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Nature Experiences and Ecoliteracy: The Effect of PlaceBased Education Experiences, Adventure and Outdoor Education Experiences and Undirected Nature Experiences on EcoLiteracy

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NATURE EXPERIENCES AND ECOLITERACY: THE EFFECT OF PLACE-BASED EDUCATION EXPERIENCES, ADVENTURE AND OUTDOOR EDUCATION EXPERIENCES AND UNDIRECTED NATURE EXPERIENCES ON ECO-LITERACY

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CHAPTER ONE

Introduction

Aldo Leopold (1949) stated that "It is inconceivable to me that an ethical relationship to the land can exist without love, respect, and admiration for land and a high regard for its value" (p. 223). Leopold believed that a significant obstacle in developing an environmental land ethic was the shift in education away from an intense consciousness of land.

If you see yourself as separate from a thing and do not have a relationship with it, then it is difficult to care for or about it. I experienced this separation from and apathy towards nature as a young adult. I grew up in an urban environment with limited experiences in nature. My attitudes towards nature were largely shaped by the human-centered utilitarian perspective of those around me. When I became a teenager and gained a greater exposure to environmental issues such as natural resource depletion, pollution, the energy crisis, endangered species and disappearing habitat, I adopted an angry, bleak and hopeless view of the future. I felt rage at the problems but only because I felt they made my personal future a dark and dreary one. I felt disconnected from these issues or any sense of responsibility, individually or collectively as a species, towards them. Environmental issues just felt so much bigger than me and out of control.

Then I met a mountain. After a long full day of hiking to get to the top, I sat in a meadow of flowers below the peak and looked up at the sky. It felt like I had never seen the outdoors before. The sky felt so close I could touch it yet so large it went on forever.

Everything smelled differently. The flowers, grass and trees seemed to have turned up the volume on their color and sang out to me. In that moment I felt like I could feel the earth moving and I was moving with it. It felt like I had come home, to a home I never realized existed.

Nature had been there in the background my whole life but it took the large looming expanse of the Rocky Mountains and hours of exhausting hiking for me to finally see it. Something shifted profoundly for me that day and each day since. While I did not have the words to communicate it well at the time, I had come to realize that I live in the world, not separate from it. I had discovered the biotic community of the mountain and felt suddenly so incredibly tiny and simultaneously part of such an enormous and breathtakingly complex system. That day and that relationship with the mountain fueled an understanding of the ecological world that I am still growing and expanding today.

A short time after my journey up the mountain, a teacher gave me a copy of the *Sand County Almanac* (Leopold, 1949). Aldo Leopold gave words and witness to my experience. It began a lifelong path to study ecology, natural history and build a relationship with the natural world. Reading Leopold's words gave me a sense of coming home to something I did not know I had been searching for. Something I found during my time in nature on the mountain. My experience made me curious about the methods and types of interactions with nature that inspire this shift in consciousness towards the environment in others.

Nature Experiences

Experiences in nature allow individuals to develop a relationship with the environment and the natural world and to see themselves as part of a larger system. As environmental educators we are striving to provide opportunities for others to become more ecoliterate citizens of the world. Ecoliteracy is knowledge of environmental systems, the issues that affect those systems and the relationships between and interdependence of members of ecological systems, including humans. Ecoliterate individuals can then apply those principles toward creating sustainable human communities (Center for Ecoliteracy, 2014).

Our planet is currently experiencing many ecological crises; climate change, global resource depletion, pollution, waste disposal, loss of biodiversity, loss of habitat, deforestation, ocean acidification, increased urbanization, and environmentally caused public health issues. Finding solutions will require a shift in our thinking and our actions. The United Nations Educational, Scientific and Cultural Organization (UNESCO) presented a document in 1997 titled *Educating for a Sustainable Future*, which begins by stating that "Moving towards the goal of sustainability requires fundamental changes in human attitudes and behaviour. Progress in this direction is thus critically dependent on education and public awareness" (UNESCO, 1997, p. 1). Lester Brown, president of the Earth Policy Institute, repeats this idea when he offered that "The thinking that got us into this mess is not likely to get us out. We need a new mindset" (Brown, 2009, p. xiv).

One of the primary goals of environmental education is to "encourage people to engage in more pro-environmental behaviors" (Bogner, & Wiseman, 2004, p. 28). This

begins with increasing awareness and concern for the environment which in turn can alter behaviors towards the environment. Research consistently shows a reliable relationship between connectedness to nature and self-reported environmentally responsible behavior (Frantz, 2014, p. 86).

The intention of my research is to study how place-based education experiences, adventure and outdoor education experiences and undirected time in nature may have impacted the ecoliteracy of individuals. The question I seek to answer is: How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy?

This study will utilize action research through mixed methods in four parts. The first part will be a quantitative collection of data using the Connectedness to Nature Scale (CNS) survey. The 14 point CNS scale was developed in 2004 by Frantz and Mayer. It is based on Aldo Leopold's concept for the land ethic; “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise” (Leopold, 1949, p. 225). This research functions from the assumption that the current state of ecological problems is a scientific fact and that it is to the benefit of society in general to have a more ecoliterate population.

The second part in my data collection, again using a quantitative approach, will build on this with a set of survey questions exploring the individual's' level of ecoliteracy and their exposure to different experiences in nature. I will collect data from a wide age range that includes elementary age students, high school age students and adults.

The third and fourth part will gather qualitative data. The third part will be a series of open ended questions gathered as part of the online survey. These questions will explore the meaning these individuals derived from and ascribe to their experiences in nature and how they think it attributes to their ecoliteracy.

The last piece of my research will be a series of in-person interviews with a smaller sample group. These interviews will use the same set of nine questions as part three. The in-person interview format will allow participants to expand their responses and for follow up questions to be asked. The qualitative data from these interviews will allow me to gain greater insight and provide a reference to compare self-reported survey results and in-person responses.

There are many ways in which individuals can develop knowledge of the natural world and build a relationship with nature. This can include:

1. Place-based or bioregional study
2. Adventure and outdoor education opportunities
3. Solo experiences or undirected experiences in nature

These methods can be applied, with appropriate modifications, to any age group from preschool students to college students.

Experiences in nature that may lead to individuals becoming more ecoliterate happen both inside and outside the classroom setting as well in both group and individual activities. Time in nature might be directed, such as an adventure based rafting trip, or undirected, such as a long walk alone in the woods. These experiences may or may not include in-person delivery of factual information or preparatory lesson materials. As an

environmental educator I want to look past whether this relationship with nature was developed in or out of the classroom and instead look at the underlying process of what brought about this shift towards ecoliteracy in an individual.

In my work as an environmental educator and naturalist, I have had the opportunity to teach at a community college, a forest kindergarten, to elementary and high school students and to mixed age groups from toddlers to senior citizens. The diversity of age and life experiences may provide information on: how early nature experiences influence later life, how ecoliteracy changes over time, what methods might best fit a particular age group and where there is common ground among the different types of nature experiences.

In striving to answer my research question: How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy? I hope to provide data that environmental educators can use to guide and inform their curricula. A greater understanding of how experiences in nature influence individuals will allow environmental educators to support the development of ecoliteracy in their students.

Introduction to Chapter Two

Chapter two will examine the current literature on place-based education experiences, adventure and outdoor education experiences and undirected time in nature. In addition the chapter will explore the literature on how Next Generation Science Standards (NGSS, 2013, p. 1) supports place-based education experiences, barriers that exist for adventure and outdoor education programs and the issue of nature deficiency.

CHAPTER TWO

Review of the Literature

While some environmental educators and naturalists work in a traditional classroom setting, others find themselves working with a wide age range in a variety of settings from nature centers, to state and federal parks, in the forest or on mountain peaks. Often environmental educators have a broad knowledge base that lends itself to generalist teaching and learning. Traditional classrooms teach science with the goal of developing a specialized knowledge based in one field. In contrast, environmental education lends itself, and often demands, an interdisciplinary systems approach. When observing a plant or animal, an environmental educator also looks at its habitat, its place in the local food web, geographic range, and the relationship to the other inhabitants of the ecosystem.

In addition to a broad knowledge base, environmental educators often work with mixed age groups or several different groups of varying ages. Environmental educators teach forest pre-schools, lead high school adventure programs, teach college ecology classes and might teach the general public through a local nature center, museum, or park. The generalist nature and broad scope of environmental education makes it inherently interdisciplinary.

What factors do differing methods such as a science field study of the local stream, a rock climbing trip on a high peak in a national park, and young children playing undirected outdoors in nature share that contribute to the development of ecoliteracy in individuals? How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy? To examine

these questions we need to look at the existing research in the field of ecoliteracy, place-based education, adventure education and undirected experiences in nature.

The literature will first provide a foundation for the scope and definition of each pedagogy. This foundation will then be expanded to elaborate on and illustrate that despite the difference in approaches within place-based education, adventure and outdoor education and undirected experiences in nature, each method has an effect on the development of ecoliteracy. Each method will be examined method in the context of current practices. The literature will explore how ecoliteracy and place-based education fit with Next Generation Science Standards (2013), how adventure education can support classroom concepts, obstacles to adventure and outdoor education in traditional classrooms, and the role of undirected time in nature in creating a foundation for the study of science and nature.

Ecoliteracy

Ecoliteracy is knowledge of environmental systems, the issues that affect those systems and the relationships between and interdependence of members of ecological systems, including humans (Center for Ecoliteracy, 2014). Ecoliterate individuals can then apply those principles toward creating sustainable human communities. Goleman, Bennett, & Barlow stated that ecoliterate individuals are “moved to act upon their knowledge, values and understanding in both small ways and large” (2012, p. 3).

In our society it is all too easy to feel isolated. “The Earth is an object composed of separate entities, with humans standing apart and above everything else. Hence, it is easy to imagine ourselves as separate from life' myriad cycles – that we stand apart”

(Uhl, 2013, p. 50). Aldo Leopold argued that “in order for people to feel responsible for nature and to engage in ecofriendly acts, they need to feel connected to nature as a plain and simple member” (as cited in Mayer, 2008, p. 610). When individuals are ecoliterate they can begin to act, think and research solutions to our current environmental crisis' and work towards a more sustainable way of living.

Ecological literacy is collective knowledge. No one person has the capacity to understand all the ways in which human systems interact with natural systems and to act upon all of that knowledge (Goleman, Bennett, & Barlow, 2012, p. 7). When individuals are ecoliterate they can gather and share information “to collectively take action and foster sustainable living” (Goleman, Bennett, & Barlow, 2012, p. 7). “Maintenance of this ecological knowledge is essential for continued support of local conservation efforts and the capacity of communities to self or co-manage their local resources sustainably” (Pilgrim, 2007, p. 1742). Ecoliteracy becomes a tool for collective community action on both local and global levels.

Orr stated that “all education is environmental education … by what is included or excluded we teach the young that they are part of, or apart from, the natural world” (Orr, 1992, p. 30). The importance of our current global environmental issues makes education, ecoliterate education, a fundamental part of having an ecoliterate collective society. The idea of connection to the natural world is a central and recurring theme in ecoliteracy and environmental education.

In the 1970’s ecologist and physicist Barry Commoner developed four laws of ecology; “everything is connected to everything else, everything must go somewhere,

nature knows best, and there is no such thing as a free lunch" (Commoner, 1971, p. 44). Today these ideas are central to environmental education, particularly that "everything is connected and every choice entails a cost" (Bekoff, 2014, p. 11).

The great philosophers perceived education as a questions of how we are to live. We live in a time where the great question is how we will live in light of the ecological fact that we are interdependent and bound together in the community of life (Orr, 2002, p. xi). To navigate our current ecological crisis will require ecoliterate citizens that take a proactive systems-based approach to problem solving.

Measuring Ecoliteracy

As educators, and as a society, it is important that we develop an understanding of what factors contribute to the development of ecoliteracy. Research to measure ecoliteracy and ways of developing ecoliteracy can provide insight into these factors for educators. Frantz and Mayer (2014) argued that "Connectedness to nature is an important variable to assess when evaluating the effectiveness of environmental education programming, particularly if long-term behavior change is a stated goal" (p. 88).

The most widely used scale for measuring ecoliteracy is the Connectedness to Nature Scale (CNS) (Mayer & Frantz, 2004). This scale is based on the work of Aldo Leopold, testing his idea that increases in connectedness to nature predict eco-friendly behavior. The CNS is a 15-item scale intended to tap into individuals' sense of relatedness to nature. They later developed a 10-item scale designed for children. Mayer and Frantz (2004) "demonstrated that the scale significantly predicts eco-friendly

behavior, providing an important empirical test of Leopold's argument that connectedness to nature does, in fact, promote pro-environmental actions" (p. 85).

There are a variety of other scales that have been developed to measure connectedness to nature. In 1999, Kals, Schumer and Montada developed a 16 item scale that measure emotional affinity towards, or love of, nature. In 2001, Schultz developed the Inclusions of Nature in the Self. A scale called the Connectivity with Nature was design by Dutcher, Finley, Luloff and Johnson in 2007 to measure a sense of shared or common essence between the self, nature, and others. Nisbet, Zelenski and Murphy developed the Nature Relatedness Scale in 2008 to assess one's appreciation for an understanding of our interconnectedness with all other living things on earth. The CNS scale developed by Mayer and Frantz (2004) is widely used and has been modified to work for different age groups.

