THESIS

CONNECTING CHILDREN TO NATURE: INTEGRATING TECHNOLOGY INTO NATURE PROGRAMS AND INCORPORATING ENVIRONMENTAL EDUCATION INTO AN URBAN AFTER-SCHOOL PROGRAM

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ABSTRACT

CONNECTING CHILDREN TO NATURE: INTEGRATING TECHNOLOGY INTO NATURE PROGRAMS AND INCORPORATING ENVIRONMENTAL EDUCATION INTO AN URBAN AFTER-SCHOOL PROGRAM

This thesis consists of two documents that describe different aspects of a broader project with the ultimate goal of connecting children and their families to nature. The first paper addresses the integration of technology and knowledge about people's wildlife value orientations (WVO's) to influence participation in nature programs. While a *domination* orientation defines wildlife primarily as a resource to be used and managed for human benefit, a *mutualism* orientation perceives wildlife as capable of relationships of trust with humans and as life forms deserving of rights and caring. These different orientations have different implications for response to wildlife issues and for participation in wildlife-related recreation. The mixed-methods study included survey data acquired from a sample of residents (n = 282) from Wake County, North Carolina and a subset of that sample that subsequently participated in focus groups and a pilot program about box turtle tracking using radio telemetry. Results indicated that interest in nature and nature programs incorporating technology was positive among all WVO segments - though the motivation for that interest was different for the *distanced* WVO group - and that the use of technology in nature programs can facilitate positive, nature-focused experiences for families. This research represents a step in developing methods

for integrating technology into optimal programs directed towards segments of society with specific WVO's.

The second paper examines the incorporation of Environmental Education (EE) into an after-school program in the Bronx, New York City. In this qualitative case study, focus group interviews were conducted to first determine parent and educator interest in and barriers to participation in nature programs and incorporation of EE into the curriculum. Interest level was high and a series of trainings in EE were conducted and evaluated. Findings reveal that some of the barriers to incorporating EE were only perceived barriers and successful integration is possible as long as interest and motivation is present. Staff showed significant confidence and ability to teach EE in there program after minimal training and were motivated to continue with the curriculum due to strong support from the students and parents. Methods from this study for effective incorporation of EE into an existing curriculum could be modeled in both the formal and non-formal classroom.

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I. INTRODUCTION

Inspired in part by Richard Louv's book *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*, large-scale initiatives are emerging throughout the United States to reconnect youth to the natural world. These initiatives come as a response to concern that children do not experience nature as much as past generations (Clements, 2004; Louv, 2005: Rivkin, 1995). One often cited explanation for this occurrence is the trend toward global urbanization, with the vast majority of people in modern society living in urban areas (Satterthwaite, 2000; United Nations, 2008). This situation has caused the disappearance and fragmentation of natural areas, decreasing urban dwellers' access to nature. This has spawned research into the negative health consequences of such a condition (Verheij, Maas & Groenewegen, 2008). Another common explanation for the increasing disconnect from nature cites the increased use of technology such as television, computers, video games, and mp3 players. There is no doubt that people in the modern, industrialized world spend an increased amount of time engaged with technological devices and research supports this observation (Pergams & Zaradic, 2006; Singer, Singer, D'Agostino, & DeLong, 2009). Whether technology is partly responsible for children having less exposure to the natural world remains debatable, as there is a lack of empirical evidence to support the rhetoric that technology is directly responsible for kids staying inside, or if there are other trends keeping kids inside and technology is just something they then resort to.

Lack of time spent in nature can lead to mental and physical health issues such as Attention Deficit Disorder (ADD), obesity, vitamin D deficiency, and depression (Kumar, Munter, Kaskel, Hailpern & Melamed 2009; Louv, 2005). Time spent in nature leads to an appreciation and respect for the natural world, whereas non-exposure can lead to a lack of empathy for nature and its living organisms. This potential could have adverse consequences to the well-being and sustainability of the planet in the future. In contrast, the benefits enjoyed from exposure to nature throughout one's life are tremendous. Louv (2005) argues that children who play in nature are more balanced and healthier; humans evolved in and with the natural world and therefore are part of nature and are naturally connected. It is unnatural, then, that a child is raised with little to no exposure to natural places. Children educated in schools that incorporate environmental education (EE) into the curriculum generally perform above average on state exams and report increased enthusiasm toward learning (Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998). Finally, research shows that positive experiences in nature as a child lead to increased environmental awareness, knowledge, and action as an adult (Chawla, 1999; Palmer, 1993; Palmer, Suggate, Bajd, & Tsaliki, 1998). The vision of an environmentally aware and sustainable society relies heavily upon today's youth learning about the wonders of the natural world, ideally through direct contact.

