water running*

when I brush my teeth than shut it off. This item approached significance from pretest ($M = 6.42$, $SD = 1.21$) to post-test ($M = 6.19$, $SD = 1.64$); $t(154) = 1.74$, $p = .04$, $d = .16$, but the change was in the opposite direction than was hypothesized. The third item addressed energy conservation: *I'd rather turn off the lights than leave them on when I leave a room.* The energy conservation item demonstrated a significant change from pretest ($M = 5.64$, $SD = 2.12$) to post-test ($M = 6.20$, $SD = 1.76$); $t(153) = -3.01$, $p < .01$, $d = .29$ with a small effect size. A comparison of the post-test scores indicates a near significant difference in the treatment ($M = 6.20$, $SD = 1.76$) and control groups ($M = 5.60$, $SD = 1.88$); $t(226) = 2.23$, $p < .05$, $d = .30$. The fourth item related to discussion of environmental topics: *I'd rather talk with my friends and family about the environment.* No changes were found from pretest ($M = 5.10$, $SD = 1.57$) to post-test ($M = 5.10$, $SD = 1.62$); $t(155) = -.05$, $p = .48$, $d = 0$. Similar to attitude toward recycling, this item is “double-barreled,” forcing respondents to give the same answer for both friends and family. This is a limitation in the study. The fifth and final item assessed food consumption: *I'd rather fill up my plate than only put as much food on as I know I can eat.* (This item was also reverse coded). ($M = 4.93$, $SD = 2.02$) to post-test ($M = 4.64$, $SD = 2.33$); $t(155) = 1.48$, $p = .07$, $d = .13$. None of the control group items were significantly different from pretest to post-test. Overall, Outdoor School did not seem to affect attitudes toward environmental stewardship as measured by this instrument. Though the program had an impact on energy usage, the strength of the relationship was relatively weak. The need to reverse code three of the five items may have also confused some participants.

Outdoor Play Behavior

H₆: Participants in Outdoor School will demonstrate significant, positive increases in scores of outdoor play behavior as measured on pretest and post-test assessments.

The final two indexed comparisons examined changes in behavior. Outdoor play behavior was measured with a four-item scale. Significant differences were found between the pretest ($M = 5.60, SD = 1.25$) and post-test ($M = 5.97, SD = 1.21$) conditions; $t(155) = -4.30, p < .001, d = .30$. The control group showed no significant differences from pretest ($M = 5.59, SD = 1.31$) to post-test ($M = 5.78, SD = 1.31$); $t(71) = -1.61, p = .06, d = .15$. The results indicated that outdoor play behaviors increase significantly after participation in Outdoor School in support of Hypothesis 6. However, it is important to note that there is no significant difference between the outdoor play behavior post-test scores of the treatment and control groups. Outdoor School's goal of eliciting behaviors that lead to increased outdoor play appear to have some merit; however, while statistically significant, the strength of the relationship ($d = .30$) was modest. In light of the similarity in post-test scores between those who attended Outdoor School and those who did not, this change must be viewed with caution.

Environmental Stewardship Behavior

H₇: Participants in Outdoor School will demonstrate significant, positive increases in scores of environmental stewardship behavior as measured on pretest and post-test assessments.

Environmental stewardship behavior was measured with a five-item scale. Significant differences were found between pretest ($M = 5.35, SD = 1.08$) and post-test ($M = 5.78, SD = 1.02$) assessments; $t(155) = -5.95, p < .001, d = .41$. The control group showed no significant differences in environmental behaviors from pretest ($M = 5.47, SD = 1.08$) to post-test ($M = 5.60, SD = 1.10$); $t(71) = -1.43, p = .08, d = .12$. Therefore, support was found for Hypothesis 7. Participants engaged in more environmentally responsible behaviors after participation in the program than they did prior to attending Outdoor School. Similar to outdoor play behavior, however, no significant difference was found between the post-test scores of the treatment and control groups. In light of this, support for Hypothesis 7 should be viewed with caution.

In conclusion, the evaluation results for Outdoor School were mixed. Significant changes from pretest to post-test were seen in ecological knowledge, connection to nature, outdoor play behavior, and environmental stewardship behavior. Because there was no difference in the post-test scores on the two behavior items, attributing change to the program may be hasty. The program failed to demonstrate an impact on school belonging, outdoor play attitudes, and four of five environmental stewardship attitude items as measured in this evaluation study. Table 4-9 provides evaluation scores for each of the constructs tested to demonstrate changes from pretest to post-test. Table 4-10 shows a comparison pretest and post-test scores between the treatment and control groups.

Table 4-9. Comparison of pretest and post-test evaluation scores.

	# of items	Sample	N	Pre-Experience		Post-Experience		t	df	p	Cohen's d
				M	SD	M	SD				
Ecological Knowledge	10	Treatment	156	5.81	1.69	6.92	1.77	-7.71	155	<.001	.64
		Control	72	5.26	2.05	5.53	2.10	-1.50	71	.138	.13
Nature Connection	10	Treatment	156	5.76	.89	6.01	.96	-4.03	155	<.001	.27
		Control	72	5.67	1.05	5.66	1.12	.10	71	.46	.01
School Belonging	4	Treatment	156	5.00	1.29	5.13	1.11	-1.08	155	.14	.11
		Control	72	4.95	1.26	5.13	1.33	-.50	71	.07	.14
Play Attitude	4	Treatment	156	5.82	1.18	5.74	1.18	1.07	155	.14	.07
		Control	72	5.09	1.19	5.29	1.16	-2.09	71	.02	.17
Stewardship Attitude (recycling)	1	Treatment	156	5.65	1.98	5.63	1.82	.24	155	.46	.01
		Control	71	5.70	1.77	5.23	1.94	1.82	70	.07	.23
Stewardship Attitude (water)	1	Treatment	156	6.42	1.21	6.19	1.64	1.74	155	.04	.16
		Control	72	6.01	1.50	5.74	1.40	1.61	71	.11	.19
Stewardship Attitude (energy)	1	Treatment	156	5.64	2.12	6.20	1.76	-3.01	155	<.01	.29
		Control	71	5.08	2.35	5.59	1.89	-1.52	70	.13	.24
Stewardship Attitude (talking)	1	Treatment	156	5.10	1.57	5.10	1.62	-.05	155	.48	.00
		Control	72	4.61	1.71	4.40	1.76	1.00	71	.32	.12
Stewardship Attitude (food)	1	Treatment	156	4.93	2.02	4.64	2.33	1.48	155	.07	.13
		control	70	4.29	2.06	4.40	1.88	-.41	69	.69	.06
Play Behavior	4	Treatment	156	5.60	1.25	5.97	1.21	-4.30	155	<.001	.30
		control	72	5.59	1.31	5.78	1.31	-1.61	71	.11	.15
Stewardship Behavior	5	Treatment	156	5.35	1.08	5.78	1.02	-5.95	155	<.001	.41
		control	72	5.47	1.08	5.60	1.10	-1.43	71	.16	.12

Table 4-10. Comparison of control and treatment group evaluation scores.

	# of items	Sample	<i>N</i>	Treatment		Control		<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
				<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Ecological Knowledge	10	Pre-Experience		5.81	1.69	5.26	2.05	2.11	226	.04	.28
		Post-Experience		6.92	1.77	5.53	2.10	5.22	226	<.01*	.69
Nature Connection	10	Pre-Experience		5.76	.89	5.67	1.05	.73	226	.47	.10
		Post-Experience		6.01	.96	5.66	1.12	2.46	226	.01*	.33
School Belonging	3	Pre-Experience		5.00	1.29	4.95	1.26	.26	226	.80	.03
		Post-Experience		5.13	1.11	5.13	1.33	-.01	226	.99	.01
Play Attitude	4	Pre-Experience		5.82	1.18	5.09	1.19	4.33	226	<.01*	.58
		Post-Experience		5.74	1.18	5.29	1.16	2.66	226	<.01*	.35
Stewardship Attitude (recycling)	1	Pre-Experience		5.65	1.97	5.70	1.77	-.18	225	.85	.02
		Post-Experience		5.63	1.82	5.24	1.93	1.50	225	.14	.20
Stewardship Attitude (water)	1	Pre-Experience		6.42	1.21	6.01	1.50	2.18	225	.03	.29
		Post-Experience		6.18	1.64	5.74	1.40	1.99	225	.05	.26
Stewardship Attitude (energy)	1	Pre-Experience		5.64	2.12	5.08	2.35	1.75	223	.08	.23
		Post-Experience		6.17	1.78	5.60	1.88	2.23	223	.03	.30
Stewardship Attitude (talking)	1	Pre-Experience		5.10	1.57	4.61	1.71	2.11	226	.04	.28
		Post-Experience		5.10	1.62	4.40	1.76	2.96	226	<.01*	.39
Stewardship Attitude (food)	1	Pre-Experience		4.93	2.02	4.32	2.07	2.08	225	.04	.28
		Post-Experience		4.63	2.33	4.42	1.88	.67	225	.50	.09
Play Behavior	4	Pre-Experience		5.60	1.25	5.59	1.31	.06	226	.95	.01
		Post-Experience		5.97	1.21	5.78	1.31	1.07	226	.28	.14
Stewardship Behavior	5	Pre-Experience		5.35	1.08	5.47	1.08	-.78	226	.44	.10
		Post-Experience		5.78	1.02	5.60	1.10	1.20	226	.23	.16

Testing the Behavioral Models

While knowing whether or not a program is effective at meeting its goals is important from a practical point of view, understanding why participants perform a behavior is interesting from a theoretical perspective. There is an emerging body of research on the decrease in children's outdoor experiences; however, there remains a lack of information regarding what increases outdoor play or environmentally responsible behaviors in the lives of children. This study examined the influences of both outdoor play and environmental stewardship behaviors using the Theory of Planned Behavior to guide the investigations. Path analysis, which allows researchers to examine the strengths of direct and indirect relationships, including mediated paths (Kline, 2005), was used to assess the predictors and consequences of the two behaviors of interest.

Reliability Analysis of Theory-Testing Constructs

Scale reliabilities of the study constructs pertinent to the theory testing were assessed by analyzing their internal consistency using Cronbach's alpha coefficient. Internal consistency was measured using the post-test scores from only the treatment group (n=156). All of the constructs in the outdoor play model had adequate to good reliability ($\alpha = .62$ to $.88$); however, multiple constructs in the environmental stewardship model did not demonstrate adequate reliability. Reliabilities of some of the constructs—children's connection to nature, outdoor play attitude, environmental stewardship

attitude, outdoor play behavior, and environmental stewardship behavior—were described previously in the evaluation section of this chapter. The reliabilities of the remaining theory-testing constructs are described below. The reliability coefficients of all of the constructs used in the model testing are shown in Table 4-14.

Norms

Subjective norms describe the participants' perceptions of significant others' beliefs toward the performance object. The Outdoor Play Norms Scale consisted of four items ($\alpha = .72$) and focused on the perceived norms of family and friends concerning outdoor play, time spent outside, and exploring nature. The overall ratings of outdoor play norms were clustered around the high end of the scale. The mean of the lowest rated item, *The people I live with spend time outside* ($M = 5.74$, $SD = 1.50$) was quite close to the mean of the highest rated item, *The people I live with think spending time outside is important* ($M = 6.19$, $SD = 1.19$).

The Environmental Stewardship Norms Scale consisted of five items and displayed adequate reliability ($\alpha = .75$); however, one item, *The people I live with think it is important to put only as much food on my plate as I think I can eat*, had a very low item-total correlation indicating that it was not a good fit with the rest of the items. Removing this item improved the scale reliability ($\alpha = .77$). The scale addressed the social norms of friends and family related to picking up trash, discussing the environment, conserving water, and recycling. Table 4-11 presents the reliabilities for both subjective norms scales.

Perceived Behavioral Control

Perceived behavioral control describes an individual's perception of the ease or difficulty of performing a behavior (Ajzen, 1992). The Outdoor Play Perceived Behavioral Control Scale (Table 4-12) consisted of four items with borderline acceptable reliability ($\alpha = .62$) and low item-total correlations. The scale attempted to capture participants' perceived ease or difficulty of playing in the outdoors. The most-highly rated item, *I am allowed to play outdoors when I am at home* ($M = 6.81$, $SD = .65$), had a mean near the extreme end of the seven-point scale. The lowest rated item was *I can be outdoors on most days, even if it is hot, cold, or raining* ($M = 5.90$, $SD = 1.37$).

The five-item Environmental Stewardship Perceived Behavioral Control Scale demonstrated inadequate scale reliability ($\alpha = .58$) and very low item total correlations. This scale attempted to capture the participants' perception of their ability to perform actions consistent with environmental stewardship. Those acts, which were drawn from the literature on environmentally responsible behavior (Hungerford & Volk, 1990; Sivek & Hungerford, 1989; Smith-Sebasto & D'Costa, 1995), included recycling, taking shorter showers, talking about the environment, conserving food, and throwing away trash. In light of the low reliability, this scale was not used in the model testing portion of this study.

Behavioral Intentions

Behavioral intentions (Table 4-13) indicate a person's willingness to perform a specific action. The Outdoor Play Intentions Scale consisted of four items measuring

participants' readiness to play outdoors, to explore nature, and to go outside regardless of the weather in the next week. This scale demonstrated adequate reliability ($\alpha = .65$). Two of the play items, *In the next week I will play outside with my friends* ($M = 6.37, SD = .87$) and *In the next week I will spend time outside even when I could be playing video games or watching TV* ($M = 6.28, SD = 1.21$), were rated much higher than the rest, *In the next week I will go outdoors even if the weather isn't great* ($M = 5.50; SD = 1.59$) and *In the next week I will explore in a natural area* ($M = 5.50; SD = 1.59$).