"However connectedness to nature is measured, research consistently shows a reliable relationship between connectedness to nature and self-reported environmentally responsible behavior" (Frantz & Mayer, 2013, p. 86). The CNS has been shown to predict self-reported environmentally responsible behavior across multiple populations, including college students, children and a general adult population (Frantz & Mayer, 2013, p. 86). Measuring ecoliteracy and exploring the development of ecoliteracy in individuals provides important background data for environmental educators in developing effective inter-disciplinary curricula and incorporating various pedagogies with the end goal of developing an ecoliterate society.

Ecoliteracy and Next Generation Science Standards

Next Generation Science Standards are built on a framework designed to "provide a sound, evidence-based foundation for standards by drawing on current scientific research—including research on the ways students learn science effectively—and identifies the science all K–12 students should know" (NGSS, 2013, p. 1). Coyle (2014) believed that "Next Generation Science Standards represent one of the greatest opportunities we have ever seen for having millions of environmentally literate students...we will need to both save people, the planet and have a prosperous and sustainable economy" (p. 1).

The NGSS uses a three part structure of: a) core principles, b) scientific and engineering practices, and c) cross cutting subjects. This transdisciplinary approach with a focus on learning by doing differs from the traditional classroom teaching of science and may provide greater opportunities for methods that promote the development of ecoliteracy in students.

One of the stated goals of the Next Generation Science Standards is to increase scientific and technological literacy with mindfulness of what it takes to thrive in today's society. "Citizens now face problems from pandemics to energy shortages whose solutions require all the scientific and technological genius we can muster" (NGSS, 2013, p. 1). The new standards use a framework of understanding how humans impact the Earth. This makes them an "effective new tool for environmental education in subjects such as biodiversity, wildlife, weather systems, agriculture, transportation, health care, green chemistry, green technology and more" (Coyle, 2014, p. 1).

The framework is designed such that K-12 students will learn science content as it is integrated with real-world applications and common themes. The NGSS science in action approach mirrors a longstanding principle of environmental education focusing on the teaching of skills that can be applied in a real world context. “This teaching method aims to prepare students for success in STEM learning, as well as careers in the field and informed decision-making throughout life” (Whiteacre, 2014, p. 2). These new standards provide a framework for the integration of place-based education methods, adventure and outdoor education methods and providing students undirected time in nature within the curriculum.

Place-Based Education

Place-based education focuses learning within the local community of a student. It provides learners with a path for becoming active citizens and stewards of the environment and place where they live (Center for Place-Based Education and Community Engagement, 2014). The resources of the community are brought into the learning process in a way that makes education exciting. Place-based educators “design learning activities that could potentially engender a sense of appreciation or positive regard about students’ home communities and regions” (Sobel, 2005, p. 58). The approach emphasizes hands-on, real-world learning experiences that challenge students to learn and solve problems.

Place-based education experiences come in many different forms. Students might work in a school garden, take part in a community project, go into their schoolyard or community to study nature or natural history, take part in a citizen science or project or

participate in community service. Local adventure and outdoor educational experiences can by place-based allowing students to spend more time in their local environment. Place-based projects can also include a reflective requirement that encourages students to simply spend time in their local environment and "increase knowledge, develop skills and clarify values" (Center for Place-Based Learning and Community Engagement, 2012, p. 4).

A kindergarten class might spend time searching for frogs in their local stream while learning about amphibians. A second grade class might grow vegetables in the school garden plot as part of a curriculum studying soil science, seasonal changes and weather patterns. A sixth grade class could visit the local nature center to help tag and count monarch butterflies for a citizen science project. Middle school students might take a day hike up a local mountain or through a local conservation area while learning about local geology and ecology. High school students might help build a community garden as a service project for their communities. College students might go kayaking on a local river while studying the local watershed. A mixed-age naturalist study group might take time making local observations of weather patterns, plants and animals. All of these examples allow students to develop a sense of place by using the local environment as a classroom.

Orr (1992) stated that "for a world growing short on many things, the next sensible frontiers to explore are those places where we live and work" (p. 258). He offered that place-based education is important for four key reasons. First, it requires combining intellect with experience through direct action. Second, the study of place is

relevant to the problems of overspecialization. “A place cannot be understood from the vantage point of a single discipline or specialization” (p. 129). A study of place encourages “diversity of thought and a wider understanding of relatedness” (Orr, 1992, p. 129). Third, the present study of place gives rise to many significant projects that serves to improve policy and practice in communities. These activities leading to more sustainable community practices can promote policy change related to “food, energy, architecture, and waste” (Orr, 1992, p. 129). Lastly, the study of place offers a reeducation in the art of living well where we are. “Some view the destruction of local community life as a source of the instability, disintegration and restlessness which characterize the present epoch” (Orr, 1992, p. 130). Orr proposed that those who inhabit the land and have a relatedness to it are more invested in making ethical and ecologically sound decisions about the use they make of the land.

Bekoff (2014) suggested that when this sense of connection to place is fostered and restored “it is easy to see and do what’s right” (p. 41). Developing a sense of place that focuses on local knowledge can help to achieve a wider perspective that “stresses an interdisciplinary approach and seeing the world as an interconnected community” (Bekoff, 2014, p. 17). One of the primary reasons for incorporating more educational experiences in the local environment is “to acquaint young people with the nonhuman assets encountered in their home places. Once children and youth value those assets, they will more likely be disposed to care for and protect them” (Sobel, 2005, p. 47).

“Place-based educators believe that schools should prepare people to live and work to sustain the cultural and ecological integrity that focuses on the places they live”

(Thomashow, 1995, p. 170). Research on place-based education suggests that a sense of place fosters pro-environmental behavior, and related emotions, attitudes, and behavioral intentions. “When participants purposefully consider their relationship to the landscape, they relate more closely to their world . A sense of rootedness in a place leads to a sense of personal concern for that place” (Knapp, 2005, p. 278). Orr (1992) contended that a sense of rootedness motivates people to act responsibly towards the environment.

A 1998 survey of 300 residents in Spitsbergen, Norway found “a significant correlation between strength of place attachment and willingness to actively contribute to solutions for potential environmental problems” (Kaltenborn, 1998, p. 172). When 259 visitors to a Canadian national park were surveyed (Walker, 2003), the result was that “place attachment positively predicted pro-environmental behavioral intentions” (p. 75). A 2010 survey (Halpenny) of 355 park visitors found that “place attachment predicted both place-specific pro-environmental behavior and general pro-environmental behavior” (p. 410). Vaske and Kobrin (2001) surveyed 182 youths age 14-17 that had participated in a conservation work program and found that place “attachment predicted general and specific environmentally responsible behaviors” (p. 17).

A study conducted in 2010 that examined the ways in which sense of place inspired ecoliteracy and environmental stewardship, concluded that “placed based-education is an ideal venue for helping students develop a resilient environmental ethic” (Litz, 2013, p. 1). Through place-based educational experiences “the welfare of the environment is made personally significant to students while simultaneously they are developing critical thinking and ecoliteracy skills” (Litz, 2013, p. 1). Aldo Leopold

believed that “if students and educators could develop literacy to know and read the local landscape, they would come to know respect, and love their places” (as cited in Knapp, 2005, p. 281). Louv (2008) argued that an environment-based educational movement “will help students realize school isn’t supposed to be a polite form of incarceration, but a portal to the wider world” (p. 226). Knapp (2005) suggested that experiential educators might take up Leopold's challenge to incorporate a sense of love, respect and admiration for the land to add to their repertoire of hard and soft skills, and their knowledge of outdoor adventure activities.

Place-based education and Next Generation Science Standards. Using the environment as a context for learning is built into the transdisciplinary nature of the NGSS. “It’s fairly easy to use the environment to teach multiple things in science” (Whiteacre, 2014, p. 1). By bringing the neighborhood and community into the science classroom, students learn “that science is not only applicable to events in the classroom, but it also extends to what they experience in their homes and what they observe in their communities” (NGSS, 2013, p. 10 - Appendix D). Place-based learning gives a more central role to students’ lived experiences and identities. NGSS stated that this community context for science education “capitalizes on the community resources and funds of knowledge to make science more culturally, linguistically, and socially relevant for diverse student groups” (NGSS, 2013, p. 10 - Appendix D).

Environment-based, place-based education produces student gains in social science, language arts, and math; improves standardized test scores and grade-point averages; and develops skills in problem solving, critical thinking, and decision making

(Louv, 2008, p. 206). A 2005 California Department of Education study of at-risk sixth grade students who attended three several month long outdoor education programs showed a 27% increase in measured mastery of science concepts; enhanced cooperation and conflict resolution skills; gains in self-esteem, problem solving, motivation to learn, and classroom behavior (Louv, 2008, p. 208).

NGSS and the principles of place-based education are highly compatible. Both methods encourage a cross curricula approach, the need for authentic forms of assessment, and creativity in curriculum development. Hackworth (2015) concluded that "the principles of place-based education can serve as a guide for developing new curriculum using the NGSS" (p. 68).

Within the context of place-based learning, the problem-solving focus and learning-by-doing nature of NGSS, also provides a framework for incorporating adventure and outdoor education methods into the curriculum.

Adventure & Outdoor Education

Another pedagogy for developing ecoliteracy is adventure and outdoor education. This method of education draws on both experiential education and environmental education. Learning takes place outdoors through structured activities such as hiking, canoeing, rafting, ropes courses, mountain climbing, camping and wilderness journeys. This form of education emphasizes the effect of the natural environment on human beings, the educational role of stress challenge, and hands-on learning (Bogner, & Wiseman, 2004; Palmberg & Kuru, 2000; Schwartz et al., 2012).

One example of adventure outdoor education is a residential program where students have first hand opportunities to explore the environment, adventure-based challenges and develop stewardship skills in an active outdoor setting. Stern, Powell, & Ardoin (2008) evaluated a 5-day residential program that took place at the Great Smoky Mountain Institute in the Great Smoky Mountain National Park. They found significant positive, short-term effects in connection with nature, environmental stewardship, interest in learning, and awareness of the national park. A 3-month post test evaluation indicated retention of significant gains in environmental stewardship and awareness.

Bogner and Wiseman (2004) also examined the participants of a residential adventure program for adolescents. He looked at the pupils' knowledge of conservation and their attitudes towards nature and the environment. The study found that pupils in outdoor settings move towards a higher level of environmental awareness (Bogner & Wiseman, 2004, p. 38). They proposed that outdoor education may provide "a response to the urgent need within biology education to shift away from a materialistic and atomistic worldview, and its epistemological paradigm shift towards an ecological approach with its network thinking and its sense of identification with background pattern" (2004, p. 43).

A study done by Palmberg and Kuru (2000) looked at a outdoor education program for 11 and 12 year olds in Finland where students hike, camp, canoe and ski. When the study compared students who were experienced in outdoor activities with students who were not, it found that students experienced in outdoor activities have a strong and clearly definable empathetic relationship to nature (Palmberg & Kuru, 2000,

p. 34). The study concluded that both knowledge and values are required in decision making. “Knowledge that enables pupils to understand the dependence and interactive relations between man and nature will, together with personal values, form a basis for a willingness to act” (Palmberg & Kuru, 2000, p. 35). The activities of outdoor education stimulate environmental education and nature studies allow students to learn about and experience nature while simultaneously learning strategies to protect it (Palmberg & Kuru, 2000, p. 36).

Schwartz et al. (2012) examined the effect of an outdoor activity day on urban city-dwellers. People living in urban Paris were invited to participate in a day of conservation activities. This short activity day “seems to increase people's knowledge, awareness, interest and concern” (Schwartz et al., 2012, p. 1). The study found that short activities may only have limited environmental impact but proposed that when repeated locally, outdoor programs could enhance people's experience with nature in cities and achieve conservation goals more fully.

Adventure and outdoor education “gives teachers and students an opportunity to have experiences in an outdoor setting while instilling an appreciation for fish, wildlife and our natural resources” (Steinhaus, Cox, & Tudor, 2009, p. 22). All the activities encourage the students to think critically and promote the main idea that every person adds value to the team in their own unique way. “By providing learning experiences in subject matter not found in typical classrooms, outdoor Education cultivates leadership from those who may struggle in school and build up that exceptional sense of individual and long lasting self-worth” (YMCA Camp Bernie, 2015, p. 27).

Eaton believed that participating in outdoor activities that include a measure of risk could help build positive character traits in youth, as well as cultivate their sense of wonder, curiosity, and respect for all living things (Schwab & Dustin, 2014, p. 27). "Outdoor education opportunities increase awareness and concern for the environment, as well as, shaping relevant behavior towards the environment, and in the long range, towards reducing human impact on nature" (Bogner & Wiseman, 2004, p. 27). As educators providing opportunities for students to have structured directed experience in nature and the outdoors, whether in a remote rural or urban area, can build a foundation for developing ecoliteracy.