The benefits of EE that may ultimately lead to increased environmental stewardship can be termed as *environmental* or *eco-literacy*. Coyle (2005) defines environmental literacy as possessing knowledge and awareness of environmental issues, as well as having the skills and ability to apply the information toward real life solutions. True change is not possible if people do not alter their behavior based upon the

information they have attained. Cole (2007) argues that environmental literacy should not be assessed solely on Western science, but must also take into account the perspectives of various cultures and ways of seeing the world. In order to impart the desire for conservation and to live an environmentally conscious lifestyle, educators must first understand the ways in which the various demographics of the people they teach perceive the natural world. This has led to a current trend in EE to cater programs toward different, traditionally underserved populations, broadening the goal of environmental literacy to include all members of our society.

Understanding people's diverse backgrounds, beliefs, and values allows educators to develop more effective and targeted programs through selecting more specialized content. As people become more aware of the importance of time in nature, society must respond by placing a greater emphasis on methods for increasing exposure to EE and natural places. Government agencies responsible for the protection and conservation of natural lands recognize the important role education can play in facilitating a connection with nature, in turn conserving natural areas. Long term and wide spread support for conservation initiatives depends on these agencies' ability to reach diverse audiences through more tailored educational programs. As part of a larger multi-state project initiative to connect children and families to nature, this thesis attempts to inform organizations involved with education of effective methods for involving underserved populations in EE.

This thesis consists of two articles representing different studies. The first article examines the use of technology in a turtle tracking program adapted from a pre-existing program offered through the North Carolina Wildlife Resources Commission (NCWRC).

The intent was to learn whether incorporating technology into an EE program could enhance the experience and perhaps draw greater attendance from a tech-savvy population with traditionally limited participation in nature programs. The second article demonstrates the effective adoption of an EE curriculum in an after-school program in a highly urban area in the Bronx, New York City with a significant Dominican population. This case study explored parent and staff interest in and perceived barriers to participation in nature programs and subsequent incorporation of EE into the after-school curriculum.

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II. INTEGRATING TECHNOLOGY TO ENHANCE PARTICIPATION IN PROGRAMS ABOUT NATURE: A CASE STUDY IN NORTH CAROLINA

INTRODUCTION

There has been a noticeable uptick in consciousness about environmental issues such as global climate change and biodiversity loss during the past decade. As the world population becomes more globally conscious people increasingly realize that what we do as individuals on the Earth affects a much larger population, if not the entire planet. Environmental education (EE) has a critical role to play in facilitating this awareness and creating a deeper understanding of the impacts of our actions. In addition, exposing children to nature at a young age, when their values are less entrenched and receptiveness to learning and new ideas is greater, heightens the potential for developing a positive environmental ethic.

A common aspect of EE is an experience in nature; such experiences are instrumental in the development of an individual ethic toward environmental stewardship (Chawla, 1999). However, fewer people and youth in particular experience nature directly, which author Richard Louv (2005) argues has created an epidemic he refers to as "nature deficit disorder". Louv defines nature deficit disorder as "the human costs of alienation from nature: diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses" (p. 36). Louv argues that as children spend less time experiencing nature, we lose our connection to the Earth which ultimately threatens our collective well-being.

One argument for why children spend less time outdoors is the abundance of modern technology which has led to the concern that children in developed nations spend much of their time in front of televisions, computers, and video games (Cordell, Betz, & Green, 2009; England Marketing, 2009; Singer, Singer, D'Agostino, & DeLong, 2009). Indeed there is a great deal of evidence that technology is occupying a significant portion of children's free time that could otherwise be spent playing outdoors (Hardy, Dobbins, Denney-Wilson, Okely & Booth, 2009, Pergams & Zaradic, 2006).

Despite these trends, there is also a growing body of research demonstrating the benefits that technology can provide when properly incorporated into EE programs as well (Bodzin, 2008; Chavez, 2009; Uzunboylu, Cavus, & Ercag 2008). Innovative and successful strategies exist that utilize technology to enhance children's understanding of science and prompt them to be outside in nature. Activities integrating technologies such as mobile phones (Rutcher, Klar, & Geiger, 2009; Uzunboylu, Cavus, & Ercag 2008), photography, GPS for geo-caching (Chavez, 2009; Rivet & Scneider, 2004), and GIS (Bodzin, 2008; Emmanouloudis, Myronidis, Lambova, & Tzanerikou, 2008; Ramasubramanian & Logie, 1999) have proven to enhance learning, environmental awareness, and communication for both students and teachers.

While prior research in EE has addressed issues such as the role of technology, it appears to fall short in investigating the role of individual values in participation in programs. Societal changes associated with modernization have prompted a shift in people's values towards wildlife away from a *domination* value orientation and the simultaneous rise of a *mutualism* view in the United States (Manfredo, Teel, & Henry, 2009). This change has stimulated much research into how a population's values toward

wildlife can help predict attitudes towards natural resource management decisions. However, there has been little convergence of values work with EE. EE programs often exist in the realm of non-formal educational institutions such as nature centers, outdoor camps, museums, zoos, and government agencies. As these institutions focus more attention on ways to gain participation in educational programs, particularly those that connect children to nature, understanding people's WVO's can help create successful educational programs. Ideally results of this research will help influence the generation of quality environmental education programs in the future by establishing the tools, methodology, and theoretical perspective necessary for creating more targeted and values sensitive programs. In this case study, in partnership with the North Carolina Wildlife Resources Commission (NCWRC), we investigated how values influence participation in and satisfaction with an EE program that integrates technology to learn about Eastern Box Turtles.