The Environmental Stewardship Intentions Scale consisted of five items ($\alpha = .61$) measuring participants willingness to participate in environmentally responsible behaviors in the next week. The scale measured participants' willingness to conserve water, turn out lights, recycle, talk about the environment, and pick up litter. Both reducing water usage when taking a shower ($M = 6.73, SD = .60$) and turning out lights when leaving a room ($M = 6.55, SD = .98$) were rated very highly. Willingness to talk about the environment, however, was much lower ($M = 4.85, SD = 1.63$).

Table 4-11. Reliability analysis of Norms (post-test only)

Survey Item	M	SD	ItemTotal Correlation	Alpha If Item Deleted	Cronbach's Alpha
Outdoor Play Norms (n=153)					.72
The people I live with spend time outside together	5.74	1.50	.54	.64	
My friends and I like to explore nature together	6.02	1.30	.44	.69	
People who care about me encourage me to play outdoors	6.15	1.26	.56	.62	
The people I live with think spending time outside is important	6.18	1.19	.50	.50	
Environmental Stewardship Norms (n=155)					.77
My friends think it is important to pick up trash when it is lying on the ground	5.66	1.56	.63	.67	
The people I live with think it is important to talk about the environment	4.80	1.74	.58	.71	
People who care about me think it is important to recycle	5.74	1.51	.67	.65	
The people I live with think it is important for me to shut off the faucet when I brush my teeth	6.38	1.13	.42	.78	

Table 4-12. Reliability analysis of Perceived Behavioral Control (post-test only)

Survey Item	M	SD	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Outdoor Play Perceived Behavioral Control (n=154)					.62
I am allowed to play outdoors when I am at home	6.81	.66	.48	.56	
There are places for my friends and me to play outdoors near home (fields, playgrounds, etc.)	6.38	1.29	.38	.57	
The people I live with take me places I can be outdoors	6.28	1.19	.47	.50	
I can be outdoors on most days, even if it is hot, cold, or raining	5.90	1.37	.38	.58	
Environmental Stewardship Perceived Behavioral Control (n=151)					.58
It is easy for me to recycle at home	5.47	1.73	.32	.53	
I can take a shorter shower to save water if I wanted to	6.37	1.43	.24	.57	
I know how to talk with my family about the environment	5.28	1.77	.54	.39	
I am the one who puts my food on the plate when I get a meal	5.67	1.83	.26	.57	
I know what to do with trash when I find it	6.52	1.08	.38	.52	

Table 4-13. Reliability analysis of Behavioral Intentions

Survey Item	M	SD	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Outdoor Play Behavioral Intentions (n=154)					.65
In the next week I will spend time outside even when I could be playing video games or watching TV	6.28	1.21	.44	.58	
In the next week I will play outside with my friends	6.36	.87	.39	.63	
In the next week I will explore in a natural area	5.66	1.37	.54	.51	
In the next week I will go outdoors even if the weather isn't great	5.50	1.60	.43	.61	
Environmental Stewardship Behavioral Intentions (n=154)					.61
In the next week I will turn off the water when I brush my teeth	6.74	.60	.40	.58	
In the next week I will recycle items at home	5.87	1.33	.31	.59	
In the next week I will turn off the lights when I leave a room	6.55	.98	.31	.59	
In the next week I will talk with my family about the environment	4.86	1.63	.49	.49	
In the next week I will pick up trash that is lying on the ground	6.01	1.24	.44	.52	

Table 4-14. Reliability coefficients of post-test TPB constructs.

Scale	# of items in Scale	Internal Consistency (Cronbach's α)	n
Nature Connection	9	.883	156
Outdoor Play Attitude	4	.763	154
Stewardship Attitude	5	.484	155
Outdoor Play Social Norms	4	.718	153
Stewardship Social Norms	4	.766	155
Outdoor Play PBC	4	.621	154
Stewardship PBC	5	.577	151
Outdoor Play Intentions	4	.653	154
Stewardship Intentions	5	.613	154
Outdoor Play Behavior	4	.757	153
Stewardship Behavior	5	.658	156

Correlations of Measured Variables in Outdoor Play Path Model

Six variables were used in the model predicting outdoor play behavior: children's connection to nature, outdoor play attitudes, outdoor play norms, outdoor play perceived behavioral control, outdoor play intentions, and outdoor play behavior. Correlation coefficients were computed among the six variables using SPSS 18.0. The Pearson correlation coefficient measures the strength of the relationship between variables. The values of the Pearson correlation coefficient range from -1 to 1; a larger absolute value indicates a stronger relationship (Vaske, 2008). The correlation matrix for the measured variables is presented in Table 4-14. Means and standard deviations are also provided. Using Vaske (2008) as a guideline, the strength of the correlations was considered

moderate. The strongest correlation was between perceived behavioral control and outdoor play norms ($r = .64, p < .001$), closely followed by the relationship between intentions and behaviors ($r = .59, p < .001$). The weakest correlation was found between children's connection to nature and play intentions ($r = .40, p < .001$); however, this correlation was still significant. Table 4-15 suggests that increases in any one of the variables corresponded to increases in the others. The correlation sizes are moderate and do not indicate multicollinearity (Vaske, 2008).

Testing a Model of Outdoor Play Using the Theory of Planned Behavior

H₈: There is a positive relationship between connection to nature, outdoor play attitudes, outdoor play subjective norms, outdoor play perceived behavioral control, outdoor play intentions and outdoor play behaviors.

The objective of the outdoor play path analysis was to examine the relationship between connection to nature, attitudes, norms, perceived behavioral control, intentions and behaviors as they relate to outdoor play behavior. Post-test scores from participants in the treatment group were utilized to test the hypothesized model. In an attempt to match intention to engage in outdoor activity with actual (self-reported) outdoor play performance, measurement of behavioral intentions and actual behavior were separated by two weeks. The antecedent constructs—attitude, norms, and perceived behavioral control—were measured concurrently with behavior.

Table 4-15. Correlations between Children's Connection to Nature, Attitude, Norms, Perceived Behavioral Control, Intentions, and Behaviors of Outdoor Play (N=156)

	Connection to Nature	Outdoor Play Attitude	Outdoor Play Norms	Outdoor Play PBC	Outdoor Play Intentions	Outdoor Play Behavior
Connection to Nature	1					
Outdoor Play Attitude	.47	1				
Outdoor Play Norms	.55	.48	1			
Outdoor Play PBC	.48	.41	.64	1		
Outdoor Play Intention	.40	.49	.47	.48	1	
Outdoor Play Behavior	.58	.53	.54	.56	.59	1
Mean	6.01	5.74	6.03	6.34	5.95	5.97
<i>SD</i>	.96	1.18	.96	.79	.90	1.21

* All correlations are significant at the .01 level (two-tailed).

The model depicted in Figure 4-1 was tested as the baseline structural model. Six cases were removed from the data set because they were multivariate outliers as indicated by Mahalanobis distance (Tabachnick & Fidell, 2007). All of the paths in the proposed model were significant, except for the path from subjective norms to outdoor play intentions. Therefore, this path was removed from the model. At the same time the modification index indicated a direct path from nature connection to outdoor play behavior. When the path was added, the direct effect was significant ($p < .001$). Next a direct path from outdoor play norms to outdoor play attitude was added per the modification index. The respecified model had good fit in all areas except RMSEA

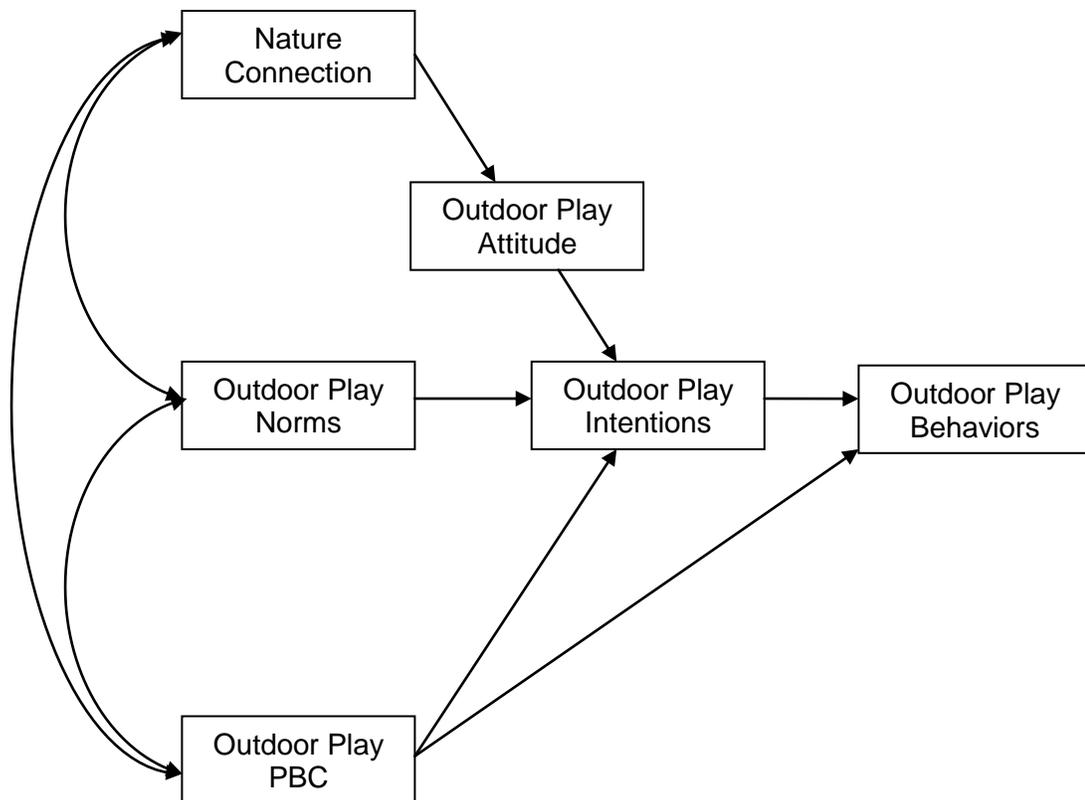


Figure 4-1. Hypothesized model of outdoor play behavior adapted from the Theory of Planned Behavior.

(Kline, 2005): $\chi^2 = 12.5$, $df = 5$, $CMIN/df = 2.51$, $CFI = .98$, $GFI = .97$, $RMSEA = .10$
(90% CI: .030, .172), $SRMR = .05$.

The model shown in Figure 4-2 accounted for 45% of the variance in outdoor play behavior. Outdoor play intention was the most significant predictor ($\beta = .44$, $p < .001$), followed by nature connection ($\beta = .26$, $p < .001$), and outdoor play perceived behavioral control ($\beta = .18$, $p < .01$). Outdoor play attitude ($\beta = .32$, $p < .01$) and outdoor play perceived behavioral control ($\beta = .39$, $p < .01$) explained 32% of the variance in outdoor play intention. Outdoor play norms ($\beta = .25$, $p < .01$) and nature connection ($\beta = .29$, $p < .01$) explained 22% of the variance in outdoor play attitudes.

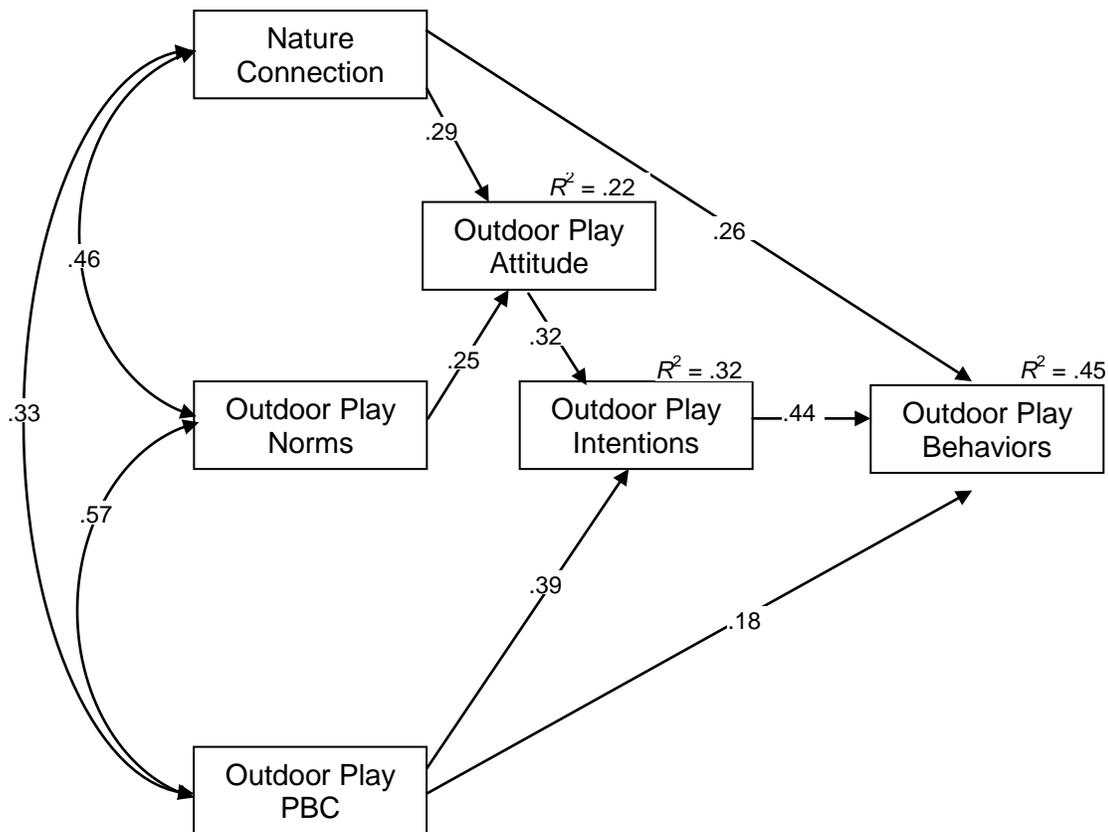


Figure 4-2. Final model of outdoor play behavior.