Barriers to adventure education. Adventure and outdoor education experiences have typically not been part of the traditional classroom environment. Adventure and outdoor experiences are typically led by informal educators through camps, adventure programs, and nature centers. Some examples of adventure and outdoor education programs are: outdoor clubs at colleges and universities, programs at large outdoor schools like the National Outdoor Leadership School and Outward Bound, Boy Scouts and Girl Scouts programs, residential and adventure camp programs, programs for persons with disabilities, programs that are part of mental health treatment, and challenge courses.

While some teachers and schools work to incorporate these opportunities into the curriculum, other schools have barriers; financial cost, time, social influence, access to equipment, lack of teachers with any training or background in outdoor education and liability concerns. "Many youth will never embark on an extended backcountry adventure

experience where they are immersed in nature with a small group of peers" (Sibthorp, 2011, p. 114).

There are programs trying to address this disconnect and increase accessibility. Project Adventure offers training to educators who wish to incorporate the use of adventure activities and techniques into their schools and classrooms. Their goal is "to integrate the best practices of the adventure modality with the content and context of K-12 schooling" (Sibthorp & Morgan, 2011, p.115). Another example is Outward Bound's move to more urban centers and expeditionary learning schools. "This represents a strategic decision to move the successful Outward Bound process closer to populations that might otherwise find this programming inaccessible" (Allen & Barcelona, 2011, p. 120).

In Utah, Cavett Eaton developed the Healthy Lifestyles and Outdoor Explorations Skills program, a non-traditional physical education program for the local grade 6 through 12 public school system, by combining public school resources and parks and recreational resources (as cited in Schwab & Dustin, 2014). His program uses adventure activities such as bicycling, kayaking, swimming, walking, hiking, camping, and slacklining activities to offer students the opportunity to engage in problem solving, critical thinking, and technical skill building. Eaton built abundant opportunities into his physical education program to experience nature and to explore, question, wonder, and participate in outdoor activities (as cited in Schwab & Dustin, 2014, p. 27).

Utilizing adventure education experiences presents challenges for classroom educators but these examples offer a few ways to increase accessibility. Private adventure

and outdoor organizations can be encouraged to offer programs in more urban communities and populations with limited access. Adventure programs can offer trainings and opportunities for classroom teachers to learn ways to incorporate adventure and outdoor learning into their curriculum. Building on this environmental educators can utilize collaboration between existing school resources such as physical education programs, parks and recreation staff and facilities, and school facilities.

These experiences provide an immersion based introduction to nature. These experiences in combination with place-based opportunities and undirected time in nature become the foundation for students to build a relationship with the environment.

Undirected Nature Experiences

Undirected experiences in nature can range from free play outdoors as a child, to solo walks in the woods, sitting in nature, family camping trips, and time spent outdoors doing some activity other than a structured learning environment.

There is little doubt to anyone who has read the journals of Henry David Thoreau, John Muir, Aldo Leopold, and Rachel Carson that the time each of these individuals spent exploring and observing the natural world significantly influences their attitudes and behaviors. Thoreau used Walden Pond as a reflective mirror with which to learn natural history and to expand his sense of self in relationship to nature (as cited in Thomashow, 1995, p. 29). Muir stated that “most people are on the world, not in it – have no conscious sympathy or relationship to anything about them...but when one gets close to Nature, and the love of beauty grows” (Muir & Teale, 1954, p. 315). Leopold's land ethic and concept of a biotic community, recorded in the *Sand County Almanac*, grows

out of direct observations through the seasons and a close encounter with a dying wolf. Carson immersed herself in the micro habitats of the edge of the sea and her "feelings of wonder and love [for nature] become starkly contrasted with impressions of pain and loss, as she warned Americans about the devastating threats to nature" (as cited in Thomashow, 1995, p. 29). Each of these figures of the environmental movement had their ecological identity shaped by their experiences in the natural world.

Horwitz (1996) examined life experiences that had influenced environmental activists and found the most common influence to be nature experiences during childhood. The outdoors was also listed as an important influence in adolescence. Participants in the study proposed several effects of early experiences with nature "learning directly about nature itself or about human caused problems in nature, instilling a love of nature, giving them a desire to work outdoors in adulthood, providing an emotional refuge or a source of creative inspiration and recreation" (Horwitz, 1996, p. 34). Participants also described comparable experiences during adulthood as being important. "One cannot spend much time outdoors without becoming sensitized to the wonders of nature/earth, this becomes a source of inspiration to protect these natural systems" (Horwitz, 1996, p. 37).

Arnold, Cohen, & Warner (2009) examined the formative influences of young environmental leaders. In every interview time spent in nature was mentioned as an influence. These were both intense immersion experiences in the natural world and unstructured and habitual contact with nature through play beginning in childhood. Ewert, Place, and Sibthorp (2005) also looked at early life outdoor experiences and

environmental attitudes and concluded that the values that a child forms through experiences such as direct play in the natural environment may serve to precondition him or her to developing a pro-environmental, or eco-centric set of beliefs and attitudes, about the environment later in life (Ewert, Place, & Sibthorp, 2005, p. 234).

A policy action plan developed by the National Wildlife Federation stated that "children who spend time in nature are more likely to have pro-environmental attitudes as adults" (White, 2008, p. 11). This study found that direct childhood experiences before the age of 11 promoted a long-term connection to nature. When interviewing adults about environmental attitudes and behaviors environmental leaders consistently attributed their commitment to a combination of two sources: Many hours spent outdoors in a keenly remembered wild or semi-wild place in childhood or adolescence, and an adult who taught respect for nature. The National Wildlife Federation action plan concluded that the most important factor of long-term environmental attitudes is many hours spent outdoors in natural habitat during childhood or adolescence (White, 2008, p. 14).

Noortgaete and Taverneir (2014) proposed that "repeated, participative and emotionally engaging experiencing of nature for motivation provide opportunities to be addressed by nature in a way that invites us to interpretation...leads to commitment and motivated pro-environmental behavior" (p. 580). Spending time in nature allows for the development of a relationship with nature which in turn encourages people to care for the environment.

Nature deficiency. Today children and adults are aware of global threats to the environment and even develop a fear of ecological deterioration that Sobel (1998) called

ecophobia while at the same time they have no personal relationship with nature itself. "Within the space of a few decades, the way children understand and experience nature has changed radically" (Louv, 2008, p. 1). In the United States, children and adults are spending less time playing outdoors. "From 1997 to 2003, there was a decline of 50 percent in the proportion of children nine to twelve who spent time in such outside activities as hiking walking, fishing, beach play and gardening" (Louv, 2008, p. 35). Every year, a smaller percentage of Americans are engaging in nature-based activities. Since the late 1980s, participation is down 18 percent to 25 percent from peak levels (Nielson, 2008, p. 1).

Louv referred to this lack of relationship with nature as nature-deficit disorder and lists the human costs as: diminished use of the senses, attention difficulties and higher rates of physical and emotional illness (Louv, 2008, p. 36). "Exposure to nature may reduce the symptoms of Attention Deficit Hyperactive Disorder (ADHD), and that it can improve all children's cognitive abilities and resistance to negative stresses and depression" (Louv, 2008, p. 35). Ginsberg (2007) found that unstructured outdoor play benefited cognitive development, mental health, and the social and emotional well-being and gave children an opportunity to learn how to solve problems, self-regulate, and to value intrinsic interests (p. 189). Researchers in England and Sweden found that time exposure to nature also benefited adults. Adults who spent time exercising in a natural green setting with trees, foliage and landscape views felt "more restored, and less anxious, angry, and depressed than people who be exercised indoors" (Louv, 2008, p. 49).

Sobel (1998) stated that as educators we must "allow them to love the Earth before we ask them to save it" (p. 1). The Wildwoods Foundation (2014) proposed that sometimes educators have "to get out of the way and allow students to have their own moment and begin to develop their own personal relationship with nature" (p. 1). Teachers model behaviors to students through their own attitudes and relationship towards nature. "Parents, friends and teachers set examples through their attitudes and behaviors, and the consequences of those attitudes and behaviors" (McFarland, Zajicek, & Waliczek, 2014, p. 527). One of the goals of environmental educators is to work to connect children, families and communities to the natural world. The healthy way to foster environmentally aware, empowered students is through "supporting children's biological tendency to bond with the natural world" (Sobel, 1998, p. 1).

Conclusion

The existing literature shows a clear connection between ecoliteracy, place-based education experiences, adventure and outdoor education experiences and undirected time in nature. Place-based educational experiences might include teacher-led instruction and more traditional classroom type studies and include time for observation, field studies or science projects in a particular place. Adventure and outdoor educational experiences often have a stronger hands on and physical skills focus and less or no academic instruction. Undirected experiences in nature are an opportunity for individuals to spend time exploring nature without being led, directed or having a structures focus. What each of these methods share in common is that individuals getting an opportunity to spend time outdoors in nature.

To develop a greater understanding of how each of these methods might influence an individual's' environmental awareness and behavior, I will conduct a study that examines the ecoliteracy of individuals in connection with place-based education experiences, adventure and outdoor education experiences and undirected time in nature looking for insight into how each of these pedagogies contribute to that individual's sense of ecoliteracy. My hope is that this data will assist environmental educators and naturalist in designing and planning their curricula with the goal of developing ecoliteracy in their students.

Introduction to Chapter Three

Chapter three describes the action research methods used in my study. The purpose of my study is to examine how place-based education, adventure and outdoor education and undirected experiences in nature can develop ecoliteracy in students. My research was divided into four parts. The data for the first three parts of my research is gathered through an online survey that includes having participants complete survey that included the Connectedness to Nature (CNS) scale, a series of nine Likert scale survey questions that focus on place-based education, adventure and outdoor education and undirected experiences in nature, and a series of nine open ended questions that focus on each theme. The four part of data collection will be done through in-person interviews that utilize the same nine open ended questions from part three. The in-person nature of these interviews will allow for follow up questions and provide greater context to the survey data.

CHAPTER THREE

Research Methods

The intention of this research was to study how place-based education experiences, adventure and outdoor education experiences and undirected time have impacted the ecoliteracy of individuals. The literature I reviewed in chapter two showed each of these methods can have a positive impact on ecoliteracy. To examine how this occurs for differing populations I utilized multi-instrument case study research method through mixed methods in four parts.

A Case Study

Case study research methods are used to find "holistic and in-depth explanations of the social and behavioural problems in question" (Zainal, 2007, p. 354). "Case studies are pertinent when your research addresses either a descriptive question—What is happening or has happened?—or an explanatory question—How or why did something happen?" (Yin, 2003, p. 5). Case studies can be qualitative, quantitative or both. This type of research allows for the "study of a phenomenon within its real-world context which can provide rich descriptions or insightful explanations" (Yin, 2003, p. 5). As an environmental educator, case study research can be a tool to examine how students are affected by educational experiences and use this information in the future development of lessons and curriculum.

Mixed-Methods

Mixed methods research is an approach involving the combining of quantitative and qualitative data in a research study. The method resides in the idea that all methods have bias and weaknesses and the collection of both quantitative and qualitative data neutralizes the weakness of each form of data (Creswell, 2014, p. 15). My research used an explanatory sequential mixed methods approach where I first conducted quantitative research through a Likert type study and analyze the results. I then built on those results in greater detail through qualitative research through the use of open ended questions using an online survey and a set of in-person interviews. The qualitative data provides context and provides more complete understanding of the initial quantitative data.

Gathering data through both quantitative and qualitative methods enabled me to better uncover any issues related to bias or to see multiple perspectives related to the same quantitative data points. Using a mixed-method approach builds on the "strength that exist between quantitative and qualitative methods to understand a phenomenon more fully than is possible using either method alone" (Mills, 2011, p. 5). The quantitative data collected in the second part of data gathering could be compared to and cross checked with the the qualitative data gathered in the third and fourth part. This overlap of mixed methods data collection allows for triangulation of the data.

Setting and Participants

I utilized my existing network of students, educators, friends and contacts along with Internet social networking tools, to have a large population for the data. I obtained a diverse cross section of one hundred sixty eight individuals for the survey.

The target population for data collection was a wide-age range that includes five categories: Kindergarten through 6th grade (approximate ages 6-12), Middle School or High School (approximate ages 13-17), College student (undergraduate), Adult (general population over age 18 and under 60, not in college as an undergraduate), Senior (age 60 and above). The reason for choosing to use such a large age range for data collection is two-fold. First to look for factors that may be common across ages groups or specific to a particular age group. The second reason is that environmental educators and naturalists, who this research is intended for, are often teaching to mixed age groups or working with several different groups of varying ages.

In spring 2016, I sent out a brief introduction to my survey via email and social media tools inviting participation in the study with link to the consent form, the survey and an option to schedule an in-person interview. Participants also were able to and encouraged to invite others to participate in the survey. Ten in-person interviews were conducted with volunteers having at least one individual from each age group. In-person interviews were conducted in a neutral public location.

A Four Part Process

The first two parts of my data collection gathered quantitative data through the use of a Likert scale survey (see Appendix A). Parts two and three consisted of a series of essay questions and in-person interviews. The scale asks participants to indicate whether they strongly agree, agree, are neutral, disagree, or strongly disagree with each statement. Each response corresponds with a point value. “The responses to such a survey can be reduced to numbers, but the data are still largely descriptive” (Mills, 2011, p. 91). The

numerical data from point values allows me to infer whether participants have a positive attitude towards a particular survey item and/or an their overall attitude towards the research topic. The essay and interview responses provide context for and additional feedback on the numerical data.

Part One: The CNS Scale

The first part is the collection of data using the Connectedness to Nature Scale (CNS) survey. This is a scale developed in 2004 by Mayer and Frantz. It is based on Aldo Leopold's concept for the land ethic; “A thing is right when it right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise” (Leopold, 1949, p. 225). This research functions from the assumption that the current state of ecological problems is a scientific fact and that it is to the benefit of society in general to have a more ecoliterate population.

Starting with the quantitative data on ecoliteracy from the CNS scale provided a foundation for data collection built on a pre-existing, accepted and tested tool for the evaluation of ecoliteracy. The original CNS is a fourteen item five point Likert type scale that gathers quantitative data. The CNS scale is one of the most widely used tools for measuring a connection to nature in relation to ecoliterate behavior. It has been used around the world and translated into several languages. The CNS consistently predicts self reported environmentally responsible behavior (ERB) and often explains the relationship that other variables have. It has an internal consistency rate of approximately .84 and a test retest reliability of approximately .79. It has been shown to predict self

reported ERB across multiple populations, including college students, children and a general adult population (Mayer & Frantz, 2004, p. 504).

This research, like the CNS scale, functions from the assumption that it is to the benefit of society in general to have a more ecoliterate population. By having participants first complete the CNS scale the underlying assumption about a pre-existing connection or concern for nature inherent in the remaining data can be determined. For example an individual who self reports no sense of connection to nature on the CNS scale is not the target audience of the survey and questionnaire in the remaining data collection. Those responses were eliminated from the data collection group for the remaining research collection. In order to examine how factors contribute to ecoliteracy the data will need to be gathered from only those individuals that self report a sense of connectedness to nature and ecoliterate behavior. The later steps of data collection are built upon the framework that the participants have a basic working definition of ecoliteracy and have had time to reflect on the factors that have influenced their own level of ecoliteracy.

Part Two: Survey Questions

The second part in my data collection, again using a quantitative approach, built on this with a set of survey questions directly focused on place-based experiences, adventure and outdoor experiences and undirected time in nature. This set is nine items using a four-point Likert scale designed to gather data focused directly on the three themes of my research; placed based experiences, adventure and outdoor experience and undirected experience in nature (see Appendix A). These nine questions are the

foundation for the interview type questionnaire used as the third and fourth parts of data collection.

Part Three: Open Ended Questions

The third part of gathering data was qualitative, a series of nine open-ended questions, asked through an online questionnaire, to explore the meaning, influence and impact these individuals derived from and ascribe to their experiences with place-based experiences, adventure and outdoor experience and undirected time in nature and how they think it attributes to their ecoliteracy (see Appendix A). The open-ended questions provide deeper insight into some of the connections between the data and better illustrate any commonly occurring patterns that arise from the data.

Part Four: Interviews

To provide a greater insight into how each of these themes has impacted individuals, I conducted in-person interviews with a smaller sample of 10 participants with at least one individuals from each age group as the fourth part of my data collection. These interviews were based on the same set of nine questions used in the third part of the online survey (see Appendix A). These interviews provided information that can be compared and contrasted with self reported survey data. The in-person format allowed for follow-up questions that provided additional insight and a more complete picture. Conducting in person interviews provided an additional method of data collection, allowed me to compare the responses to self reported survey data, and fill in any gaps or limitations of the survey data.

Data Collection

I collected data from January 25, 2016 to March 1, 2016. Both the quantitative and qualitative data in part one, two and three are cross sectional and were gathered through an online tool, SurveyMonkey. My hope was that by utilizing a survey method that allowed participants to answer the questions from their own home at a time that works best for them, I would retain more participants for the entire process of data collection and avoid non-responses or rushed responses.

Survey Content

The content of the research began with an introduction to my project that included my research questions, a definition of the terms ecoliteracy, place-based education, adventure and outdoor experiences and undirected experience in nature. It explained the three part data collection process and a brief explanation of action research and the Connectedness to Nature (CNS) scale. In order to meet the Human Subject Research requirements, this was followed by an acknowledgement of consent that included a section for parental consent for minors that participate in the project and a link to the SurveyMonkey privacy policy (see Appendix A).

Human Subjects Committee

A human subject review was completed after my research proposal was approved. I completed Hamline University's Human Subject Committee (HSC) long form and submitted it to the Institutional Review Board (IRB). Since my research was done independent of a particular school district or organization I did not need consent from any

outside organization. I provided the IRB with information concerning the expectations for the participants, setting of my research and a description of my study.

Survey Consent

Consent for survey participation was required through the use of an initial webpage consent document (see Appendix B) that then sent participants to the SurveyMonkey website. Names were used only as a validation of consent. No names or IP addresses were used in the organization or reporting of data. The SurveyMonkey tool allows data to be on a secure site using the https protocol and to be encrypted. This tool also provided permission to conduct research using SurveyMonkey for academic and institutional research. The US Department of Health and Human Services stated that this meets the criteria as a collection method for gathering electronic consent; "One method of allowable electronic signatures in some jurisdictions is the use of a secure system for electronic or digital signature that provides an encrypted identifiable 'signature'." (US Department of Health and Human Services, 2011, p. 1). Participants were given the recommendation to print the first page of the survey so that they have a record of the survey description and their consent.

Interviews and Consent

For the in-person interview all participants were given an informed consent document (see Appendix C) that included an introduction to my project that including my research questions, a definition of the terms ecoliteracy, place-based education, adventure and outdoor experiences and undirected experience in nature.

Data Organization

Participants were asked to list their age group in one of five categories. This allowed the data to be stratified by age groups without any identifying names or IP addresses.

The first part of my data organization used the results of the CNS data to organize any participants to find a target population of ecoliterate participants for data collection when comparing the remaining parts of the research. Then I stratified the data in age groups. Qualitative data gathered from interview questions was be coded into themes and subtopics to explore the meaning individuals ascribe to each. Finally the two forms of data, quantitative and qualitative, were integrated into a table to cross check the nine item quantitative responses with the nine item qualitative questionnaire responses looking for deeper insight into each theme.

Data Analysis

To analyze the data the CNS Likert type CNS score was converted to a percentage score to get a CNS value on a scale from 0-100. This allowed for participants to be divided into a highly ecoliteracy group that score in the top 50 percent and top 25 percent of reported values. The range of CNS values was between .41 and .85 with a majority of participants, 139 of 168, scoring in the in the top half of that range above the median value of .63. The responses for this group on the remaining survey questions on place-based education, adventure and outdoor education and undirected time in nature were then compared to the CNS value to look for factors that influence ecoliteracy.

Conclusion

By researching deeper into individual feedback about place-based educational experiences, adventure and outdoor education experiences and undirected experiences in nature I hoped to uncover connections and relationships that can assist environmental educators and naturalist in designing and planning their curricula with the goal of developing more ecoliterate students.

Introduction to Chapter Four

Chapter four presents and analyzes the quantitative data collected from surveys and the qualitative data collected from open ended questions and in person interviews answering the question: How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy? I report the themes and relationships that emerged from the data analysis for each theme in relationship to ecoliteracy.

CHAPTER FOUR

Results

The purpose of my research is to study how place-based education experiences, adventure and outdoor education experiences, and undirected time have impacted the ecoliteracy of individuals. I conducted research in four steps that included: 1) survey questions designed to calculate a participant's CNS score; 2) survey questions related to place-based education experiences, adventure and outdoor educational experiences and undirected time in nature; 3) open-ended essay questions; and, 4) in-person interviews focusing on each theme. The results include quantitative data collected from surveys and qualitative data collected from open ended questions and in person interviews. This data provides insight on how place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy?

Survey Responses

The survey collected 168 responses of which 11 were from individuals in the kindergarten through 6th grade age range, 7 were from middle and high school students, 1 college students, 120 adults and 19 seniors age 60 and above (see Table 1).

Table 1.

Responses

Total Responses	
Total Survey Responses	**168**
Kindergarten through 6th Grade	11
Middle and High School	7
College	11
Adult	120
Senior	19
Total Essay Responses	**109**
Kindergarten through 6th Grade	5
Middle and High School	4
College	5
Adult	77
Senior	18
Total Interviews	**10**
Kindergarten through 6th Grade	2
Middle and High School	2
College	2
Adult	3
Senior	1

Survey responses for all 168 participants were then ranked by the CNS scores. The CNS was calculated by responses to the first 15 survey questions. Each answer had a value between 1 and 5 with the highest possible total being 75. These were then converted to a percentage based CNS value. The highest CNS score in the all participants group was a 64 out of 75 for a CNS value of 85%. The lowest scoring response was 41 of 75 for a CNS value of 54%. The median score was calculated at .63%.

This data was then divided into four groups (see Table 2) by CNS value to determine the relationship between the CNS value and scores on place-based education,

adventure and outdoor education, and undirected time in nature. A majority of the responses, 139 of 168 participants, scored above .63 as a CNS value. Approximately 27% of participants, or 46 of 168, scored .74 or greater on the CNS value. The lowest two categories included only 29 participants, with 24 scoring between .52-.62 and only 5 scoring between .41-.51.

Table 2.

CNS Scores Divided into Four Quarters

CNS Values in Quarters		
Group 1 (highest CNS Values)	Values from 74-85%	46 respondents
Group 1 (above median)	Values from 63-73%	93 respondents
Group 3 (below median)	Values from 52-62%	24 respondents
Group 4 (below median)	Values from 41-51%	5 respondents

Separating out participants who scored above 63% and above 74% allows a comparison of those participants who scored high on the CNS value versus responses to questions about place-based education, adventure and outdoor education and undirected time in nature. In order to study factors that influence ecoliteracy, the target population for this study are participants who self identify as ecoliterate. For this reason the 29 participants who scored below a 63% on the CNS value were not used when evaluating factors that influence ecoliteracy. Each of the three topics of place-based education, adventure and outdoor education and undirected time in nature were represented by three survey questions (see Appendix A).

The group with the highest values on the CNS scale scored between 74-85%. Of these 46 of participants, over 60% of the group, scored 100% on placed-based education

(see Figure 1). A majority of this group, 80% of the group, scored greater than 80% on place-based education.

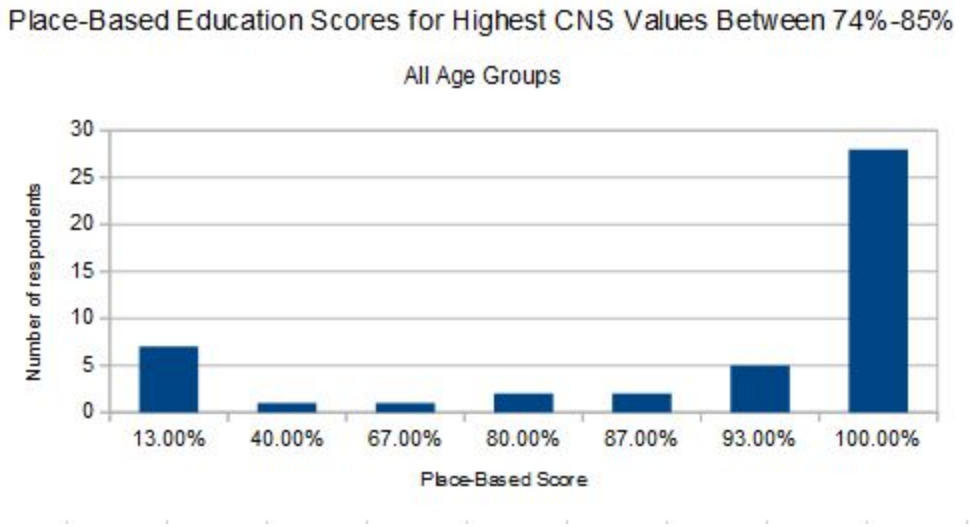

Figure 1. Place-based education scores for highest CNS values.

Adventure and outdoor education scores were high in this group with 23 participants scoring 100%. Greater than half of the group, 68%, scored 80% or greater on adventure and outdoor education (see Figure 2).

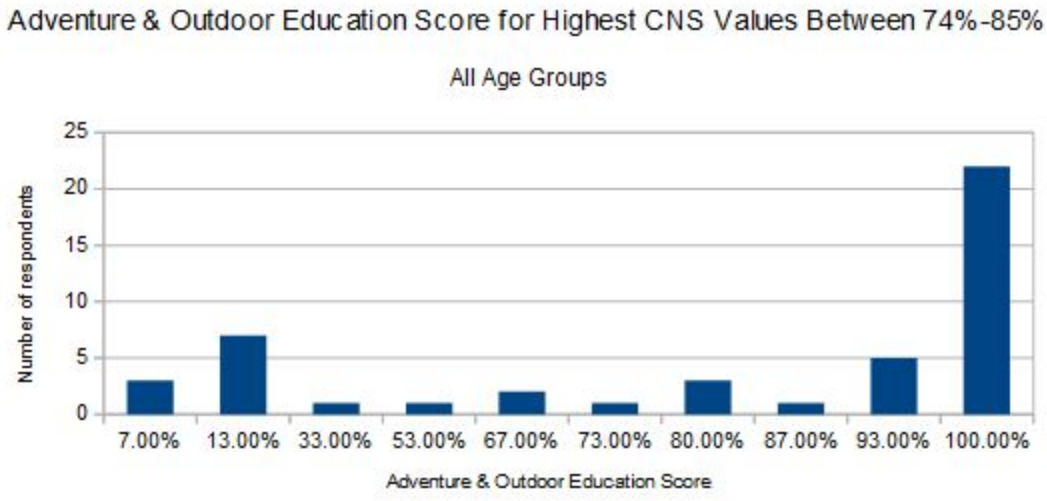

Figure 2: Adventure and outdoor education scores for highest CNS values

Scores for Undirected Time in Nature were also high in this group with 34 participants, 74% of the group, scoring 100%. In this group of the high CNS values 94% of the group scored 80% or above for Undirected Time in Nature (see Figure 3).