Testing a Model of Environmental Stewardship Using the Theory of Planned Behavior

H₉: There is a positive relationship between connection to nature, environmental stewardship attitudes, environmental stewardship social norms, environmental stewardship perceived behavioral control, environmental stewardship intentions and environmental stewardship behaviors (see Figure 1-2).

For environmental stewardship behavior, intention to engage in environmental stewardship was modeled as a mediator between the antecedent variables (environmental stewardship attitudes, environmental stewardship social norms, and environmental stewardship perceived behavioral control) and environmental stewardship behavior. Connection to nature was added as a predictor of stewardship attitudes. A direct path was added from perceived behavioral control to behavior, per the suggestion of Ajzen (1991), the originator of the Theory of Planned Behavior. In cases where perceived behavioral control is similar to actual behavioral control, it can be used to predict behavior (Ajzen, 1991).

Because multiple scales demonstrated inadequate reliability based on low Cronbach's alpha coefficients (i.e., Environmental Stewardship Attitude: $\alpha = .48$; Environmental Stewardship PBC: $.58$), the path analysis of the environmental stewardship model was not tested. The items in each of the scales measure actions participants can take to exhibit environmentally responsible behaviors, such as recycling, conserving water, talking about the environment, and properly disposing of trash. While

these items have practical similarity, attitudes and perceived behavioral control toward carrying out these attitudes were not consistent. Single-item indicators were not tested in place of the unreliable scales (i.e., *It is easy for me to recycle at home*), because the items were not comprehensive, but rather were specific to actions taken. Implications for addressing this issue in future studies are addressed in Chapter 5.

Examining the Influence of Outdoor Play and Connection to Nature on Environmental Stewardship

In this section, the influence of outdoor play on environmental stewardship behavior is examined. Direct experience with the natural world has been associated with the development of environmental values (Chawla, 2006). Whether or not bringing children outdoors leads to nature connection, and whether nature connection leads to environmental stewardship is in need of examination. The mediation model tested in this study is an attempt to clarify the relationship between play, stewardship, and nature connection.

Correlations Between Connection to Nature, Outdoor Play, and Environmental Stewardship

In order to test for multicollinearity of the three constructs, correlation coefficients were computed among outdoor play behavior, environmental stewardship behavior, and nature connection using PASW 18.0. The results of the correlation analysis presented in Table 4-16 show that each of the three relationships was statistically

significant. The strongest correlation was between nature connection and environmental stewardship ($r = .518, p < .001$), closely followed by the relationship between outdoor play and environmental stewardship ($r = .439, p < .001$). In addition, a moderate-to-strong correlation was found between connection to nature and outdoor play ($r = .427, p < .001$).

Table 4-16. Correlations between Children's Connection to Nature, Outdoor Play, and Environmental Stewardship (N=218)

	Nature Connection	Outdoor Play	Environmental Stewardship
Nature Connection	1		
Outdoor Play	.43*	1	
Environmental Stewardship	.52*	.44*	1
Means	5.79	5.76	5.45
<i>SD</i>	.88	1.03	1.04

* Correlation is significant at the .01 level (two-tailed).

Table 4-16 suggests that increases in any one of the variables correspond to increases in the others. As feelings of connection to nature increase, the likelihood of engaging in outdoor activity and performing in stewardship behaviors also increase.

Examining Nature Connection as a Mediator in the Relationship Between Outdoor Play and Environmental Stewardship

H₁₀: Nature connection will mediate the effect between outdoor play and environmental stewardship behaviors (see Figure 1-3).

A predictive model was created to examine the influence of outdoor play and nature connection on environmental stewardship. Based on significant life experience research (Chawla, 1999) and outdoor recreation literature (Palmberg & Kuru, 2000), outdoor play is hypothesized to predict connection to nature. Connection to nature, in turn, is predicted to influence environmental stewardship. Nature connection, therefore, mediates the relationship between outdoor play and environmental stewardship. In order to remove the bias that the Outdoor School program may have had on the results of this test, pretest scores from both treatment and control participants were used. Ten cases were removed from the data set because they were multivariate outliers as indicated by Mahalanobis distance (Tabachnick & Fidell, 2007), leaving a total of 218 participants.

Table 4-16 presents the results of the mediation analysis. Step 1 demonstrated a significant direct effect ($\beta = .44, p < .01$) from the independent variable (outdoor play behavior) to the dependent variable (environmental stewardship behavior). Step 2 showed a significant effect ($\beta = .43, p < .01$) from the independent variable (outdoor play) to the mediating variable (nature connection). Finally, step 3 tested the full model and demonstrated a significant effect ($\beta = .40, p < .01$) from the mediator variable (nature connection) to the criterion variable (environmental stewardship), as well as a reduced, though significant effect ($\beta = .27, p < .01$) from the predictor variable (outdoor play) to the criterion variable (environmental stewardship). Therefore, for this group of fifth grade

students, connection to nature partially mediates the relationship between outdoor play and environmental stewardship. The mediation model is illustrated in Figure 4-3.

The amount of mediation, or the indirect effect, was found by subtracting the coefficient of the independent variable on the dependent variable in the mediation model from the coefficient of the direct effect (in this case $.44 - .27 = .17$). Using Preacher's (2010) interactive calculator for the Sobel test, the indirect effect was found to be significant ($z = 4.74$, $SE = .04$, $p < .001$). Overall, nature connection and outdoor play explain 32% of the variance in environmental stewardship behavior.

Table 4-17. Mediation analysis.

	B	SE	B
Step 1. DV: Environmental Stewardship			
IV: Outdoor Play	.44	.06	.44
Step 2. DV: Nature Connection			
IV: Outdoor Play	.37	.05	.43
Step 3. DV: Environmental Stewardship			
IV: Outdoor Play	.27	.06	.27
MV: Nature Connection	.48	.07	.40

DV Dependent Variable; IV = Independent Variable; MV = Mediating Variable

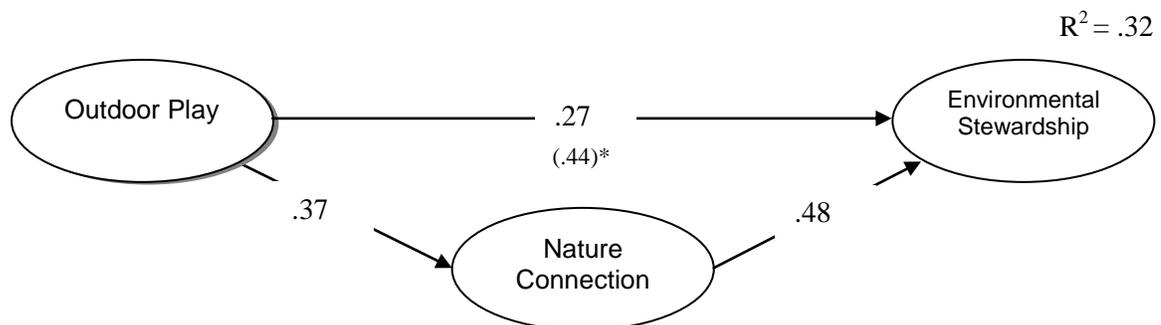


Figure 4-3. Model of nature connection mediation analysis.

* The beta coefficient within parentheses represents the direct effect (β) of outdoor play on environmental stewardship without the mediator present.

Chapter 5

Summary and Conclusions

This chapter discusses the implications of findings for residential environmental education programming and for future research. There were three distinct purposes of this study. The first purpose was to examine the short-term outcomes of a residential environmental education program on knowledge, connection to nature, school belonging, attitudes, and behaviors. The second purpose was to predict behavior using a modification the Theory of Planned Behavior that included nature connection as a distal predictor. The last purpose was to explore the relationship between outdoor play, environmental stewardship, and connection to nature.

Evaluation Measurement and Discussion

This evaluation was designed to examine changes in Outdoor School participants. Using pertinent literature, existing scales, and stakeholder input, the survey instrument was created to examine differences in knowledge, affect, attitudes, and behaviors from pretest to post-test. Dependent samples *t*-tests were run using PASW 18.0 on six indexed variables: ecological knowledge, connection to nature, school belonging, outdoor play attitude, outdoor play behaviors, and stewardship behaviors. Additionally, a dependent *t*-test was run on the five items associated with environmental stewardship attitude. This

section will discuss the measurement of the evaluation constructs as well as the implications from the results of the dependent samples analyses.

Ecological Knowledge

Consistent with previous studies (AIR, 2005; Chenery & Hammerman, 1985; Dettman-Easler & Pease, 1999; Kieffer, 1992; Stern et al., 2008), results from this study indicate that the Outdoor School experience leads to improved environmental knowledge. Five multiple choice and five true/false items measured the participants' knowledge of Pennsylvania environment and ecology. The post-test assessment of ecological knowledge occurred one week after the last day of the participants' Outdoor School experience. The treatment group demonstrated a 19.2% increase in measures of ecological knowledge from pretest to post-test. This was a significant change both statistically and practically, supporting Hypothesis 1, that Outdoor School would have a significant, positive impact on knowledge scores. The control group scores did not significantly increase on either the summated scale or on any of the individual item scores, indicating that it was the program rather than another factor that made the difference in the change.

Like all education programs, improving knowledge is a primary goal of Outdoor School. Because the ecological knowledge index tested core concepts aligned with the Pennsylvania Environment and Ecology standards, there is evidence that Outdoor School increased understanding of school-based curricula. This finding has positive implications for Outdoor School. Being able to demonstrate to teachers, parents, and school

administrators that the program positively affected students' understanding of concepts aligned with state standards is a powerful tool for recruitment and retention. Schools that see evidence of filling their Environment and Ecology curricular requirements would be more likely to re-enroll in the program.

The most dramatic increase in knowledge came from the question with the lowest baseline score. About one-fifth of the participants knew that eastern screech owls were capable of turning their heads 270 degrees prior to the program at pretest. At the post-test, 60% answered correctly, an increase of 160.9% from the original score. Animal adaptations are one of the four themes taught during the week. To highlight the adaptations, the learning group leaders interpret the adaptive characteristics of live animals brought from Shaver's Creek Environmental Center. Participants are brought into close proximity to snakes, turtles, frogs, and birds of prey and are allowed modest interaction with the animals. It is unclear whether it was the experiential teaching methods, the inquiry-based educational style of the leaders, or another component that led to the retention of knowledge concerning screech owls. What is certain is that nearly three times as many participants were able to accurately identify the correct answer after completion of the program. Future studies should examine the impact of different teaching methods on educational outcomes.

The "cycles" component of the Outdoor School curriculum focuses much of its time on reaching goals under section 4.2 of the Environment and Ecology Standards, Watersheds and Wetlands. According to Pennsylvania Department of Education Academic Standard for Environment and Ecology 4.2.5A, fifth grade students should have the skills and knowledge required to explain the water cycle. However, only 23% of

participants could identify condensation on a water cycle diagram during the pretest assessment. At post-test 46% of the participants were able to correctly recognize condensation. This represented a 100% increase from pretest to post-test. Though this demonstrates a certain level of programmatic success, one must consider that less than half of the participants were able to correctly categorize condensation, a fundamental element in the water cycle, after the program. Other significant increases were seen in understanding concepts related to the soil cycle (a 30.2% increase from pretest to post-test) and photosynthesis (18.6 % increase).

Future studies should consider a process evaluation of the program to determine what topics and methods are leading to the largest improvement in knowledge retention. This type of evaluation, which may be done on its own or in conjunction with an outcomes-based evaluation, examines the operations and activities of the program to determine how consistently program components are delivered, how resources are utilized, and whether the program is implemented as designed (Rossi, Lipsey, & Freeman, 2004). According to Rossi et al. (2004), the information from an outcomes-based assessment is incomplete without information on the program delivery that produced the results.

For the most part, items that did not see significant increases had baseline measurements of 70% or higher. These higher pretest scores made it less likely that participants would demonstrate significantly increased scores; however, there was room for improvement. It would be unwise to view these non-significant results as without value; indeed, Outdoor School stakeholders can learn from them. Being able to recognize that oceans contain the majority of the water in the world, for example, is a skill that

Pennsylvania elementary school children should have prior to fifth grade, yet about half believed that rivers contain the majority of the earth's water. Although this concept is covered in the Cycles component of the Outdoor School curriculum, the participants' scores did not significantly differ at post-test. Perhaps a perceived lack of personal experience with this topic influenced the results. It would be interesting to examine whether students from a coastal environment have a better understanding of oceans. Studying this program element further could reveal the cause for this gap in program goals and program outcomes.