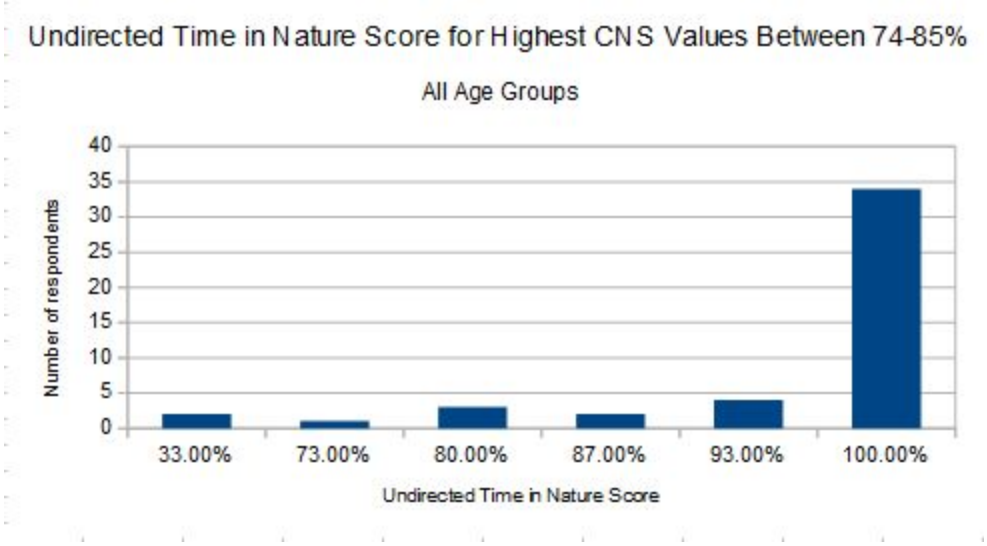

Figure 3: Undirected time in nature scores for highest CNS values

Of this group of participants with the highest CNS values, place-based education scores, adventure and outdoor education scores and undirected time in nature scores were high. Over two-thirds of the group scored higher than 80% on all three categories.

The second group in the study compared were CNS values between 63-73%. In this group 13 participants scored 100% on place-based education with over just over half of the group scoring 80% or greater in place-based education (see Figure 4). In adventure and outdoor education 10 of participants in this range scored 100% with 64% of the group scoring 80% or greater in this category (see Figure 5). Undirected time in nature scores continued to be high in this group with 38 participants scoring 100% and 85% of

the group scoring equal to or greater than 80% (see Figure 6). Overall more than half the participants in this CNS score range scored 80% or greater in all three categories.

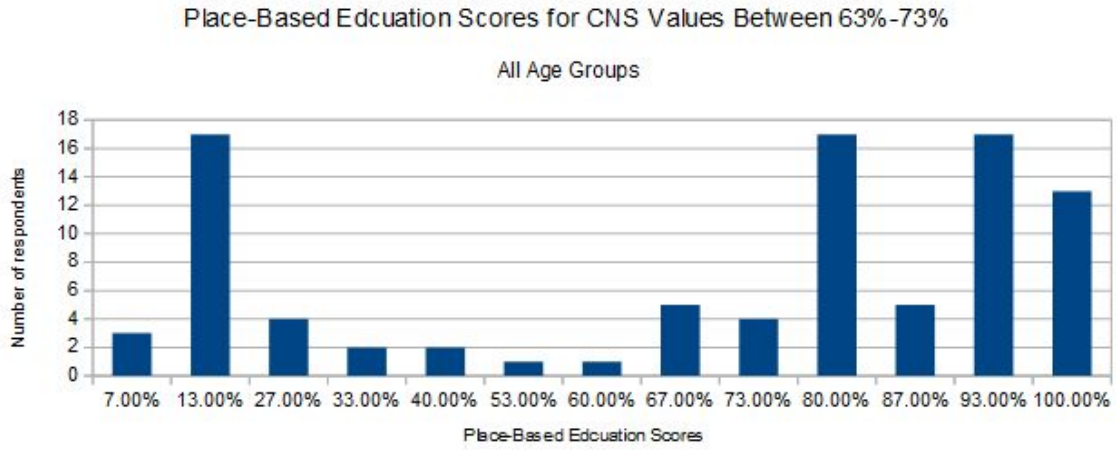

Figure 4: Place-based education scores for CNS values between 63%-73%

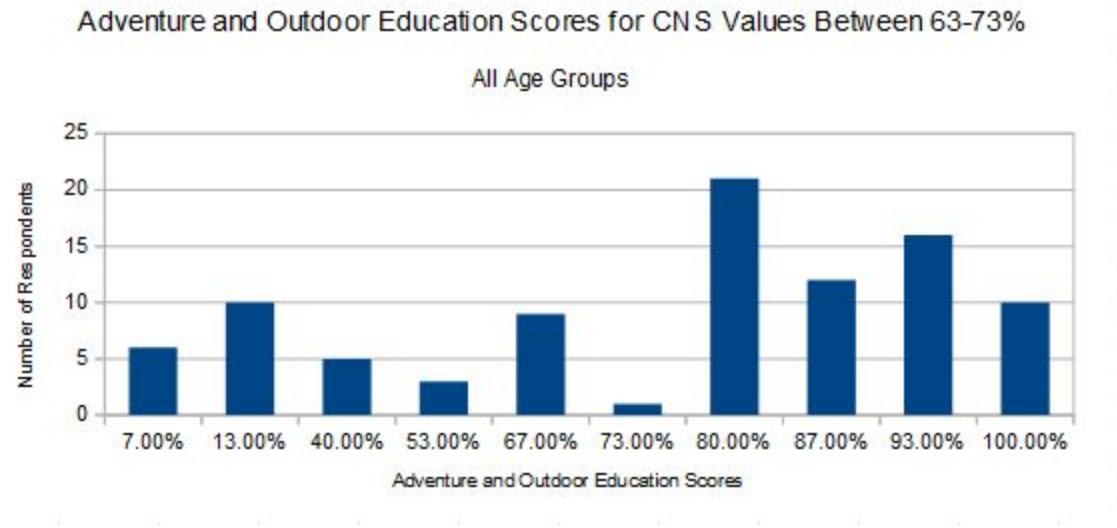

Figure 5: Adventure and outdoor education scores for CNS values between 63%-73%

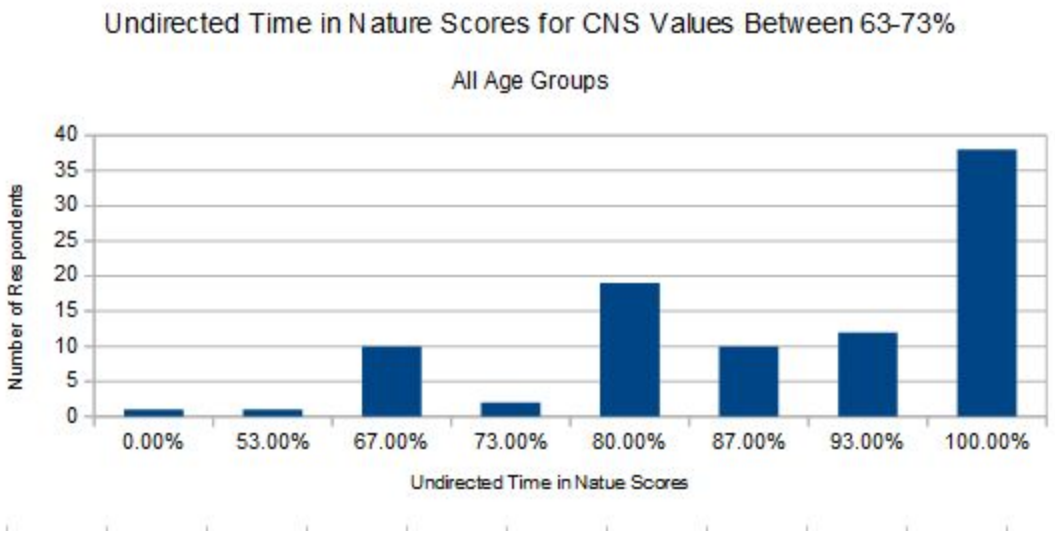

Figure 6: Undirected time in nature scores for CNS values between 63%-73%

Specific Age Groups

For the next step the survey results were organized by five age ranges including kindergarten through 6th grade, middle and high school students, college students, adults and seniors age 60 and up (see Figure 7). The kindergarten through 6th grade group had CNS values between 63-71%. The middle and high school students age range had CNS values between 63-83%. The college age group had scored from 45-85%. The adult age group had CNS values from 40-83%. Senior age 60 and above had CNS values from 55-84%.

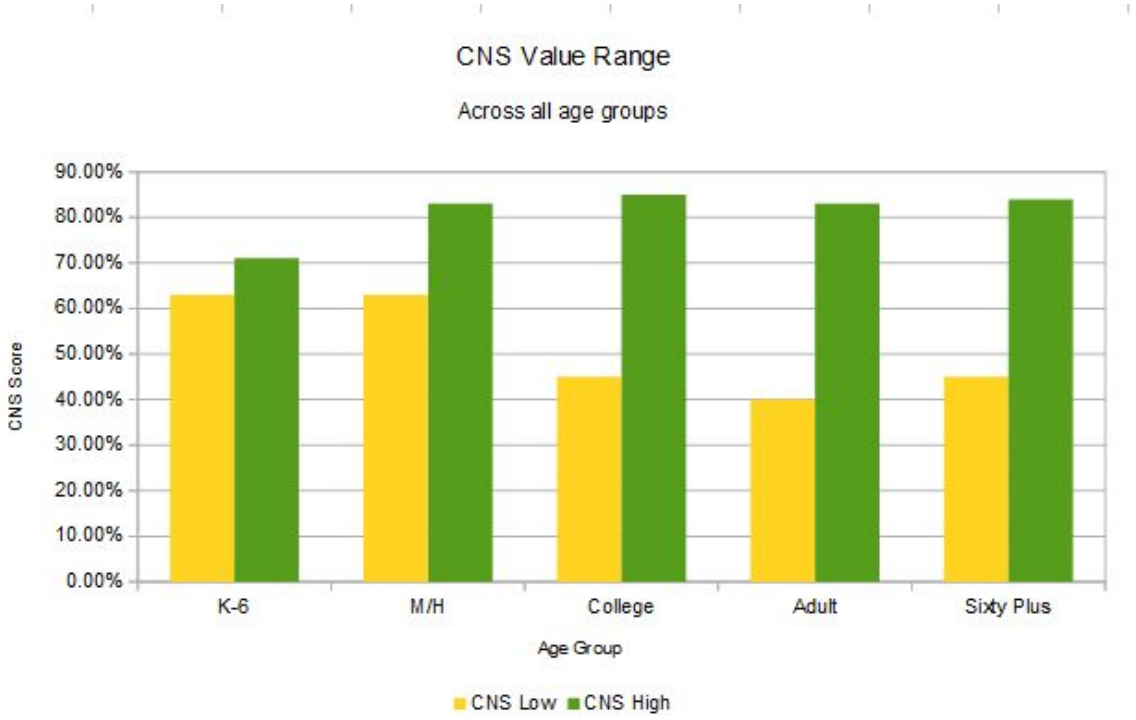

Figure 7: CNS ranges for age groups

In the kindergarten through 6th grade group more than 50% of participants scored 80% or greater in place-based education and adventure and outdoor education. This age group had 80% of participants scoring 80% or higher in undirected time in nature (see Figure 8).

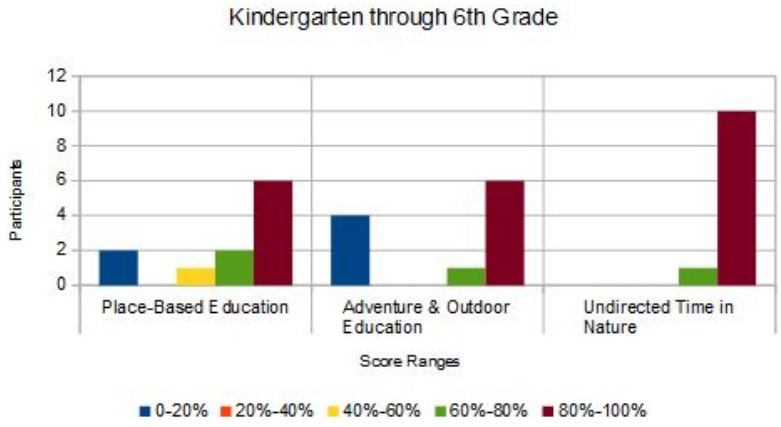

Figure 8: Comparison of scores for kindergarten through 6th grade group

The middle and high school student age range had 86% of the group scoring greater than 80% on place-based education (see Figure 9). All of the participants in this group scored 80% or greater on adventure and outdoor education and undirected time in nature.

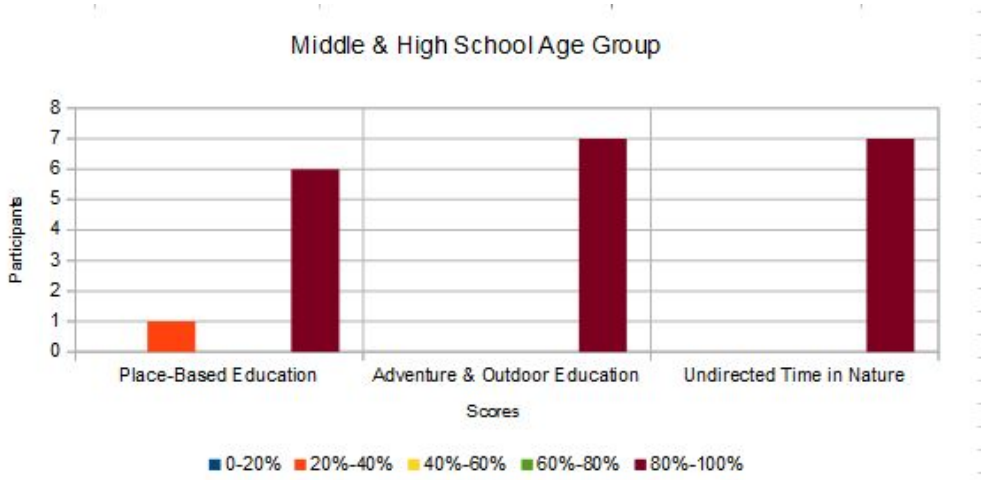

Figure 9: Comparison of scores for middle and high school group

In the college age group 90% of participants scored 80% or greater in place-based education, 63% of participants scored 80% or greater in adventure and 81% scored 80% or greater in undirected time in nature (see Figure 10).

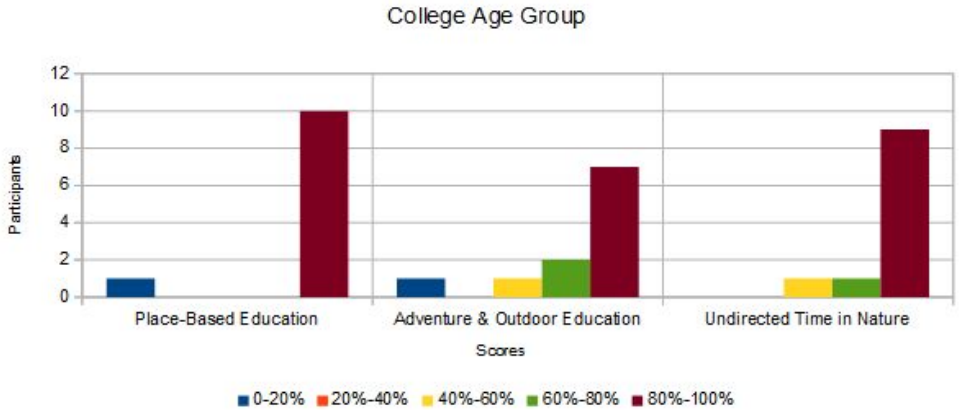

Figure 10: Comparison of scores for college age group

In the adult age group 60% scored 80% or greater in place-based education and over 60% of adult participants scored 80% or greater in adventure and outdoor education and undirected time in nature (see Figure 11).

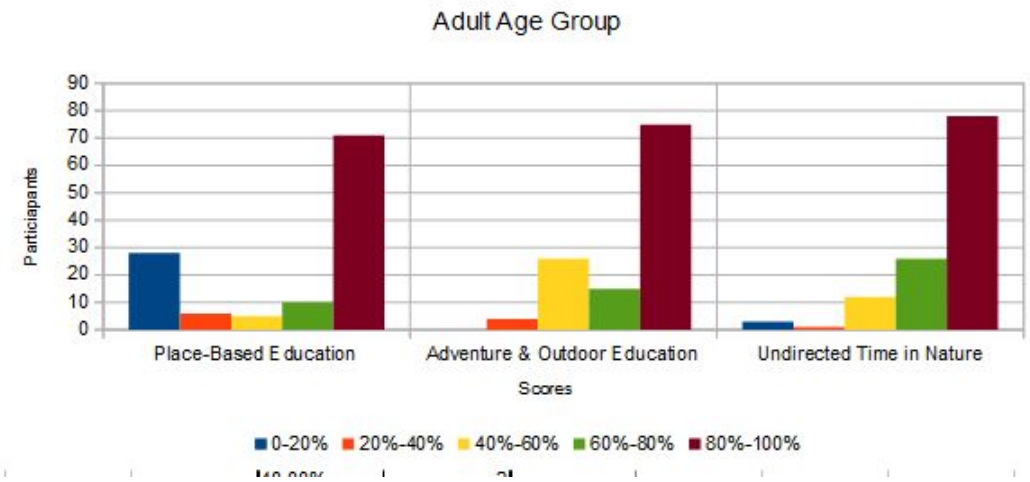

Figure 11: Comparison of scores for adult age group

In the senior age 60 and up age range 63% of participants scored 80% or greater in place-based education. In adventure and outdoor education 53% of this group scored 80% or greater and 89% of the group scored 80% or greater in undirected time in nature (see Figure 12).

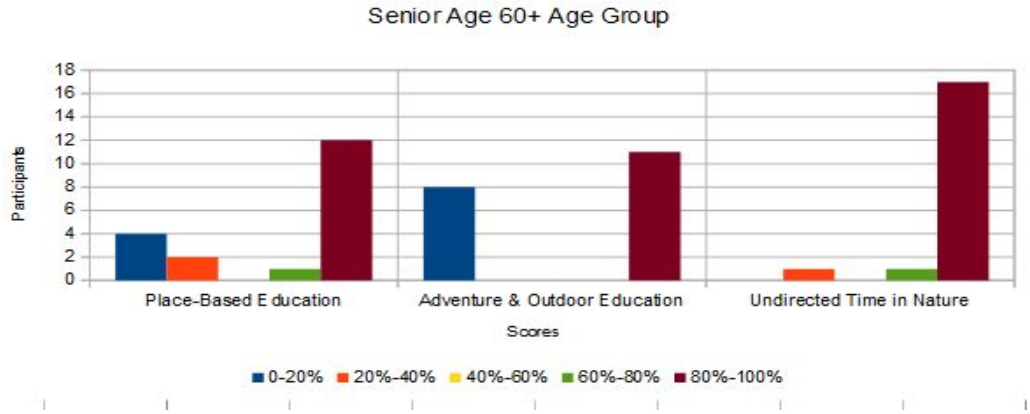

Figure 12: Comparison of scores for seniors age 60+ group

The overall CNS values for participants were high with 139 of 168 participants scoring 63% of greater. The data shows a relationship between higher CNS values and those that score higher on all three categories of place-based education, adventure and outdoor education and undirected time in nature. CNS values were lower when experiences with any one of the three major themes was in a lower range.

Essay Questions

There were a total of 109 essay responses with the age ranges distributed as 5 kindergarten through 6th grade students, 4 middle and college age students, 5 college students, 77 adults and 18 senior age 60 and above.

Essay responses were organized by age group. A chart was created based on the responses that showed keywords, influencing factors and behavior changes that occurred that occurred in relation to each of the three categories of place-based education, adventure and outdoor education and undirected time in nature.

Place-based education. In the essay responses the keywords of camp and nature centers were present across all age group in relation to place-based education. All of the age groups mentioned school based classes from elementary classes, high school, university, community college and grad school as a common theme in their experience of place-based education.

When discussing ways that place-based education influenced them the common theme across all age groups was the idea that it increased their knowledge base. Words that came up were “connections” (kindergarten respondent, survey), “connected to nature” (middle school respondent, survey), “connected me to the natural world” (adult

respondent, survey), “connections between humans and nature” (senior respondent, survey).

When asked about ways that place-based education experiences changed their behaviors all age groups reported recycling and composting. The college, adult and senior group reported behavior changes such as driving less, reducing plastic use, using renewable energy, and eating less meat.

Adventure education. Essay participants gave a wide range of keywords that represented the broad scope of adventure and outdoor education: rock climbing, rafting, snorkeling, camping, hiking, boating, kayaking, snowshoeing, skiing, scuba diving, zip lines, hunting, wilderness survival class, cycling, ropes course, and backpacking.

All the age groups reported an increase in their knowledge base as a way in which adventure and outdoor education influenced them. All age groups with the exception of the kindergarten through 6th grade group reported that adventure and outdoor education influenced them by increasing their awareness. Responses included influences such as “greater appreciation” (adult respondent, survey) and “inspired a career in science and nature” (adult respondent, survey).

When asked about behavior changes that were inspired by adventure and outdoor education experiences the kindergarten through 6th grade group could not think of any. The middle school and high school group mentioned that it raised their awareness. The college student and adult age groups listed composting, recycling, reducing waste, reducing impact. The senior age group listed many of the same things as the adult and

college group but added going out and teaching others what they have learned as a behavioral change.

As demonstrated in the responses, there was clear shift in a participant's awareness and ability to describe the ways that adventure and outdoor educational experiences had influenced them. The older the participant was, the more they connected adventure and outdoor education experiences as an influence despite the fact that many of their experiences had happened much earlier in their lifetime, often in their childhood.

Undirected time in nature. The most common keyword across all age groups when asked about undirected time in nature was free play in the outdoors. All age groups listed walking, hiking and biking outdoors. The college, adult and senior age group added bird watching and gardening as common undirected activities in nature.

The kindergarten through 6th grade group, middle and high school group and seniors stated that undirected time in nature influenced them by increasing their observation skills. One middle school respondent stated "I observe things like butterflies on blackberries and where bees nests are and woodpeckers are leaving holes in the trees and finding snakes and making all kinds of observations" (survey). Another respondent said "I learn bird songs, animal migration, plant life cycles, etc. Pattern literacy, flora & fauna id, awareness" (college age respondent, survey). The college, adult and senior group reported an increase in their knowledge base. Some phrases use to describe the influence of undirected time in nature were "makes me value the natural world" (middle and high school respondent, survey) "more connected to nature" (adult respondent,

survey), and "nurture my feelings of being part of the world" (senior respondent, survey).

All age groups reported that undirected time in nature changed their behavior through a desire to protect and defend the environment. The adult and senior age groups added increased involvement with environmental organizations. Similar to the findings when asked about adventure and outdoor education, the self reported awareness of and ability to connect undirected time to nature as an influencing factor increased with age range of the participant. All age groups mentioned free play as a child and many adult and senior responds contributed these experiences as life-long influences.

Interviews

Ten in-person interview were conducted of which 2 were kindergarten through 6th grade, 2 were middle or high school students, 2 college students, 3 adults and 1 senior. Each interview consisted of 9 questions related to place-based education, adventure and outdoor education and undirected time in nature along with the opportunity for the person being interviewed to add additional comments at the end. Interview responses were organized into a chart that showed keywords, influencing factors and behavior changes that occurred that occurred in relation to each of the three categories of place-based education, adventure and outdoor education and undirected time in nature.

Place-based education. Across all of the age groups nature centers classes and school classes were a common theme. The kindergarten through 6th grade group and middle and high school group also mentioned spending time on a farm. "I worked on a

goat farm. I learned about what resources go into a farm and a piece of land and what waste is made" (middle & high school respondent, interview).

All age groups reported that the primary influence of place-based education was an increase in their knowledge base. One senior respondent stated "I learned there are a lot of variables to consider" (senior age respondent, interview). Another respondent offered that "Place-based experiences give me the opportunity to get in touch with the world around me and increase my knowledge of nature" (college age respondent, interview). An adult respondent said "Yes these experiences also make the learning very personal and make you more connected to where you are" (adult age respondent, interview). Place-based education provided an academic experience that expanded the knowledge base of the subject matter for all age groups.

Behaviors that were reported as a result of place-based educational activities included recycling and growing food. The adult and college age groups stated that there were several behavior changes but that they developed over time. For example one college student when asked about behavior changes influenced by place-based educational experiences reported "I suspect many but can't think of a specific one" (college age respondent, interview). An adult respondent stated that behavioral change "has developed over time, not from one specific thing" (adult age respondent, interview). A senior respondent offered that "only many years later I realize the influence those experiences had on me" (senior age respondent, interview). It is possible that time for reflection is required before there is a connection made between an experience and the influence and behavioral changes that arise from that experience.