From its beginnings in the 1960s and 1970s, increasing citizens' environmental knowledge has been one of the primary goals of environmental education (Stapp et al., 1969; UNESCO/UNEP, 1976). An understanding of the interrelationships found in the natural world—and by extension in the built environment—underpins ecological literacy (Orr, 1994) and is fundamental to developing an ethic of care toward the land and its species (Martin, 1999; Nabhan & Trimble, 1994). Recent reports point to an alarming reduction in children's knowledge of the natural world (Louv, 2005; Kellert, 2002). Today's children know cartoon characters better than the species in their back yards (Balmford et al., 2002) and even parents who want to let their children roam freely do not allow them to do so (Clements, 2004). Outdoor School programs provide an opportunity to learn from direct exposure to the local environment in an educational setting.

More research is needed to examine whether or not the short-term effects are consistent over time. This study had only one post-test administration of ecological knowledge variables. Future knowledge-based evaluations should include longitudinal assessments to measure the long-range impacts of the program. Research is also needed

to examine the role of knowledge in attitude and behavior related to environmental stewardship and outdoor play. Changes in knowledge and attitude are inadequate to explain changes in behavior fully (Marcinkowski, 2004); however, each has been identified as a key component to successful environmental education (UNESCO, 1978). Future studies should consider environmental knowledge as an independent variable to measure its effects on corresponding levels of attitude and behavior.

Children's Connection to Nature

Children's connection to nature demonstrated very good internal reliability at pretest ($\alpha = .84$). Having a scale that reliably measures children's connection to nature is an important step in recognizing the influence that a feeling of connectedness to nature has on attitudes and behaviors. In adults, nature connection has been correlated with a desire to protect the environment (Schultz, 2000) and to engage in environmentally responsible behaviors (Mayer & Frantz, 2004; Nisbet et al., 2008). An affective or belief-based measure such as this is important, because nature-protective behaviors are inadequately explained by rational, cognitive approaches (Kals et al., 1999; Pooley & O'Connor, 2000).

The highest-rated items on the pretest scale had to do with the importance of other life (*When I think of life on Earth, I think other species are just as important as humans*; $M = 6.14$, $SD = 1.18$) and nature as community (*The natural world is a community to which I belong*; $M = 6.12$, $SD = 1.20$). These two statements are connected by a cognitive process, namely thinking about other species and thinking about community. Contrast

that with the two lowest rated items: *I feel part of the natural world, like a tree in a forest* (M = 5.44, SD = 1.65) and *I feel like I am a part of the web of life* (M = 5.46, SD = 1.69). Both of these statements begin with “I feel” and ask the participants to place feeling at the forefront of their decision making process. The participants’ cognitive representation of nature—what they *think* of nature—includes an aspect of community; however, their affect—how much they *feel* that they are a part of nature or have a direct effect on natural processes—denotes less of this idea.

Whether or not the inclusion of the word “feel” truly captures an emotional perspective has been challenged. Perrin and Benassi (2009) contend that the Connectedness to Nature Scale (CNS) (from which the scale used in this survey was adapted) does not capture an emotional connection to nature, because the statements “are not internal, mental conditions with an affect focus” (p. 435). The authors contend that “I feel” statements in the CNS are more akin to beliefs and attitudes about nature (Perrin & Benassi, 2009). Whether or not the feeling statements denote emotion, they certainly go beyond cognitive assessment, moving into the range of beliefs and values, both of which have been linked with environmentally responsible behaviors (Stern, 2000).

The difference in the two highest and two lowest-rated items may also have to do with a construction of nature as something separate from humans. The items that were scored lowest both include the phrase “part of,” situating them within the natural system, rather than separate from it. Vining, Merrick, and Price (2008) found that although three-quarters of their sample felt that humans were a part of nature, nature was most often defined as absent from human interference. This apparent contradiction—being simultaneously a part of nature and separate from it—may be partially explained by the

increase in the amount of time children spend indoors. Children view humans as part of nature when thinking in abstract, intellectual terms, but their daily behaviors inside the home, at school, and engaged in electronic media support an understanding that people are actually separate from nature. Because interaction with the natural world is not a part of the daily routine, nature is considered “out there” and away from human artifacts (Haluzá-Delay, 2001).

The change demonstrated in the children’s connection to nature scale from pretest to post-test supported Hypothesis 2, which stated that the feeling of connectedness to nature would significantly increase after attending Outdoor School. The development of a positive bond with nature is an important finding for the Outdoor School program. A lack of exposure to the natural world reduces children’s opportunity to build a relationship with nature (Louv, 2005). According to Chawla (2006), exposure to nature with a mentor or significant adult (normally a parent or teacher) is hugely influential in later life: “When children have access to the natural world, and family members encourage them to explore it and give it close attention, they have a strong basis for interest in the environment” (p. 76). There is a gap between what parents want and what they feel they can responsibly allow in terms of free play, nature exploration (Clements, 2004). Outdoor School helps fill this gap by providing outdoor experiences in an educational environment with adult mentors. The role that a caring adult plays in the development of positive attitudes toward the environment cannot be overstated (Chawla, 2006; Wells & Lekies, 2006).

Nature connection is a relatively new construct in environmental literature. It has been operationalized by psychologists and sociologists most often as an affective attribute or belief, and has been utilized as an independent variable to predict

environmentally responsible behavior (Mayer & Frantz, 2004; Nisbet et al., 2008; Schultz, 2000). Using retrospective study designs, nature connection has also been positively associated with future environmental stewardship in the significant life experience literature (Chawla, 2006). The present study demonstrates Outdoor School's success in facilitating an increase in participants' perceived connection to nature. If nature connection is indeed a predictor of environmentally responsible behavior, and we as a society are truly concerned with the promotion of environmental stewardship, then Outdoor School's success in this area numbers among its most important achievements.

It is important to note how highly the participants rated their connection to nature prior to the program ($M = 5.76$, $SD = .89$). This indicates a relatively high feeling of overall connection at baseline, which runs counter to the prevailing notion that youth in the U.S. are disconnected from nature (Kellert, 2002; Louv, 2005). This may be an artifact of the relatively rural population from which the study sample was drawn. Future studies should draw from both rural and urban populations to control for this demographic attribute. We do not know if this level of reported connection is lower than previous generations (or even previous classes within the same generation), because we do not have any longitudinal data tracking nature connection. These measurements should be taken regularly, so researchers can track potential changes over time. We also cannot compare the levels of connectedness for those with more exposure to the outdoors than those with less. Future studies should incorporate an objective measure of outdoor experience to examine the relationship between time spent outdoors and level of nature connection. Louv (2005) speaks of a direct correlation between time outdoors and connection to nature, but empirical studies are needed to verify this conclusion.

School Belonging

During the information gathering phase of the survey, teachers repeatedly expressed that their students bonded at Outdoor School. The educators noted that this bond had a lasting, positive effect on their in-class interactions and led to a feeling of belonging within their schools. They noticed an improvement in their students' support of one another and changes in their interaction with their classroom instructors. A qualitative study of the Outdoor School program's impact on pre-service elementary school teachers also noted the bonding amongst participants (Hug, 1995). The program coordinators also were interested in knowing about the effects on the schools beyond traditional environmental education outcomes of knowledge, attitude, and behavior. Based on this information and conversations with Outdoor School program stakeholders, a school belonging scale was included in the evaluation.

School belonging was assessed with a reduced version of the School as Community Scale ($\beta = .80$) (Chi et al., 2006). This scale was used as one indicator of children's civic engagement and was found to be a reliable measure of children's judgment of the level of care, respect, and community in a school. The results of the paired samples *t*-test did not support the teachers' observation that Outdoor School increased their respect and care for one another as measured by the reduced School as Community Scale. Hypothesis 3, which stated that participants will significantly increase their feelings of school belonging was not supported. The items measuring caring and community were the least affected by the program. In contrast, even after adjusting the alpha level with a Bonferroni correction, the item measuring respect increased

significantly from pretest ($M = 4.64$, $SD = 1.71$) to post-test ($M = 5.00$, $SD = 1.44$), $p < .01$.

It is possible that Outdoor School has no effect on caring and community, but it is also plausible that these attributes take time to develop. School belonging was measured during the week following participation in Outdoor School. The level of caring that a particular student feels both toward and from his or her classmates may take a few weeks to occur. Likewise, an increase in feeling like an important part of the school may require time and experience. The lack of a delayed post-test means that these possible longer-term effects were not measured. In addition, the survey administration occurred during the last month of class in the students' final year of elementary school. Most of these students had a great deal of time to bond and come together. A bigger impact on school belonging would likely be seen on participants who attend Outdoor School in the fall, when the school year is relatively young.

Finally, the survey items used to measure school belonging may not have accurately measured the positive in-school interactions and inclusivity described by the teachers. Future research should include observation of classroom interactions and further discussion with the teachers to better understand the changes in student social behavior. This would also present the opportunity to observe how teachers extend the outdoor school experience in their home classrooms.

Outdoor Play Attitude

The overarching outcome that guided much of what the program coordinators sought to accomplish was a “positive outdoor experience.” This is a refrain that could be heard in conversation with prospective teachers, with new counselors and learning group leaders, and with the participants. The program coordinators made a conscious effort to provide time for students to enjoy themselves in the outdoors by creating free time activities, offering extracurricular hikes, and building solo journaling activities into each half-day lesson. One of the program coordinators stated that the best possible outcome of the program would be that participants chose to spend time outside because they developed a preference for outdoor activity while at Outdoor School. To attempt to capture the development of a predilection toward the outdoors, the Outdoor Play Attitude Scale was created. This scale measured participants’ level of preference for outdoor, nature-based activities over indoor activities. The attitude items assessed were designed to be consistent with the outdoor play behavior items discussed below.

Outdoor play attitudes were measured with four items consistent with those used in Stern et al.’s (2008) study of the residential EE program at the Great Smoky Mountains Institute at Tremont. The scale demonstrated adequate reliability ($\alpha = .74$). However, the participants’ attitudes toward outdoor play were not significantly different after the Outdoor School experience; therefore, support for Hypothesis 4 (i.e., that there would be a positive difference in scores from pretest to post-test) was not found.

There are some points to consider with this finding. Attitudes are influenced by what people know about the attitude object, what they feel, and their experience with the

attitude object in the past (Smith & Mackie, 2007). Both the treatment and control groups in this study exhibited rather high pretest means on the outdoor play attitude scale, indicating favorable attitudes at baseline. It is likely that previous outdoor play experiences led to positive attitudes toward outdoor play, which limited the likelihood of finding an effect. This finding is not without precedent. Dettman-Easler and Pease (1999) concluded that participants' initial positive attitudes toward wildlife prevented any change in attitude that could be attributed to the six programs they studied. Likewise, a previous study of Outdoor School (Kieffer, 1992) attributed the lack of change in attitude toward the outdoors from pretest to post-test to a high pretest mean. Bogner (1998) stated that the largest changes can be seen in those unfamiliar to the program or experience. Future studies should consider a less generalized outdoor attitude measure. A more program-specific attitude measure may be a better determinant of programmatic success.

Environmental Stewardship Attitude

Holding a positive attitude toward the performance of an environmentally responsible action is seen as a predictor of environmentally responsible behaviors (Ajzen, 1991; Newhouse, 1990). The items chosen to demonstrate environmental stewardship corresponded with the items in the Environmental Stewardship Behavior Scale. The attitude items asked participants to rate their level of preference toward performing five distinct actions that collectively demonstrate environmentally responsible behavior. The items in this scale were influenced by a variety of inventories, including the *Children's Attitudes Toward the Environment Scale (CATES)* (Musser & Malkus, 1994) and the

Children's Environmental Attitude and Knowledge Scale (CHEAKS) (Leeming, Dwyer, & Bracken, 1995), as well as from the environmental education literature on the use of attitudes to predict environmentally responsible behaviors (Kaiser, 1998; Sia, Hungerford, & Tomera, 1986; Smith-Sebasto & D'Costa, 1985).

Five topics were represented in the scale: recycling, water conservation, turning off the lights, talking about the environment, and food conservation. The age of the participants and their ability to perform the behavior that is the object of each attitude statement were considered during item construction. Three of the five items were asked in reverse order in which a higher score would indicate a less favorable attitude toward environmental stewardship (e.g., *I'd rather fill up my plate than only take as much food as I can eat*). The scale for environmental stewardship attitudes demonstrated poor reliability ($\alpha = .42$). Although each item was associated with preferences toward attributes of environmentally responsible behavior, they did not hold together as a consistent measure. Because there was not a reliable scale, the five items were analyzed for pre- and post-test differences individually.

There were inconsistencies in the findings, which may be explained by curriculum and behavior modeling. Two of the items, *I'd rather throw cans and bottles in the trash than recycle* and *I'd rather talk with my family and friends about the environment* demonstrated very little change from pretest to post-test. Although recycling and speaking about the environment undoubtedly enter into the week's conversations, neither topic was explicitly addressed in the program curriculum. Contrast the lack of change on those items with scores on *I'd rather turn off the lights than leave them on when I leave a room*, which significantly changed from pretest to post-test. Reducing energy is taught

experientially. Program coordinators, learning group leaders, and especially counselors with whom participants share a cabin model conservation behaviors for the students.

Ways to reduce the amount of water usage were also modeled by program leaders, especially during the morning and evening hygiene routines. Counselors demonstrated how to wash their faces and brush their teeth using a minimal amount of water, yet the program appeared to have no significant impact on water conservation. In fact, the mean went down between the two test administrations. The very high initial pretest mean of 6.42 out of 7.0 may explain the lack of change. The baseline mean was so close to the extreme that the likelihood of demonstrating change was remote.