Adventure and outdoor education. Hiking, camp, scuba diving, kayaking, rock climbing, rafting were all common themes mentioned in relation to adventure and outdoor education. The college age and middle and high school age groups reported that the primary way adventure and outdoor education experience influenced them was an increase in their knowledge base. Responses included "I learned about the river and the plants that live in that ecosystem" (college age respondent, interview), "I saw new things and learned more about the animals that live in the water" (kindergarten through grade 6 age respondent, interview), and "I was amazed to learn there was a whole unique ecosystem. It changed my sense of space" (senior age respondent, interview). Having a directed adventure experience that takes place in nature allowed students an opportunity to observe and learn about nature at the same time they were participating in the activity.

The adult age group stated that it influenced them by inspiring them to learn stating "It made me want to know more" (adult age respondent, interview). The kindergarten through 6th grade group was not able to associate adventure and outdoor education as a direct influence.

The younger age ranges of the kindergarten through 6th grade group and the middle and high school age range were uncertain if adventure and outdoor education had influenced their behaviors. The college group stated that there was an influence in their behavior but could not verbalize in exactly what ways. "It helped me make connection. I don't know that in the moment, it changed my behavior, but in hindsight it was a big influence" (college age respondent, interview). The adult group stated that adventure and outdoor education led to behavioral changes through raising their awareness. A senior

respondent talked about the influence of a caving trip she took with her college outing club over 40 years ago “I don't think I connected these experiences to my knowledge of nature or other behaviors at the time but in hindsight I realize the caving had a strong influence on me and I was left knowing the earth is just amazing and diverse. When I did it I was amazed by the experience but now many years later I realize the strong influence those experiences had on me” (senior age respondent, interview). The senior age group reported that behavioral changes from adventure and outdoor education experiences had developed over long time. This data once again supported the idea that the understanding of the effects of an experience may come to us much later after a period of reflection.

Undirected time in nature. The common theme when asked about undirected time in nature was play. All age groups with the exception of the kindergarten through 6th grade group mentioned hiking and walking. An increase in observation skills was reported as an influence of undirected time in nature. Some of the influences reported were “feels more connected” (college age respondent, interview), “makes me happy” (college age respondent, interview), “allows me to make more connections” (adult respondent, interview), “shaped my relationship with nature” (adult respondent, interview), and “reminds me to be grateful” (senior respondent, interview). Participants reported social, emotional and health benefits of spending time undirected in nature.

It was difficult for the kindergarten through 6th grade students and middle and high school students to think of behaviors that may have changed based on undirected time in nature. One middle and high school age respondent who could not pick out specific behavior changes still felt that experience in nature was critically important for

children, “Kids need to be allowed to go outside and experience nature. You can't just tell us about things - you need to let us try” (middle and high school age respondent, interview). The college, adult and senior age groups reported that behavioral changes from undirected time in nature increase over time. This is perhaps related to the greater control adults have over their life style and daily decision making.

In addition to the influence of experiences taking time to manifest some adult and senior respondents had trouble thinking of pro environmental behaviors despite the fact that in earlier parts of the interview they stated several. “I can't point to any one thing or experience. I don't feel like I do much that is environmentally but I compost, recycle, grow food, have solar panels on my home, walk, use public transportation, buy less, use less etc. It just has developed slowly over a lifetime and they just become the thing you do. They become normal behaviors instead of extra effort” (senior respondent, interview). Over time they no longer thought of these things as pro-environmental behaviors, rather they just became every day habits.

Summary

Participants in this study tended to have generally favorable CNS values with 82% of the group scoring above 63% on the CNS scale. Over a quarter of participants scored in the top range for CNS values. The data shows a relationship between higher CNS values and those that score generally higher on all three categories of place-based education, adventure and outdoor education and undirected time in nature. CNS values were lower when experiences with any one of the three major themes was in a lower range. The qualitative data gathered from both essay and interview questions gave greater

insight to the participants particular experiences with place-based education, adventure and outdoor education and undirected time in nature. In addition it provided context for specific ways in which each theme influenced both their learning and their behaviors in relationship to the environment.

Introduction to Chapter Five

Chapter five includes my observations, reflections, and the limitations of this research study. In addition, it will discuss the connections between my findings and the use of a transdisciplinary approach within the Next Generation Science standards to offer students opportunities to participate in all three types of nature experiences; place-based education, adventure and outdoor education and undirected time in nature.

CHAPTER FIVE

CONCLUSIONS

This chapter focuses on the conclusions of my research study on how place-based education experiences, adventure and outdoor education experiences and undirected time have impacted the ecoliteracy of individuals. The chapter includes recommendations on how this data may assist environmental educators and naturalist in designing and planning their curricula with the goal of developing more ecoliterate students. In addition, this chapter will discuss how Next Generation Science Standards can support environmental educators to support each of the major themes of this research.

The question I set out to answer was: How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy? An understanding of how experiences in nature influence individuals will allow environmental educators to support the development of ecoliteracy in their students.

My research led me to three key discoveries: 1) that ecoliteracy develops from a combination of all three types of experiences 2) that becoming ecoliterate does not happen all at once from one experience and 3) pro-environmental behaviors often grow as people grow older.

Key Discoveries

Ecoliteracy from a Combination of Experiences. My research shows a connection between the development of ecoliteracy and individuals having varying types and levels of exposure to nature. One of the more important things I learned from this

research is that development of ecoliteracy typically comes through a combination of experiences over time.The participants that scores in the highest CNS ranges tended to score high in all three categories with half of the participants in this group score 100% in each category. Of this group 80% of the group for place-based education, 68% of the group in adventure and outdoor education and 94% of the group in undirected time in nature scored 80% or greater in each category. This data show that connectedness to nature is typically not gained from any one of the three major themes. Rather it is a combination of different methods each offering a slightly different type of exposure and influence on ecoliteracy.

Ecoliteracy Develops Over Time. This idea of multiple forms and opportunities for exposure to nature ties directly to another important concept I learned through this research: that ecoliteracy does not happen all at once or from one experience. During interviews participants repeatedly stated that experiences influenced them years later or that a combination of experiences over time were a major influence. One senior citizen interview participant stated, “I don't think I connected these experiences to my knowledge of nature or other behaviors at the time ... but now many years later I realize the influence those experiences had on me. It just has developed slowly over a lifetime” (senior respondent, interview). Another adult participant offered that “I grew up on a 300 acres orchard...I didn’t realize how that influenced me until later when I had children of my own” (adult respondent, interview). Individuals are not always conscious of the influence of experiences when they happen but with reflection and time they begin to draw connections and realize the way experiences in nature have shaped their behavior.

The responses from essay and interview questions provided additional context for the data. Individuals in the study had place-based experiences in several academic environments, had adventure education experiences that covered a wide range of styles and activities, and had spent time in nature in different ways often depending on their age range. The youngest participants in the kindergarten through 6th grade range were able to list activities they had done or talk about experiences in nature but they were not able to verbalize or list tangible ways these experiences had influenced their learning or their behaviors. The older participants were in the essays and interviews the more capable they seems of being able to list specific activities or experiences that contributed to their ecoliteracy. Often these experiences may have happened much earlier in their lifetime or even in their childhood but their awareness of its influence on them came much later or developed over time.

Pro-Environmental Behaviors Grow with Age. Proactive behaviors and involvement with environmental justice, environmental activism, and supporting environmental organizations also seems to grow as participants grew older. While children through adults reported that they changed a variety of behaviors having to do with recycling, local food, water use, reducing plastic, renewable energy etc. Several adults mentioned in their essay responses that experiences with place-based education, adventure and outdoor education and undirected time in nature inspired them to become educators. A common theme among the seniors age 60 plus in the essay responses was teaching what they have learned to others. “I dedicated myself to teaching natural history after these experiences” (senior respondent, survey). Many seniors listed teaching

permaculture, gardening, natural history and environmental science and becoming an activist as a primary behavior change that occurred for them. “Out of doors became an integral component of my curriculum plan, environmental education became the core focus in my teaching of art, reading, etc.” (senior respondent, survey). Pro-environmental behaviors grew and accumulated over long periods of time and developing into daily habits.

Place-based education experiences, adventure and outdoor education experiences and undirected time in nature help to develop ecoliteracy by offering a multiple ways to be in nature each with its own unique perspective. These methods support one another and build on previous experiences through an individual’s lifetime.

Bias and Limitations

This research functions from the assumption that the current state of global ecological problems are a scientific fact and that it is to the benefit of society in general to have a more ecoliterate population. The largest group of participants to the survey were adults with 120 of the 168 participants in this group. The limited data from other age groups means there is only a small sample of these age groups with which to draw conclusions. The language used in the survey and length of the survey limited its accessibility for the younger population. In the future it would be better to use a data tool with language specifically geared toward young children to gain greater into ecoliteracy with this group.

In the context of the assumption this research is based on and its goals, having a large cluster of adult responses may actually be an asset. Since the goal is to examine

what factors influence and shape ecoliteracy, adults who self report as ecoliterate individuals, are the target population to look at these factors.

Another limitation of the study is that it was in being distributed by the researcher the study may have only reached a certain demographic. Since the study utilized online tools for data collection in the survey and essay portions the demographic was also restricted to those with access to technology.

Not everyone who responded will be ecoliterate or have had enough time for personal reflection in this area to quantify and describe how place-based education, adventure and outdoor education and undirected time in nature has influenced them. This offers insight into the real world as it mirrors what is happening for students while participating in these forms of education. Students may not already be ecoliterate or have an understanding of how the activities they are participating in are influencing them, if at all, in the moment. This research shows that an understanding that ecoliteracy grows over time from a combination of experiences. That means that environmental educators need to rethink the way they assess student learning. Unlike using a math test at the end of a semester to see if students learned to apply a particular math concept, the measurement of the development of ecoliteracy from a nature based experience may need to be determined over much longer time frame, perhaps even over a lifetime.

Revisiting the Literature Review

The literature from chapter two stated that ecoliterate individuals are "moved to act upon their knowledge, values and understanding in both small ways and large" (Goleman, Bennett, & Barlow, 2012, p. 12). The results of this study reinforce this. The

responses offered by participants to essay questions and interview questions when asked how knowledge of the environment encouraged them to change their behavior include a wide variety of actions from recycling, to dietary changes, to giving up driving a vehicle and installing renewable energy in their homes. Both the literature and the results of this study show a "reliable relationship between connectedness to nature and self-reported environmentally responsible behavior" (Frantz & Mayer, 2014, p. 86). Place-based education experiences, adventure and outdoor education experiences and undirected time in nature become the conduit to feeling connected "to nature as a plain and simple member" (as cited in Mayer, 2008, p. 610). The environment, and these three ways of being in the environment, are the context for learning that is build into the NGSS (NGSS, 2013, p. 10 - Appendix D).

Next Generation Science Standards. The NGSS uses a transdisciplinary approach with a focus on learning by doing differs from the traditional classroom teaching of science (NGSS, 2013, p. 10 - Appendix D). These standard have a strong focus on learning by doing and on problem solving in the real world. My research show a connection between ecoliteracy and individuals having varying types and levels of exposure to nature. The hands-on nature of the NGSS encourages getting students out into the environment to observe, study and explore while contemplating and expanding their current knowledge of environmental science and environmental issues (NGSS, 2013, p. 10 - Appendix D). NGSS is highly compatible with place-based education methods and can be a method for incorporating adventure and outdoor education opportunities and undirected time in nature into a blended interdisciplinary and

transdisciplinary approach to curriculum. Both adventure and outdoor education and provide undirected time in nature can be incorporated into a place-based curriculum using the NGSS.

Adventure and outdoor education. In the literature Bogner and Wiseman (2004) stated that outdoor education opportunities "shape relevant behavior towards the environment" (p. 30) which in turns reduces human impact. Many participants in this study listed adventure activities as an influencing factor in their awareness of nature, knowledge base and their connection to the natural world. Participants also reported a wide range of pro-environmental behavioral changes that they associated with an adventure or outdoor experience. A study by Schwartz et al. (2012) found that short or single activities may have only limited impact but that repeated experiences "enhance people's experience with nature..and achieve conservation goals more fully" (p. 1). The comments given by participant in interviews and essay questions (see Appendix D & E) in this study also suggested that it not one experience in the outdoors that shapes ecoliteracy, rather it is many experiences over time and with reflection that alter behavior.

Adventure and outdoor education opportunities are often limited by economics and lack of access. When educators begin to recognize the value of these experiences both individually and in conjunction with other methods then we can begin to recognize the importance of including them into our curriculum and incorporating these experiences with other Next Generation Science methods such as place-based experiences. It clear that there is benefit to providing students the opportunity to have experiences in nature.

Nature Deficiency. There is a growing concern that each year fewer people engage in nature-based activities (Nielson, 2008, p. 1). In the literature review, Sobel (1998) pointed out that more and more children have no personal relationship with nature itself. It is difficult to care about something in which you have no relationship or understanding. As environmental educators one of our primary goals is to connect students to the natural world so they can build that relationship.