For four of five items, no change was seen from pretest to post-test in attitudes toward environmental stewardship. Similar to outdoor play attitude, prior assessments of residential EE that found no change in attitudes toward the environment (Shepard & Speelman, 1985; Smith-Sebasto & Semrau, 2004). This may be attributable to experience with these ideas prior to Outdoor School. Bogner (1998) found that people with less previous exposure to environmental education had a greater amount of growth.

What is more likely, however, is that the outcomes reflect a shortage of programmatic attention to environmentally responsible behaviors. The curriculum focuses on natural and cultural history much more than conservation and stewardship. Understanding natural history and interrelationships by collecting invertebrates during the stream study imprints important and relevant information into the mind of the participant. This experience is often considered a highlight. However, there is no comparable technique to teach conservation or environmental stewardship. The closest is the town meeting, which educates the participants on the need to engage civically in their

community's decisions. Stewardship behaviors were consistently modeled by coordinators, educators, and counselors, making them an integral part of the programming; however, explicitly integrating environmentally responsible behaviors in the curriculum is a more pragmatic way to go about creating an environmentally literate population.

Outdoor Play Behaviors

Increasing the frequency of outdoor experiences and behaviors for youth is a fundamental goal of Outdoor School. Outdoor play behaviors were measured with four items that assessed outdoor and nature-based activities during the week prior to the survey administration. These items were linked with the outdoor play attitude items, which measured the preference for performing outdoor play behaviors. Similar to the attitude scale, the outdoor play behavior scale contained one global item (*In the last week I played outside with my friends*) and three specific behaviors.

In support of Hypothesis 6, there was a significant increase from pretest to post-test (which was administered four weeks after Outdoor School) in the outdoor play behavior scale. Looking item by item, the greatest change was found in the statement *In the last week I explored in a natural area*, which demonstrated a 14.0% increase from pretest to post-test. The other significant result was seen in the item *In the last week I spent time outside when I could have been playing video games or watching TV*. For this group of participants, the program increased their outdoor play, reversing the trend toward more indoor activity, at least in the short-term. Although there is no evidence that

the increase in outdoor play behavior will have a sustained effect, this short-term outcome is important. Today's youth are in an ever-increasing media-saturated culture (Rideout et al., 2010) which has been identified as a predictor of a reduction in time outdoors (Pergams & Zaradic, 2006). The indoor habits of children have also been linked with a host of maladies from attention deficit disorder to obesity (Louv, 2005).

The benefits of exposure to the outdoors are well established (see Kellert, 2002), and it is only through direct experience with the outdoors that a connection with nature may begin (Nabhan & Trimble, 1994). However, there has been a tendency in popular press to overstate the ability of outdoor play to cure what ails us as a society (Louv, 2005). Experience with nature is sometimes portrayed as a panacea for the social and environmental issues facing youth today. Despite this rhetoric, more research is needed to understand outdoor play's role in health promotion and environmental stewardship.

It is important to examine the timing of the survey administration in light of these results. The first test administration measured outdoor play in late April and early May, whereas the post-test that measured behavior for the second time occurred in late May and early June. It is logical to consider that warmer weather more conducive to outdoor activities may have contributed to the increase in outdoor play. However, we would then expect to see a similar trend for the control group, whose test administrations were also separated by four weeks. The control group did not demonstrate a significant increase on either the outdoor play behavior scale or on any of the items individually, indicating that the change could be attributed largely to the program.

Environmental Stewardship Behaviors

In addition to increasing outdoor play, Outdoor School aimed to create environmental stewards. The actions chosen to represent environmentally responsible behavior were informed both by the literature (Leeming, Dwyer, & Bracken, 1995; Sia, Hungerford, & Tomera, 1986) and by conversations with program stakeholders. Choosing items that represented behaviors consistent with environmental stewardship presented some challenges. It was important to be mindful of the limited locus of control 10 and 11 year olds have on their environmental behaviors. Smith-Sebasto and D'Costa (1995) created six groupings of environmental action: civic action, which included voting and participation in public meetings; educational action, which encompassed knowledge acquisition on environmental issues; financial action, including purchasing or boycotting of products; legal action or environmental law enforcement; physical action, such as picking up litter or recycling; and persuasive action, which include letter writing and speech making. For the Outdoor School study, only physical action and persuasion seemed to fall squarely within the range of abilities of the average 11-year-old participant. Elsewhere, Winther, Volk, and Hungerford (1994) categorized environmental action in four ways: persuasion, consumerism, political action, and ecomanagement. Of these, only ecomanagement—the physical actions taken on behalf of the environment—were considered appropriate to fifth graders.

Ultimately, five environmentally responsible actions—conserving water, recycling, turning off lights, talking with friends and family about the environment, and picking up litter—were aggregated as a composite of environmental stewardship. These

environmental stewardship items represented actions the fifth grade participant was capable of accomplishing. A composite index such as this is not without its critics (Kaiser, 1998). There is no general agreement on which items to include in the index, the items may not have unidimensionality, and the specific behaviors in the index are susceptible to various influences (Kaiser, 1998). Even so, the environmental stewardship scale demonstrated adequate reliability ($\alpha = .63$).

The environmental stewardship behavior items were assessed during the week prior to survey administration and again four weeks after the program. From pretest to post-test, participants significantly increased the frequency of environmentally responsible behaviors in partial support of Hypothesis 7. Although the treatment group scores increased by eight percent, no significant difference was found in a comparison of the treatment and control groups' post-test scores. Therefore the increase may be due to something shared between the groups, rather than the program itself. Although the program appears to have contributed to increasing environmental stewardship behaviors, Outdoor School's focus on nature study and ecology (rather than on environmental stewardship) may limit its effectiveness in this area. Environmental actions were modeled by various members of the staff, but a more intentional curricular approach would likely lead to greater increases in environmental stewardship behaviors and a greater difference in post-test scores.

Overall, the evaluation results demonstrated both success and challenge in Outdoor School's pursuit of its goals. The program was successful in its effort to increase participants' knowledge of the environment and ecology of Pennsylvania and to increase their feeling of connection to nature. Additionally, both outdoor play and environmental

stewardship increased after participation in the program. Three areas, however, demonstrated no change. Outdoor play and environmental stewardship attitudes were not affected by participation in Outdoor School as measured by the instruments used in this study. The high baseline measurement and lack of programmatic attention to attitude change may explain the static results. Additionally, changes in feelings of school belonging were found to be insignificant.

In light of these results, it is suggested that future studies include a process evaluation to determine how attitudes and behaviors are being expressed by program staff both as intentional components of the program and through latent behavior modeling. Rather than focusing solely on results—as in an outcome-based evaluation—a process evaluation describes what the program is and analyzes how a program is planned and implemented in order to provide ongoing feedback to stakeholders (Rossi et al., 2004). This type of evaluation assesses whether the program is being implemented as designed, and it reveals the strengths and weaknesses of specific program components (Freeman, Rossi, & Sandefur, 1993). A thorough process evaluation of Outdoor School provides information on which components are responsible for what outcomes (Taylor-Powell, Rossing, & Geran, 1998). It also reduces the likelihood of change being attributed to spurious influences (Rossi et al., 2004).

Outdoor Play Behavioral Model Construct Measurement

An adaptation of the Theory of Planned Behavior (TPB) was used to predict outdoor play in this study. In this model, favorable attitudes, norms, and perceived

control toward a specific behavior lead to intentions to perform said behavior. Intention to perform a behavior coupled with adequate performance opportunity “capture the motivational factors that influence behavior” (Ajzen, 1991, p. 181). The TPB has been successful at predicting a wide array of behaviors (Armitage & Christian, 2003) and is quite useful when attempting to understand the varied factors of multidimensional constructs such as environmentally responsible behavior (Kaiser, 1998; Smith-Sebasto & D’Costa, 1995). For this study, nature connection, which measured participants’ feeling of connection with nature, was added as an affective predictor variable. Recent studies using the TPB model have included an affective component as a predictor variable with some success (Hinds & Sparks, 2008; Oreg et al., 2006).

Reliability Analysis of the Outdoor Play Theory-Testing Constructs

Like the scales used in the evaluation, reliabilities of the study constructs pertinent to the theory testing were assessed by analyzing their internal consistency using Cronbach’s alpha coefficient. Internal consistencies of children’s connection to nature, attitudes, social norms, perceived behavioral control, intentions, and behavior were measured using the post-test scores from only the treatment group (n=156). To avoid repeating the information presented above, only those constructs not also used in the evaluation portion of the study are discussed in this section. Because multiple constructs in the environmental stewardship model did not demonstrate adequate reliabilities, this section focuses more attention on the reliability analyses of the subjective norms,

perceived behavioral control, and intentions of outdoor play than those of environmental stewardship.

Outdoor Play Subjective Norms

Subjective norms describe the social influence a person feels from significant others when deciding whether to perform a specific behaviors. The Outdoor Play Norms Scale was made up of four items and demonstrated adequate reliability ($\alpha = .72$). The high rating of social norms indicated that participants felt that others would look favorably on their performance of outdoor play behaviors. For children who identify with the group norm, social norms may exert influence directly on the participant's attitude (Terry & Hogg, 1996).

Outdoor Play Perceived Behavioral Control

Perceived behavioral control describes the amount of control a person feels he or she has of successfully performing a behavior (Ajzen, 2006). Many of the decisions in children's lives are dictated by the rules of parents and other adults, which makes this construct particularly important in predicting behavior. Even with a positive attitude and the social support of significant people in our lives, a behavior outside of our control is difficult to enact. The Outdoor Play Perceived Behavioral Control Scale demonstrated acceptable but low reliability ($\alpha = .62$) and low item-total correlations. The relatively low internal consistency was likely influenced by the extreme value of the item *I am allowed*

to play outdoors when I am at home ($M = 6.81, SD = .65$). This item captures the idea of parental permission, an essential element of the perceived ease or difficulty of playing outside. Overall, the participants perceived a fair amount of control over their outdoor play behaviors. They had permission to be outdoors, there were places for them to play, the people in their lives took them to places where they could be outside, and they were allowed to be outside in a variety of weather conditions.

Outdoor Play Behavioral Intentions

Behavioral intentions indicate a person's willingness to perform a specific action. The Outdoor Play Intentions Scale contained four items intended to measure participants' readiness in the next week to play outdoors and explore nature. The two more general outdoor play items were rated highest, indicating a greater perception of control over going outdoors in general rather than over specific outdoor play behaviors such as exploring in nature. The scale demonstrated adequate reliability ($\beta = .65$).

Discussion of the Outdoor Play Model

The outdoor play model was examined to test the relationship between nature connection, outdoor play attitudes, outdoor play subjective norms, outdoor play perceived behavioral control, outdoor play intentions, and outdoor play behavior. Understanding the determinants of children's outdoor play behavior has both practical and theoretical value (Bixler et al., 2002; Sobel, 1996). Additionally, the model contained nature connection as

an independent variable. The addition of nature connection is appropriate because its presence in the model increased the amount of variance explained over the original variables (Ajzen, 1991). The addition of an affective predictor such as connection to nature is consistent with research using the Theory of Planned Behavior in this field (Ajzen & Driver, 1992) and environmental psychology (Hinds & Sparks, 2008). By investigating this model, this portion of the study contributed to an understanding of childhood outdoor play behavior.

The proposed model (Figure 4-1) was first tested with three variables predicted to have a direct effect on outdoor play intention (attitudes, subjective norms, and perceived behavioral control), one variable with an indirect effect on intention (nature connection via attitudes), and two variables predicted to have a direct effect on outdoor play behavior (perceived behavioral control and outdoor intentions). The measurement of intentions drove the need for a split post-test for the treatment group. Intentions were measured by asking participants about their future behavior in the upcoming week (i.e., *In the next week I will recycle items at home*). These items were used as predictors of corresponding behavior items (i.e., *In the last week I recycled items at home*). In order to more accurately predict behavior from intention using path analysis, a chronological separation in the measurement of the items is recommended (Ajzen, 2006).

The final model (Figure 4-2) partially confirmed the proposed model. As predicted, there were significant direct effects from nature connection to outdoor play attitude, from attitude to behavioral intention, from perceived behavioral control to behavioral intention, from perceived behavioral control to behavior, and from behavioral intention to behavior. However, the effect from subjective norms to intention was not

significant. In addition, paths were added from nature connection to behavior and from subjective norms to attitude. This model explained 45% of the variance in outdoor play behavior. Intention to play outdoors and perceived connection to nature were wielded the strongest influence on outdoor play behaviors.

The results of this analysis reveal the utility of using the TPB as a theoretical framework for studying outdoor play behavior. This study demonstrated the success of the adapted TPB model, which explained nearly half of the variance of outdoor play behavior. The findings also support the inclusion of an affective component in the model. Nature connection had a significant and direct effect not only on outdoor play attitudes, but also on outdoor play behavior.

Though the percentage of variance explained is relatively large for a social science study (Creswell, 2009), one must consider that the constructs were written using similar language for attitudes, subjective norms, perceived behavioral control, intentions, and behaviors. This likely influenced the R^2 value. Additionally, more than half of the variance in outdoor play behavior was not explained by this model. A more complete model would consider beliefs, values, and norms (Stern, 2000), as well as social networks, knowledge, constraints, and culture (Clayton & Myers, 2009). The role of parents and guardians in outdoor play behaviors should also be examined. The importance that the participants' parents place on outdoor play, the parents' connection to nature, the time that parents spend in the outdoors, and the availability of outdoor play spaces in the local environment all influence outdoor play (Kellert, 2002). Additionally, the sample was drawn from a relatively rural geographic population, which may allow for

greater opportunity to engage in outdoor play behaviors than would be available in an urban location.

Research has shown that outdoor play offers significant benefits for children (Louv, 2005). Increases in creativity, social skills (Moore & Wong, 2007), psychological restoration (Hartig, Kaiser, & Bowler, 2001), and improved concentration (Taylor, Kuo, & Sullivan, 2001) are just a few of the empirically validated advantages offered by outdoor play. Understanding the constructs that influence outdoor play can help parents, educators, and recreation programmers facilitate independent outdoor play for the children in their care. This study supports previous research (Kals et al., 1999; Hinds & Sparks, 2008; Sobel, 1996) that increasing a feeling of connection for the outdoors will lead to an increase in time spent in the outdoors.

Nature Connection in the Outdoor Play Model

Based on the literature, nature connection was added to the original model as an affective predictor of outdoor play attitude, which in turn influences intention. The inclusion of measures of nature connection as a predictor variable has been seen elsewhere in the environmental education literature (Stern et al., 2008), but the role of nature connection on increasing outdoor play is mostly absent. Rather, connection to nature is more often utilized as a predictor of environmental stewardship. Nature connection is normally viewed as an outcome variable in the opposite order than that proposed in this model; that is, outdoor play predicts connection to nature (Chawla, 1999; Louv, 2005; Nabhan & Trimble, 1994; Sobel, 1996). While this study does not seek to

refute that theory, the possibility of an outdoor experience-nature connection positive feedback loop is not without precedent (Kals et al., 1999). Bixler et al. (2002) found that positive associations with nature that were developed in childhood via experience in wildland settings contributed to a preference for nature later in life. It is even possible that we have a connection to nature that precedes exposure to the outdoors. The biophilia hypothesis (Kellert, 2002; Louv, 2005) posits that humans have an inherent desire to affiliate with nature as a result of our evolutionary development in the natural world. Indeed, nature connection demonstrated a direct effect on outdoor play attitude.

Additionally, a path was added from children's connection to nature to outdoor play behavior. Nature connection's operationalization as an affective measurement helps explain this finding. Emotions have been shown to be influential in performing environmental and outdoor behaviors (Kals et al., 1999; Chawla, 2007; Hinds & Sparks, 2008; Pooley & O'Connor, 2000). This finding indicates that a person with a high degree of connection to nature is likely to have positive attitudes toward outdoor play as well as to engage in outdoor play behaviors.

When nature connection was added to the model, a key component of the TPB dropped out. The path from outdoor play norms had no direct effect on outdoor play intentions and was therefore removed from the model. A path instead was created from subjective norms to outdoor play attitude, which is consistent with theory. According to Terry and Hogg (1996), norms influence attitudes when the norm is of salience and importance to the group. For preteen children the need to affiliate and demonstrate competence to their peers explains the increase in the normative influence of family and friends on cognitive attitudes. This finding indicates that while the outdoor play

behaviors and attitudes of significant others does not increase the participants' willingness to play outdoors, the participants' subjective norms exert influence on the preference for outdoor play activities.

Environmental Stewardship Behavioral Model Measurement and Discussion

Much like the outdoor play model, a model of environmental stewardship behavior was theorized using an adaptation of the Theory of Planned Behavior and incorporating nature connection as a predictor variable. Understanding environmentally responsible behavior is a hugely important endeavor in the environmental literature (Hungerford & Volk, 1990; Smith-Sebasto & D'Costa, 1995; Sia et al., 1986). Because of a lack of internal consistency of key constructs, this model was not tested. Below is a discussion of the constructs and the model.

Reliability Analysis of the Environmental Stewardship Theory-Testing Constructs

Environmental Stewardship Subjective Norms

Environmental Stewardship Norms were measured with a 5-item scale that demonstrated good reliability ($\alpha = .75$). Like the environmental stewardship attitude and behavior scales discussed above, the environmental stewardship norm scale was an aggregation of different items consistent with environmentally responsible behaviors. In this case, the items reflected the attitudes and behaviors of significant people in the participants' lives such as picking up trash, discussing the environment, conserving

water, and recycling. One item was removed from the original scale, which slightly improved the scale reliability ($\alpha = .77$).

Environmental Stewardship Perceived Behavioral Control

The reliability of environmental stewardship perceived behavioral control was measured with a 5-item scale. Using Cronbach's alpha coefficient to test for internal consistency resulted in an inadequate scale reliability ($\alpha = .58$). Although the subjects of recycling, water conservation, talking about the environment, food waste, and waste disposal were similar to other stewardship measures, the perceived control to perform these behaviors was not consistent. The criticism of that an aggregated scale such as this may not count for the multiple dimensions and complexity of environmentally responsible behaviors (Kaiser, 1998) seemed to play out in this result. Though the items were derived from the literature (Hungerford & Volk, 1990; Sivek & Hungerford, 1989; Smith-Sebasto & D'Costa, 1995) and from conversation with program stakeholders, there were a variety of factors that influenced the ease or difficulty of performing each item. For example, if recycling was not part of the town's solid waste system, the perceived control would be quite low even for the participant who wanted to participate. Contrast that with the ability to take a shorter shower, the item chosen to represent water conservation. This is much more likely to be under the participants' actual control.

A more appropriate multi-item instrument measuring perceived behavioral control of environmental stewardship would control for the actual control participants have over performing the associated behavior into consideration. One way to achieve this would be

to talk with participants and their parents to understand the participants' actual ability to engage in the target behavior. The researchers should account for environmental influences (e.g., Does the community offer curbside recycling?), permission from parents and guardians to engage in the behavior (e.g., Is the child allowed to choose how much food he or she puts on the plate at meals?), and social norms. Only those items that received consistent ratings of difficulty or ease across the index would be included.

Environmental Stewardship Intentions

Five items were combined to create the Environmental Stewardship Intentions Scale, which measured participants' willingness to engage in environmentally responsible behaviors in the next week. The scale demonstrated adequate (though borderline) reliability ($\alpha = .61$). Intentions to conserve water, turn out the lights, recycle, talk about the environment, and pick up litter were considered in this scale. There was a wide range between the lowest rated item, talking about the environment, and the highest rated item, reducing water usage when taking a shower. Though this scale had adequate internal consistency, low item-total correlations and the wide range in item scores made its usefulness questionable. The individual items used to measure environmental stewardship behavioral intentions did not hang together as closely as expected. This finding is discussed further as a limitation of this study.

Discussion of the Environmental Stewardship Model

The environmental stewardship model proposed in this study sought to clarify the relationship between various constructs that influence engagement in environmental stewardship behaviors. In this model, intention is a mediator between the antecedent variables (environmental stewardship attitudes, environmental stewardship social norms, and environmental stewardship perceived behavioral control) and environmental stewardship behavior. Connection to nature was added as a predictor of stewardship attitudes. A direct path was added from perceived behavioral control to behavior.

Because environmental stewardship attitude ($\alpha = .48$) and environmental stewardship PBC ($\alpha = .58$) demonstrated inadequate reliability, the environmental stewardship model was not tested. The items in the scales were intended to measure actions participants can take to exhibit environmentally responsible behaviors, as indicated in the literature (Hungerford & Volk, 1990; Kaiser, 1998; Sia et al., 1986). While these items have practical similarity, attitudes and perceived behavioral control toward carrying out these attitudes were not consistent.

The option to use single-item indicators (i.e., *It is easy for me to recycle at home*), was considered in place of the unreliable scales. Because the individual items were not comprehensive, but rather were specific to actions taken, they were not seen as representative of overall environmental stewardship. Consider the specific act of recycling as an example. Recycling may be seen as a component of environmentally responsible behavior, but environmentally responsible behavior encompasses much more

than recycling. The specificity of recycling precluded it from being used as a global measure of stewardship.

In the future, researchers are encouraged to find consistent, reliable measures of environmental stewardship attitudes, norms, perceived behavioral control, intentions, and behaviors that can be tested in this model. A challenge in this study was balancing the time stress on the participants with the desire to collect data on a large number of constructs. Because there were so many variables tested in the outdoor play and environmental stewardship models—as well as those in the evaluation—it was important to limit the number of items that made up each construct so as not to burden the participants. In the case of two constructs in the Environmental Stewardship Model, this resulted in unreliable scales.

Nature Connection as a Mediator of Outdoor Play's Influence on Environmental Stewardship

The attempt to elucidate the relationship between outdoor play and environmental stewardship has a long history. The idea that time recreating outdoors leads to a positive association with nature, which in turn leads to protective behaviors is found in the literature (Chawla, 2006; Kals et al., 1999). Some point out the logic that one must develop a relationship with nature before one will act to preserve it. In the words of Robert Michael Pyle (1993), “What is the extinction of the condor to a child who has never seen a wren?” (p. 147). In other words, it is personal experience with nearby nature that provides the context and relevance for larger, global environmental issues and the

associated actions needed to address these issues. Dunlap and Heffernan (1975) stated that outdoor recreation experience is positively connected to concern for the environment, but support for this assertion has been mixed (Bixler et al., 2002; Nord, Luloff, & Bridger, 1998; Van Liere & Noe, 1981). Likewise, the significant life experience literature has demonstrated that time spent outside as a youth correlates with future stewardship behaviors as an adult (Chawla, 1999; 2006; Tanner 1980). However, this research has been challenged on multiple fronts (Gough, 1999; Payne, 1999).

The path model in Hypothesis 10 suggests that outdoor play activity leads to a connection to nature, which in turn influences environmental stewardship. Though support was not found for the full mediation model, nature connection was found to be a partial mediator of outdoor play's influence on environmental stewardship behaviors in children. The presence of nature connection partially explained how outdoor play contributes to environmental stewardship.

Previous research has linked outdoor experiences (Chawla, 1999; Ewert et al., 2005; Nabhan & Trimble, 1994; Wells & Lekies, 2006) to environmentally responsible behavior. Much of this literature is conducted retrospectively, looking back upon formative experiences that led to future behaviors and is tailored toward adult participants. There is less information on the influence of outdoor play on environmental stewardship when the independent and dependent variables are measured concurrently. This study expands our understanding by examining the role of outdoor play and nature connection in the lives of children in the present moment. The literature on connection to nature has also demonstrated a linkage between a feeling of attachment or identity with nature and environmental stewardship (Mayer & Frantz, 2004; Nisbet et al., 2008;

Schultz, 2000), but has not demonstrated this with children. This study found that children's nature connection increased the influence that outdoor play behaviors exert on stewardship. According to this model, time outdoors leads to connection to nature, and connection to nature leads to greater participation in activities that are beneficial to the environment than outdoor play alone.

These findings suggest that in addition to increasing the time children spend in the outdoors, it would also be beneficial to provide access to programs that have demonstrated success at increasing connection to nature. Outdoor School demonstrated positive, significant increases in both outdoor play behaviors and children's nature connection for participants, increasing the likelihood of influencing environmental stewardship behaviors beyond what is presented in the written curriculum.

Because environmental stewardship is at the core of environmental education goals (Kaiser, 1998; Stapp et al., 1969) knowing how to influence this behavior is quite valuable information. The mediation model demonstrated that time engaged in outdoor activities influences a feeling of connection to nature and leads to environmental stewardship. Of course, partial mediation means that nature connection explains only a portion of the effect of outdoor play on environmental stewardship. Perhaps there is an underlying personality characteristic, identity, or social value that links these two attributes and can help explain the effect (Clayton & Myers, 2009).

Limitations

This study was subject to several limitations that affected the generalizability of the findings. First, the results of the evaluation are delimited to the participants of Outdoor School. While the findings may be contextualized to other residential environmental education populations, this study used a quasi-experimental design with a non-randomized sample, which limits its generalizability. The sample represented one class of students from one geographic area who participated in the program over a limited amount of time. Furthermore, some of the influences of the program may be attributed to the learning group leaders or counselors specific to the spring 2010 season of Outdoor School. Longitudinal analyses conducted over at least three consecutive seasons would help address these shortcomings.

Constraints related to the length of the survey also presented some limitations. Consideration was taken to limit the time required to complete each survey administration. The spring is when public elementary schools in Pennsylvania participate in the Pennsylvania System of School Assessment standardized tests. Because of the strain these exams have on the students, the teachers of the participants asked that the survey take no more than 20 minutes to complete. In order to comply with this request, a decision to either reduce the number of constructs or to reduce the number of items that made up each construct had to be made. Ultimately, the number of items in each construct was reduced, thereby sacrificing precision for greater variety. This decision impacted the internal consistency on some of the constructs. More rigorous construct development could alleviate some of these issues.

A related limitation was the unorthodox survey administration timeline utilized in this study. Ideally, a pretest, post-test, and follow-up longitudinal design would be followed in an evaluation such as this (Windsor et al., 1994). Instead the data was collected with a pretest and then a split post-test, allowing for only two data points on each item. This occurred for two reasons. The first was the need to gather information on intentions at one time point and then behaviors at a later point in order to match them in the path model. While the same survey could have been administered each time, the burden on the students of completing three surveys of more than sixty questions within five weeks would have exceeded the time limit requested by school administrators and teachers.