Time in nature through place-based education experiences, adventure and outdoor education experience or undirected time in nature all contribute to overall ecoliteracy and a shifting of behaviors. Louv (2008, p. 36) and Ginsberg (2007, p. 189) list the human costs of nature deficiency as diminished senses, attention difficulties and higher rates of physical and emotional illness, decreased ability to self regulate, decreased problem solving ability and decreased cognitive development. Participants in this study reported that time in nature "makes me calm" (college age and adult respondents, survey), "makes me happy" (college age respondent, interview), "gives me peace" (adult age respondent, survey) and "made me more open minded" (adult age respondent, survey). Participants also reported that undirected time in nature increased their awareness of nature, increased observation skills and led to pro-environmental behaviors changes such as recycling, driving less, growing their own food, using renewable energy, using less plastic, and donating to environmental organizations.

Bringing students outdoors and bringing each of these methods into our curriculums has benefits for students in academic areas across the disciplines, social

well-being and overall health. This in turns helps them build a connect to nature which can shift behaviors and benefit both people and the environment.

Recommendation for Future Research

My research study attracted a population that self reported as fairly ecoliterate and scored relatively well on the CNS scale. A majority of participants had also had some exposure to all three types of outdoor experiences. For future research I think it would be valuable to apply what I observed in my study to research a population of individuals that have less exposure to these types of learning and use Next Generation Science Standards as a framework to introduce these methods. With evaluation over a longer time period this would allow researchers to determine if this trend holds true with a population that originally self reports as not connected to nature and then has the opportunity for great exposure. It may also be beneficial to interview or survey a larger population of adults that do self identify as ecoliterate to see if these findings are consistent in a larger demographic of the target population. In addition, it would be beneficial to track self reported data on these educational methods and the influence on behaviors over a much longer time period to see if there are common factors as to when and how those connections are made.

Sharing the Findings

The discoveries made while doing this research will certainly shape my own curriculum development. I will continue to be conscious of the importance of building a relationship with the natural world as a primary foundation for everything else I want

students to know about environmental science. I plan to share this study with other environmental and science educators that I work with, with the local nature center staff, a local wilderness program and within my larger online community. My hope is that as a community we can continue to share our observations and ideas for the development of ecoliteracy in our students.

Implications for Educators

The trend of my research towards a balance of multiple methods repeated over time leads me to conclude that as environmental educators we should use a mixed approach to allow opportunities for time in nature through the curriculum and across all age groups. Conducting this research reminded me that the influence of an activity of a person's thinking and behavior is rarely immediate. People process experiences over time, at different rates and often it is a collective of ideas and exposure that blend together to form new thinking or new patterns. As educators this means focusing on offering high quality exposure to environmental knowledge through a variety of methods and recognizing that immediate evaluation or testing will not reflect the long term influence of these activities.

Reflections

Both the ideas in Next Generation Science Standards of learning by doing and focusing on problem solving and my research strengthen my resolve that to be connected to and considerate of nature requires spending time outdoors in nature. Each experience is one puzzle piece in a larger worldview. In order to instill ecoliteracy in our students over a lifetime we must think of our lessons and field experiences as the foundational building

blocks. Over time as these grow so too will the knowledge base, observation skills, connection to nature and ecoliteracy of our students.

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Appendix A - Survey

NATURE EXPERIENCES AND ECOLITERACY: THE EFFECT OF PLACE-BASED EDUCATION EXPERIENCES, ADVENTURE AND OUTDOOR EDUCATION EXPERIENCE AND UNDIRECTED NATURE EXPERIENCES ON ECO-LITERACY

Consent for Participation in Research Study

Welcome to My Survey

Informed Consent:

Thank you for participating in this survey. Your feedback is important. Please answer the following questions as honestly as possible.

The intention of my research is to study how different types of interactions with nature may have impacted the ecoliteracy of individuals. How do place-based education experiences, adventure and outdoor education experiences and undirected time in nature impact ecoliteracy? Action research is either research initiated to solve an immediate problem or a reflective process of progressive problem solving to improve the way we address issues and solve problems. I hope to provide data that environmental educators can use to guide and inform their curricula. A greater understanding of how experiences in nature influence individuals environmental educators to support the development of ecoliteracy in their students.

I do not anticipate that taking this survey will contain any risk or inconvenience to you. Furthermore, your participation is strictly voluntary and you may withdraw your participation at any time without penalty.

Appendix A - Survey (Continued)

All information collected will be used only for my research and will be kept confidential. There will be no connection to you specifically in the results or in future publication of the results. Once the study is completed, I would be happy to share the results with you if you desire.

Contact Information:

Beth Anne Moonstone, Environmental Educator, Naturalist, Graduate student Hamline University, MAed: Natural Science and Environmental Education program, contact via bmoonstone01@hamline.edu

You may also contact my advisor: Trisha Harvey tharvey03@hamline.edu Assistant Professor, Advanced Learning Technologies, Hamline University 66O Drew Residence Hall MS-A1790

The Hamline University Institutional Review Board may be contacted via Matthew Olsen, chair mholson (at) hamline.edu

By clicking START SURVEY you are verifying that you have read the explanation of the study, and that you agree to participate or are giving agreement for a minor that you are parent/guardian for to participate. You also understand that all participation in this study is strictly voluntary.

It is recommended that you print this page for your records. You may opt out at any time by simply leaving the survey website.

1. Do you wish to start the survey?

Yes

No

Appendix A - Survey (Continued)

2. . Which age group are you in?

   Kindergarten through 6th grade (approx age 6-12)

   Middle School or High School (approx age 13-17)

   College student (undergraduate)

   Adult (general population over 18 and under 60, not in college as an undergraduate)

   Senior (age 60 and above)

The Connectedness to Nature (CNS) Scale

3. I often feel a sense of oneness with the natural world around me.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

4. I think of the natural world as a community to which I belong

   Strongly Disagree Disagree Neutral Agree Strongly Agree

5. I recognize and appreciate the intelligence of other living organisms.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

6. I often feel disconnected from nature.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

7. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

8. I often feel kinship with animals and plants.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

9. I feel as though I belong to the Earth as equally as it belongs to me.

   Strongly Disagree Disagree Neutral Agree Strongly Agree

10. I have a deep understanding of how my actions affect the natural world.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

11. I often feel part of the web of life.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

Appendix A - Survey (Continued)

12. I feel that all inhabitants of Earth, human, and nonhuman, share a common "life force".

    Strongly Disagree Disagree Neutral Agree Strongly Agree

13. Like a tree can be part of a forest, I feel embedded within the broader natural world.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

14. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

15. I often feel like I am only a small part of the natural world around me, and that I am no more important that the grass on the ground or the birds in the trees.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

16. 19. My personal welfare is independent of the welfare of the nature world.

    Strongly Disagree Disagree Neutral Agree Strongly Agree

17. Place-Based Education: focuses learning within the local community of a student. It provides learners with a path for becoming active citizens and stewards of the environment and place where they live (Principles of Place-based Education, 2014)

18. I have had place-based experiences, learning about the ecosystem and community directly where I live, that have contributed to my level of ecological literacy and awareness.

    Strongly Disagree Disagree Agree Strongly Agree N/A

19. Placed-based learning opportunities have expanded my knowledge of ecology and the natural world.

    Strongly Disagree Disagree Agree Strongly Agree N/A

20. My behaviors or choices have been more environmentally conscious due to a place-based educational experience.

    a. Strongly Disagree Disagree Agree Strongly Agree N/A

Appendix A - Survey (Continued)

Adventure and Outdoor Experiences:draws on both experiential education and environmental education. Learning takes place outdoors through structured activities such as hiking, canoeing, rafting, ropes courses, mountain climbing, camping and wilderness journeys.

21. I have participated in an adventure education or outdoor education experience (a structured outdoor based camp or group program or day trip to canoe, raft, ski, rock climb, hike, ropes course etc) that has contributed to my level of ecological literacy and awareness.
    Strongly Disagree Disagree Agree Strongly Agree N/A
22. Participating in an adventure or outdoor experience expanded my knowledge of ecology and the natural world.
    Strongly Disagree Disagree Agree Strongly Agree N/A
23. My behaviors or choices have been more environmentally conscious due to an adventure or outdoor experience.
    Strongly Disagree Disagree Agree Strongly Agree N/A

Undirected Experiences in Nature: can range from free play outdoors as a child, to solo walks in the woods, sitting in nature, family camping trips, and time spent outdoors doing some activity other than a structured learning environment.

24. I have had undirected experiences in nature (walks in the woods, free play outdoors, hiking, gardening, bird watching etc) that have contributed to my level of ecological literacy and awareness. (These are unstructured experiences in nature where no one is teaching or leading the activity.)
    Strongly Disagree Disagree Agree Strongly Agree N/A
25. Undirected time in nature have expanded my knowledge of ecology and the natural world.
    Strongly Disagree Disagree Agree Strongly Agree N/A
26. My behaviors or choices have been more environmentally conscious due to time spent undirected in nature.
    Strongly Disagree Disagree Agree Strongly Agree N/A

Appendix A - Survey (Continued)

Essay questions

27. What types of place-based education experiences have you participated in?
28. How have place-based experiences expanded your knowledge of ecology or the natural world?
29. What behaviors or choices do you make in a more environmentally conscious way due to a place-based experience? (think about changes you made specifically after participating in a place-based class or experience)
30. What types of adventure or outdoor educational experiences have you participated in?
31. How did your adventure experience expand your knowledge of ecology and the natural world?
32. What behaviors or choices do you make in a more environmentally conscious way due to your adventure or outdoor educational experience? (think about changes that you made specifically after this experience).
33. What form has undirected experience in nature taken in your life? (This might be free play outdoors as a child, walking in nature, watching birds, sitting in your yard, biking through the countryside etc. These are unstructured experiences where no direct teaching or leading is happening.)
34. How has undirected time in nature expanded your knowledge of ecology and the natural world?
35. What behaviors or choices do you make in a more environmentally conscious way that you feel are due to spending time undirected in nature?

Appendix B - Survey Consent

Consent for Participation in Research Study

NATURE EXPERIENCES AND ECOLITERACY: THE EFFECT OF PLACE-BASED EDUCATION EXPERIENCES, ADVENTURE AND OUTDOOR EDUCATION EXPERIENCE AND UNDIRECTED NATURE EXPERIENCES ON ECO-LITERACY

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All information collected will be used only for my research and will be kept confidential. There will be no connection to you specifically in the results or in future publication of the results. Once the study is completed, I would be happy to share the results with you if you desire.

Contact Information:

Beth Anne Moonstone, Environmental Educator, Naturalist, Graduate student Hamline University

MAed: Natural Science and Environmental Education program

contact via bmoonstone01@hamline.edu

Appendix B - Survey Consent (continued)

You may also contact my advisor: Trisha Harvey tharvey03@hamline.edu Assistant Professor, Advanced Learning Technologies, Hamline University 66O Drew Residence Hall MS-A1790

The Hamline University Institutional Review Board may be contacted via Matthew Olsen, chair mholson (at) hamline.edu

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Appendix - C Interview Consent Document

Consent for Participation in Research Study

NATURE EXPERIENCES AND ECOLITERACY: THE EFFECT OF PLACE-BASED EDUCATION EXPERIENCES, ADVENTURE AND OUTDOOR EDUCATION EXPERIENCE AND UNDIRECTED NATURE EXPERIENCES ON ECO-LITERACY

Contact Information:

Beth Anne Moonstone, Environmental Educator, Naturalist, Graduate student Hamline University

MAed: Natural Science and Environmental Education program

contact via bmoonstone01 (at) hamline.edu

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As part of my research I am asking individuals to participate in an in-person interview consisting of a series of questions related to ecoliteracy, place-based education, adventure and outdoor education and undirected time in nature. These interviews are designed to gather data to be used as part of my graduate action research based master's degree thesis at Hamline University. I am completing a Masters of Arts in Natural Science and Environmental Education. This research is public scholarship and the abstract and final product will be cataloged in Hamline's Bush Library Digital Commons, a searchable electronic repository and that it may be published or used in other ways.

Appendix - C Interview Consent Document (continued)

The duration of the interviews is approximately one hour. Interviews will be recorded for use by the investigator, Beth Anne Moonstone. The confidentiality of participants will be maintained. All response will be coded into groups by age range with no identifying names attached. The data will be examined, written up, used for this research study and kept for three years after which it will be destroyed. There is no expectation of any risks or discomforts nor any benefits that might accrue to the participant. This consent form will be kept along with the research data for a period of three years and then destroyed. Participation is voluntary and that refusal to participate or to discontinue ongoing participation will incur no penalties.

Adult Participants Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____

In addition to agreeing to participate, I also consent to having the interview tape-recorded.

Your Signature _____ Date _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____ Date _____

This consent form will be kept by the researcher for at least three years beyond the end of the study.

Adult Consent for a Minor Participant

All participants under 18 years of age must have an adult parent or guardian provide consent.

By signing below you acknowledge that you have read the above information above and give your consent as the parent of guardian of _____ age _____to participate in this research study

Your Signature _____ Date _____

Your Name (printed) _____

In addition to agreeing to participate, I also consent to having the interview tape-recorded.

Your Signature _____ Date _____

Appendix - C Interview Consent Document (continued)

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____ Date _____

This consent form will be kept by the researcher for at least three years beyond the end of the study.