The time of year also revealed a weakness. Outdoor School takes place in April and May, toward the end of the school year. This limited the time between administration of the post-test and follow-up to a maximum of three weeks. This is not enough time to show a sustained effect, which meant the second post-test would be redundant (Windsor et al., 1994). Future studies should consider conducting the evaluation in the fall semester and conducting delayed post-tests throughout the year. The warmer weather and longer days may have also impacted the positive attitudes, intentions, and amount of outdoor play engaged in by participants. Though the control group did not show increases in these areas, studies done at different times of year could control for this possible effect.

Another—and perhaps most critical—limitation is the failure to examine the relationships in the hypothesized environmental stewardship behavior path model. The model was not tested, because two of the construct demonstrated inadequate reliabilities and third was barely acceptable. Although steps were taken to create adequate measures,

more work is needed to establish consistent measures of children's environmental stewardship behaviors. A closer look at two of the five stewardship items, water conservation and recycling, helps explain this limitation. Though conserving water and recycling have been consistently identified as environmentally responsible behaviors, the willingness to perform one does not necessarily correspond with intention to perform the other. While nearly all of the participants stated that they would turn off the water when brushing their teeth, fewer intended to recycle in the upcoming week. Just because a person intends to use less water, that does not mean he or she intends to use a recycling bin instead of a garbage can to discard an aluminum can. The actions, though similar when viewed as components of a global environmental stewardship measure, are different enough in the minds of fifth graders to garner significantly different ratings. The environmental stewardship scales surrendered precision and specificity in favor of multidimensionality and a desire not to overburden the survey respondents. This decision contributed to less rigorous measurements of environmental stewardship constructs.

Bonding was also not well represented by the construct used to measure it. At face value, questions related to school belonging seemed to encompass the connections students build between one another and their teachers. Further discussion with teachers and with the Outdoor School program director revealed that school belonging is an inadequate construct to measure the emotional bonds that form. The relationship of the participant to their school is less salient than the relationship to the place and the program. How those feelings transfer to the school upon return is unknown.

One surprising limitation came as a result of collecting participant demographic information. The survey asked participants for information pertaining to their school, age,

gender, and race. Race was listed following the format used in the 2000 U.S. Census. The fifth grade participants struggled to circle the race that best described them. Although the community is predominantly Caucasian, there was a diversity of races represented by the survey answers. I approached the teachers about this during the post-test administrations and was told that the students were most likely confused by the question. Therefore, race was eliminated as a demographic descriptor of the sample.

Suggestions for Future Research

Based on the scope and findings of this study, there are several suggestions and directions for future research. First, there is a need to establish rigorous measures of environmental stewardship behaviors and associated TPB constructs. The aggregated measures have too much multidimensionality and the individual actions are too specific to represent overall stewardship. Finding the right balance is needed. Furthermore, these measures must also consider the locus of control of children. Much of the literature on environmentally responsible behaviors does not pertain to behaviors consistent with the abilities of children.

Second, there is a need to conduct Outdoor School evaluations on a consistent, ongoing basis. Future studies should consider conducting the evaluation in the fall semester and conducting delayed post-tests throughout the year. Only with a longitudinal design can sustained change be measured. Future assessments should also consider the use of a pretest, post-test, follow-up design. Long-term follow-up studies tracking participants as they progress through middle school and beyond need to be conducted to

examine the distal outcomes of the program on a variety of variables. A retrospective design could also be used for program participants who are now adults. These long-term findings could be contextualized with qualitative findings from interviews and focus groups. Evaluators have the opportunity to work with teachers, counselors, learning group leaders, and parents to track behavior change over the long term.

Additionally, an implementation evaluation that helps determine which specific components of the program are most successful at meeting the programmatic goals would be quite valuable. The outcome variable ecological knowledge provides a good example. Demonstrating a large increase in ecological knowledge is a positive finding for the Outdoor School program coordinators; however, the driver of that change is not known. Identifying whether it was the content, the method of delivery, the educational setting, or another component that led to the success would allow the programmers to design future curricula that incorporate the most effective elements in a consistent manner.

The Outdoor School program coordinators may want to actively program for the goals that were not met. The program demonstrated no impact on outdoor play attitudes, environmental stewardship attitudes, and feelings of school belonging. These were identified as important markers of programmatic success. By working backward from the goal, specific content could be created that addressed these needs. Future studies can continue to monitor these constructs to determine the efficacy of new approaches. Outdoor play attitude, for example, should be refined so that the construct measures a specific attitude object that holds meaning to the program, rather than a generalized attitude toward the outdoors or the environment.

Lastly, the children's connection to nature scale should be revisited. Though the scale demonstrated good reliability, an accurate measure of children's connection to nature that has undergone a process of meticulous scrutiny is needed. Its value in gathering baseline information to determine how connected to nature today's youth feel, to track change, to evaluate programs, and to predict behavior is unlimited. A great deal of attention is foisted upon children's apparent lack of connection with nature, but there is no corresponding great measure to examine this phenomenon or assess its impact. The participants in this study demonstrated a relatively high baseline measure of connection to nature, which limited the program's ability to demonstrate a positive impact on this construct.

Looking toward the future, scholars must continue to examine the long-term impacts of allowing children to nurture their affinity for nature. It is important to bear in mind that children's relationship with nature has changed. Increases in technology, decreases in open space, and a lack of free time mean that there are fewer opportunities for children to connect with the outdoors. Children are born with wonder and curiosity for nature, but these feelings must be cultivated. Programs such as Outdoor School function as bridges from the built environment to the natural world, giving children a chance to explore under an open sky and allowing their potential to bloom.

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Appendix A

Outdoor School Survey – Pretest



2010 Outdoor School Survey – Pretest

Your ID (The first initial of your last name and last four digits of your phone number) _____

Your School _____

Today's Date _____

PLEASE READ THESE INSTRUCTIONS BEFORE TURNING THE PAGE AND BEGINNING THE SURVEY

This survey will ask you about your attitudes and behaviors about nature, school, and things you will learn at Outdoor School. The format of this survey is a bit different than you might be used to, so please take a moment to examine the sample question below.

Each survey item will begin with a statement. You will have seven choices to choose how true that statement is for you. Your choices are range from (1) Strongly Agree to (7) Strongly Disagree. The higher the number you circle, the more you disagree with the statement.

In the example question below, the student indicated that he agrees with the statement “**I like playing soccer.**”

Sample Question	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. I like playing soccer	1	2	3	4	5	6	7

As you begin, please think carefully about each of your answers. It is very important to be accurate. No answers are right or wrong, and everyone will have different answers. Please put down what you actually think for each question.

Your responses are important to making Outdoor School better for future students

IF YOU DO NOT UNDERSTAND THE INSTRUCTIONS, PLEASE ASK FOR HELP. IF YOU DO UNDERSTAND, TURN THE PAGE AND BEGIN.

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. I like being in nature	1	2	3	4	5	6	7
2. I want to spend time outdoors	1	2	3	4	5	6	7
3. I enjoy the freedom of being outside	1	2	3	4	5	6	7
4. I am comfortable in the outdoors	1	2	3	4	5	6	7
5. I feel connected to the natural environment	1	2	3	4	5	6	7
6. Most students at this school treat each other with respect	1	2	3	4	5	6	7
7. Most students seem to care about each other, even people they do not know well	1	2	3	4	5	6	7
8. Teachers at this school won't let students make fun of other students	1	2	3	4	5	6	7
9. Students in this school have a chance to discuss issues	1	2	3	4	5	6	7
10. Students feel like they are an important part of the school	1	2	3	4	5	6	7
11. Students can talk with teachers in this school if something is bothering them	1	2	3	4	5	6	7
12. I would rather play outside than inside	1	2	3	4	5	6	7
13. I would rather watch TV than play outside	1	2	3	4	5	6	7
14. I'd rather explore nature than play video games	1	2	3	4	5	6	7
15. I'd rather be on the computer than play outside	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
16. I'd rather throw cans and bottles in the trash than recycle	1	2	3	4	5	6	7
17. I would rather leave the water running when I brush my teeth than shut it off	1	2	3	4	5	6	7
18. I'd rather turn off the lights than leave them on when I leave a room	1	2	3	4	5	6	7
19. I'd rather talk with my friends and family about the environment	1	2	3	4	5	6	7
20. I'd rather fill up my plate than only put as much food on as I know I can eat	1	2	3	4	5	6	7
21. The people I live with spend time outside together	1	2	3	4	5	6	7
22. My friends and I like to explore nature together	1	2	3	4	5	6	7
23. People who care about me encourage me to play outdoors	1	2	3	4	5	6	7
24. The people I live with think spending time outside is important	1	2	3	4	5	6	7
25. The people I live with think it is important to put only as much food on my plate as I think I can eat	1	2	3	4	5	6	7
26. My friends think it is important to pick up trash when it is lying on the ground	1	2	3	4	5	6	7
27. The people I live with think it is important to talk about the environment	1	2	3	4	5	6	7
28. People who care about me think it is important to recycle	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
29. The people I live with think it is important for me to shut off the faucet when I brush my teeth	1	2	3	4	5	6	7
30. I am allowed to play outdoors when I am at home	1	2	3	4	5	6	7
31. There are places near home for my friends and me to play outdoors (fields, playgrounds, etc.)	1	2	3	4	5	6	7
32. The people I live with take me places I can be outdoors	1	2	3	4	5	6	7
33. I can be outdoors on most days, even if it is hot, cold, or raining	1	2	3	4	5	6	7
34. It is easy for me to recycle at home	1	2	3	4	5	6	7
35. I can take a shorter shower to save water if I wanted to	1	2	3	4	5	6	7
36. I know how to talk with my family about the environment	1	2	3	4	5	6	7
37. I am the one who puts my food on the plate when I get a meal	1	2	3	4	5	6	7
38. I know what to do with trash when I find it	1	2	3	4	5	6	7
39. In the last week I spent time outside even when I could have been playing video games or watching TV	1	2	3	4	5	6	7
40. In the last week I played outside with my friends	1	2	3	4	5	6	7
41. In the last week I explored in a natural area	1	2	3	4	5	6	7
42. In the last week I went outdoors even when the weather wasn't great	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
43. In the last week I turned off the water when I brushed my teeth	1	2	3	4	5	6	7
44. In the last week I recycled items at home	1	2	3	4	5	6	7
45. In the last week I turned off the lights when I left a room	1	2	3	4	5	6	7
46. In the last week I talked with my family about the environment	1	2	3	4	5	6	7
47. In the last week I picked up trash that was lying on the ground	1	2	3	4	5	6	7
48. I feel connected to nature	1	2	3	4	5	6	7
49. I feel that what I do affects the natural world	1	2	3	4	5	6	7
50. I feel like I am part of the web of life	1	2	3	4	5	6	7
51. I feel that all living things, human and nonhuman, share a common life force	1	2	3	4	5	6	7
52. I feel a sense of oneness with the natural world around me	1	2	3	4	5	6	7
53. I feel part of the larger natural world, like a tree in a forest	1	2	3	4	5	6	7
54. When I think of life on Earth, I think other species are just as important as humans	1	2	3	4	5	6	7
55. The natural world is a community to which I belong	1	2	3	4	5	6	7
56. I feel a kinship with animals and plants	1	2	3	4	5	6	7
57. I can see intelligence in other living things	1	2	3	4	5	6	7

Part II. Read each question and answer it the best you can.

1. Green plants are able to capture light energy from the sun and convert it to food through what process?

- A. Condensation
- B. Photosynthesis
- C. Decomposition
- D. Conservation

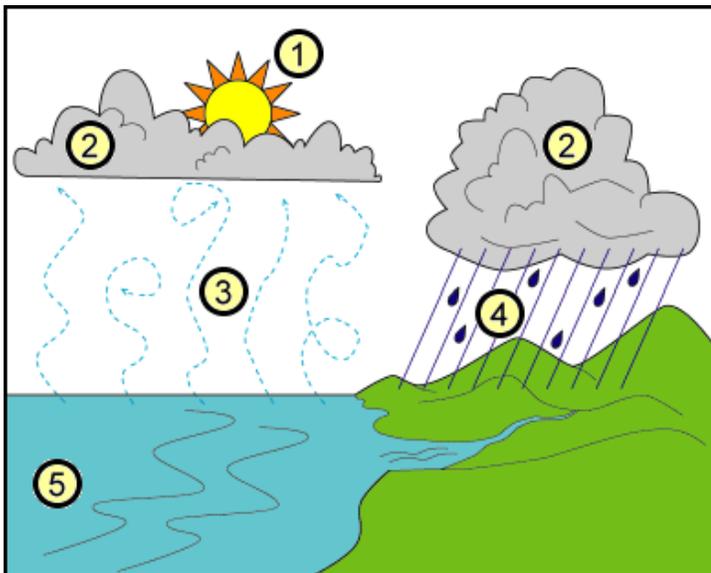
2. An Eastern screech owl can turn its head around approximately how far?

- A. 90 degrees (one quarter of the way around)
- B. 180 degrees (half-way around)
- C. 270 degrees (three-quarters of the way around)
- D. 360 degrees (all the way around)

3. Which of the following is **NOT** a characteristic of an amphibian?

- A. Lays eggs in water
- B. Has moist and smooth skin
- C. Uses claws to dig holes
- D. Breathes with gills when young

4. Look at the diagram of the water cycle below.



Which of the following is represented by number 2?

- A. Transpiration
- B. Condensation
- C. Precipitation
- D. Evaporation

5. Where do most plants in Pennsylvania get their nutrients?

- A. Air
- B. Water
- C. Soil
- D. Sun

6. Plants take in oxygen and animals breathe in carbon dioxide to stay alive.

- A. True
- B. False

7. A raptor's feet are called talons.

- A. True
- B. False

8. The natural environment where a living thing can find food, water, and shelter in an arrangement that meets its needs is called a biotic index.

- A. True
- B. False

9. Most of the earth's water is located in rivers.

- A. True
- B. False

10. Green plants are producers and most animals are consumers.

- A. True
- B. False

Part III. Please tell us about yourself

Are you a:

- a. Boy
- b. Girl

How old are you? _____

Choose the category that best describes you (pick one).

- a. Asian
- b. Black/African American
- c. Latino/Hispanic
- d. Native American/American Indian
- e. White/Caucasian
- f. Other

Appendix B

Outdoor School Survey – Post-Test 1



2010 Outdoor School Survey – Post-test 1

Your ID (The first initial of your last name and last four digits of your phone number) _____

Your School _____

Today's Date _____

PLEASE READ THESE INSTRUCTIONS BEFORE TURNING THE PAGE AND BEGINNING THE SURVEY

This survey will ask you about your attitudes and behaviors about nature, school, and things you will learn at Outdoor School. The format of this survey is a bit different than you might be used to, so please take a moment to examine the sample question below.

Each survey item will begin with a statement. You will have seven choices to choose how true that statement is for you. Your choices are range from (1) Strongly Agree to (7) Strongly Disagree. The higher the number you circle, the more you disagree with the statement.

In the example question below, the student indicated that he agrees with the statement “**I like playing soccer.**”

Sample Question	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. I like playing soccer	1	2	3	4	5	6	7

As you begin, please think carefully about each of your answers. It is very important to be accurate. No answers are right or wrong, and everyone will have different answers. Please put down what you actually think for each question.

Your responses are important to making Outdoor School better for future students.

IF YOU DO NOT UNDERSTAND THE INSTRUCTIONS, PLEASE ASK FOR HELP. IF YOU DO UNDERSTAND, TURN THE PAGE AND BEGIN.

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. Most students at this school treat each other with respect	1	2	3	4	5	6	7
2. Most students seem to care about each other, even people they do not know well	1	2	3	4	5	6	7
3. Teachers at this school won't let students make fun of other students	1	2	3	4	5	6	7
4. Students in this school have a chance to discuss issues	1	2	3	4	5	6	7
5. Students feel like they are an important part of the school	1	2	3	4	5	6	7
6. Students can talk with teachers in this school if something is bothering them	1	2	3	4	5	6	7
7. In the next week I will spend time outside even when I could be playing video games or watching TV	1	2	3	4	5	6	7
8. In the next week I will play outside with my friends	1	2	3	4	5	6	7
9. In the next week I will explore in a natural area	1	2	3	4	5	6	7
10. In the next week I will go outdoors even if the weather isn't great	1	2	3	4	5	6	7
11. In the next week I will turn off the water when I brush my teeth	1	2	3	4	5	6	7
12. In the next week I will recycle items at home	1	2	3	4	5	6	7
13. In the next week I will turn off the lights when I leave a room	1	2	3	4	5	6	7
14. In the next week I will talk with my family about the environment	1	2	3	4	5	6	7
15. In the next week I will pick up trash that is lying on the ground	1	2	3	4	5	6	7

Part II. Read each question and answer it the best you can.

1. Green plants are able to capture light energy from the sun and convert it to food through what process?

- E. Condensation
- F. Photosynthesis
- G. Decomposition
- H. Conservation

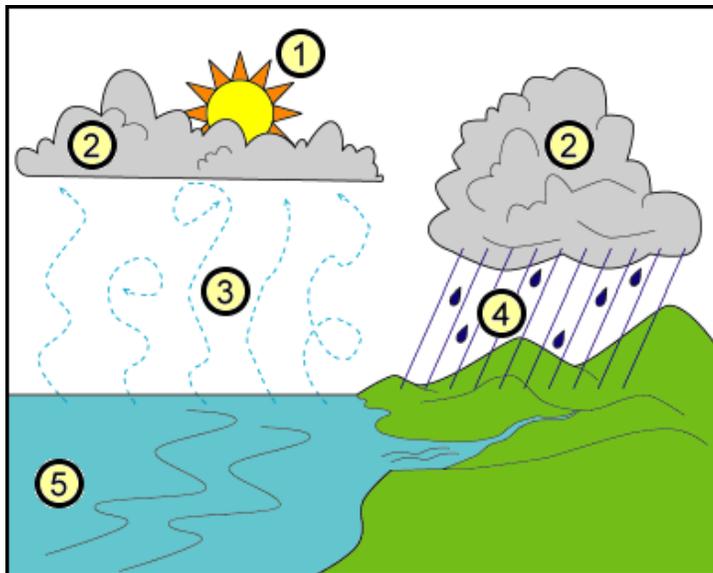
2. An Eastern screech owl can turn its head around approximately how far?

- E. 90 degrees (one quarter of the way around)
- F. 180 degrees (half-way around)
- G. 270 degrees (three-quarters of the way around)
- H. 360 degrees (all the way around)

3. Which of the following is **NOT** a characteristic of an amphibian?

- E. Lays eggs in water
- F. Has moist and smooth skin
- G. Uses claws to dig holes
- H. Breathes with gills when young

4. Look at the diagram of the water cycle below.



Which of the following is represented by number 2?

- E. Transpiration
- F. Condensation
- G. Precipitation
- H. Evaporation

5. Where do most plants in Pennsylvania get their nutrients?

- E. Air
- F. Water
- G. Soil
- H. Sun

6. Plants take in oxygen and animals breathe in carbon dioxide to stay alive.

- C. True
- D. False

7. A raptor's feet are called talons.

- C. True
- D. False

8. The natural environment where a living thing can find food, water, and shelter in an arrangement that meets its needs is called a biotic index.

- C. True
- D. False

9. Most of the earth's water is located in rivers.

- C. True
- D. False

10. Green plants are producers and most animals are consumers.

- C. True
- D. False

Appendix C

Outdoor School Survey – Post-Test 2



2010 Outdoor School Survey – Post-test 2

Your ID (The first initial of your last name and last four digits of your phone number) _____

Your School _____

Today's Date _____

PLEASE READ THESE INSTRUCTIONS BEFORE TURNING THE PAGE AND BEGINNING THE SURVEY

This survey will ask you about your attitudes and behaviors about nature, school, and things you will learn at Outdoor School. The format of this survey is a bit different than you might be used to, so please take a moment to examine the sample question below.

Each survey item will begin with a statement. You will have seven choices to choose how true that statement is for you. Your choices are range from (1) Strongly Agree to (7) Strongly Disagree. The higher the number you circle, the more you disagree with the statement.

In the example question below, the student indicated that he agrees with the statement "I like playing soccer."

Sample Question	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. I like playing soccer	1	2	3	4	5	6	7

As you begin, please think carefully about each of your answers. It is very important to be accurate. No answers are right or wrong, and everyone will have different answers. Please put down what you actually think for each question.

Your responses are important to making Outdoor School better for future students.

IF YOU DO NOT UNDERSTAND THE INSTRUCTIONS, PLEASE ASK FOR HELP. IF YOU DO UNDERSTAND, TURN THE PAGE AND BEGIN.

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
1. I like being in nature	1	2	3	4	5	6	7
2. I want to spend time outdoors	1	2	3	4	5	6	7
3. I enjoy the freedom of being outside	1	2	3	4	5	6	7
4. I am comfortable in the outdoors	1	2	3	4	5	6	7
5. I feel connected to the natural environment	1	2	3	4	5	6	7
6. I would rather play outside than inside	1	2	3	4	5	6	7
7. I would rather watch TV than play outside	1	2	3	4	5	6	7
8. I'd rather explore nature than play video games	1	2	3	4	5	6	7
9. I'd rather be on the computer than play outside	1	2	3	4	5	6	7
10. I'd rather throw cans and bottles in the trash than recycle	1	2	3	4	5	6	7
11. I would rather leave the water running when I brush my teeth than shut it off	1	2	3	4	5	6	7
12. I'd rather turn off the lights than leave them on when I leave a room	1	2	3	4	5	6	7
13. I'd rather talk with my friends and family about the environment	1	2	3	4	5	6	7
14. I'd rather fill up my plate than only put as much food on as I know I can eat	1	2	3	4	5	6	7
15. The people I live with spend time outside together	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
16. My friends and I like to explore nature together	1	2	3	4	5	6	7
17. People who care about me encourage me to play outdoors	1	2	3	4	5	6	7
18. The people I live with think spending time outside is important	1	2	3	4	5	6	7
19. The people I live with think it is important to put only as much food on my plate as I think I can eat	1	2	3	4	5	6	7
20. My friends think it is important to pick up trash when it is lying on the ground	1	2	3	4	5	6	7
21. The people I live with think it is important to talk about the environment	1	2	3	4	5	6	7
22. People who care about me think it is important to recycle	1	2	3	4	5	6	7
23. The people I live with think it is important for me to shut off the faucet when I brush my teeth	1	2	3	4	5	6	7
24. I am allowed to play outdoors when I am at home	1	2	3	4	5	6	7
25. There are places near home for my friends and me to play outdoors (fields, playgrounds, etc.)	1	2	3	4	5	6	7
26. The people I live with take me places I can be outdoors	1	2	3	4	5	6	7
27. I can be outdoors on most days, even if it is hot, cold, or raining	1	2	3	4	5	6	7
28. It is easy for me to recycle at home	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
29. I can take a shorter shower to save water if I wanted to	1	2	3	4	5	6	7
30. I know how to talk with my family about the environment	1	2	3	4	5	6	7
31. I am the one who puts my food on the plate when I get a meal	1	2	3	4	5	6	7
32. I know what to do with trash when I find it	1	2	3	4	5	6	7
33. In the last week I spent time outside even when I could have been playing video games or watching TV	1	2	3	4	5	6	7
34. In the last week I played outside with my friends	1	2	3	4	5	6	7
35. In the last week I explored in a natural area	1	2	3	4	5	6	7
36. In the last week I went outdoors even when the weather wasn't great	1	2	3	4	5	6	7
37. In the last week I turned off the water when I brushed my teeth	1	2	3	4	5	6	7
38. In the last week I recycled items at home	1	2	3	4	5	6	7
39. In the last week I turned off the lights when I left a room	1	2	3	4	5	6	7
40. In the last week I talked with my family about the environment	1	2	3	4	5	6	7
41. In the last week I picked up trash that was lying on the ground	1	2	3	4	5	6	7
42. I feel connected to nature	1	2	3	4	5	6	7

	Strongly Agree	Agree	Agree a Little	Neither Agree nor Disagree	Disagree a Little	Disagree	Strongly Disagree
43. I feel that what I do affects the natural world	1	2	3	4	5	6	7
44. I feel like I am part of the web of life	1	2	3	4	5	6	7
45. I feel that all living things, human and nonhuman, share a common life force	1	2	3	4	5	6	7
46. I feel a sense of oneness with the natural world around me	1	2	3	4	5	6	7
47. I feel part of the larger natural world, like a tree in a forest	1	2	3	4	5	6	7
48. When I think of life on Earth, I think other species are just as important as humans	1	2	3	4	5	6	7
49. The natural world is a community to which I belong	1	2	3	4	5	6	7
50. I feel a kinship with animals and plants	1	2	3	4	5	6	7
51. I can see intelligence in other living things	1	2	3	4	5	6	7

Robert G. Andrejewski

Curriculum Vitae

EDUCATION

- Ph.D. (2011) **The Pennsylvania State University**
Recreation, Park, and Tourism Management
- M.S. (2005) **State University of New York at Cortland**
Recreation and Leisure Studies
- B.A. (1998) **The College of William and Mary**
English

RECENT PROFESSIONAL EXPERIENCE

- 2010-2011 **Shaver's Creek Environmental Center**, Petersburg, PA
*Course Instructor/Environmental Educator/Curriculum Developer/
Program Evaluator/Teambuilding Facilitator*
- 2007-2010 **The Pennsylvania State University**, State College, PA
Course Instructor/Teaching and Research Assistant/Outdoor Educator
- 2003-2007 **Cornell Outdoor Education**, Ithaca, NY
Outdoor Skills Instructor/Challenge Course Facilitator/Outfitting Associate

TEACHING EXPERIENCE

- RPTM 120 (3 credits): Leisure and Human Behavior
- RPTM 230 (3 credits): Teambuilding Facilitation
- RPTM 297C (2 credits): Urban Service Experience
- RPTM 297C (3 credits): Essentials of Environmental Education
- RPTM 298 (1.5 credits): Backpacking Leadership
- RPTM 430 (3 credits): Environmental Education Materials and Methods

SELECTED PRESENTATION

- Andrejewski, R. & Mowen, A. J. (2011). Nature connection as a mediator of the influence of outdoor play on environmental stewardship. Paper to be presented at the *Northeastern Recreation Research Symposium*, Bolton Landing, NY, April.
- Andrejewski, R. (2010). Children's photographic representations of nature and not nature. Poster presented at the North American Association for Environmental Education Conference, Buffalo, NY, September.
- Andrejewski, R. (2010). An evaluation of a residential environmental education in Pennsylvania. Paper presented at the *Coalition for Education in the Outdoors Tenth Biennial Research Symposium*, Bradford Woods, IN, January.
- Andrejewski, R., Anderson, L., & Todd, S. (2009). Participant perceptions of nature after a canoe-camping experience. Paper presented at the *Northeastern Recreation Research Symposium*, Bolton Landing, NY, April.