Benefits of Nature Experiences and Environmental Education

Experiences and exposure to natural environments have proven benefits to physical health (Binns et al., 2009; Cleland et al., 2008; Lester & Maudsley, 2006), mental health (Wells, 2000; Wells & Evans, 2003) and academic achievement (Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998), as well as enhancing a person's conservation ethic and environmental stewardship (Chawla, 1999; Palmer, 1993; Palmer, Suggate, Bajd, &Tsaliki, 1998). Many benefits of EE have been identified in previous research conducted in a variety of formal and informal settings such as classrooms, nature centers, residential outdoor camps and others. Research shows that students who are exposed to interdisciplinary EE perform at higher levels on standardized tests as well as

in regular classroom activities (Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998). Lieberman and Hoody (1998) found that in schools that integrated EE, students gained knowledge more effectively, retained it longer, showed increased critical thinking and problem solving skills and became enthusiastic, self-motivated learners.

An additional compelling outcome of EE is the positive effect it can have on environmental stewardship. While definitions of and theoretical understandings about EE do not explicitly cite experiences in nature as a requirement for a program or lesson to be considered EE, such experiences are often included in EE programs and can result in positive environmental stewardship. Research has consistently shown that positive experiences in nature as a child help foster a connection to the natural world and lead to environmental stewardship as adults (Chawla, 1999; Palmer, 1993; Palmer, Suggate, Bajd, & Tsaliki, 1998). These experiences allow children to learn about the environment through direct experience and through lessons passed on by a prominent adult.

Is Technology Keeping Kids Inside?

There is growing concern that children today spend less of their free time engaged in the outdoors (Clements, 2004; Louv, 2005: Rivkin, 1995). Indeed, substantial research suggests that children are spending less time outdoors, a situation that could have serious consequences to their health and well-being (Kumar, Munter, Kaskel, Hailpern & Melamed 2009; Louv, 2005). A great deal of rhetoric places technology as a major contributor to this problem, claiming that the appeal of television, computers and video games is directly responsible for children spending less free time outside.

In a survey conducted in 16 nations, 72% of mothers reported that the most common recreational activity their children participated in was watching television

(Singer, Singer, D'Agostino, & DeLong, 2009). Though not directly related to lack of outdoor play, Hardy, Dobbins, Denney-Wilson, Okely, and Booth (2009) reported a significant inverse relationship between hours engaged in total sedentary behaviors termed small-screen recreation (TV, computers, video games), and aerobic fitness amongst girls grades 6-10, and a minimal relationship amongst developing boys in grades 6-8. Data obtained from the U.S. Census Bureau and other government agencies indicate a significant rise in the pursuit of sedentary electronic media related activities since 1988, inversely correlated with a decline in visits to the National Park System (Pergams & Zaradic, 2006). Though there is no empirical evidence that attributes the decline in outdoor recreation specifically to increased use of technology, research indicates a significant shift in American recreation pursuits and values toward a more sedentary, indoor lifestyle. Implications of this trend on a large scale suggest that continued lack of exposure to natural areas will result in a negative impact on environmental conservation.

Technology as a Potential Facilitator of Nature Experiences

Conversely, a number of prior research efforts have indicated technology can be used to facilitate experiences in and connections to nature (Bodzin, 2008; Chavez, 2009; Rutcher, Klar, & Geiger, 2009). In one study, mobile phones were used as an interpretive device on a nature hike and the outcomes yielded positive gains in environmental knowledge (Rutcher, Klar, & Geiger, 2009). In this study, participants ranged in age from young children to adults and were given a mobile Personal Digital Assistant (PDA) equipped with software that, at various sites along the trail, sent images and a text message with information about the ecological services of trees. The researchers concluded that, in comparison to results from a traditional nature hike with an interpretive

guide, participants gained an equal amount of environmental knowledge and increased awareness.

Another study incorporated the use of a portable computer system with a wireless local area network that allowed students to collect, search, edit and share information in a nature park (Liu, Tan & Chu, 2009). Results of the study revealed that the experimental group using the portable technology obtained a significantly greater degree of learning improvement than the control group; students also reported increased enjoyment and engagement in the learning process. Implications of the study are that portable technologies allow for the complete access to modern technology in a remote, natural setting, and that such technologies have a positive effect on student learning.

Chavez (2009) described a study exploring whether technology can be used to attract children to outdoor activities. Children ages 6-17 gathered in a Los Angeles park to participate in four independent outdoor activities. Of the four activities, participants reported a greater enthusiasm and enjoyment when engaged with the two technology related activities that incorporated GPS and digital photography. Adult facilitators noted that interest in taking quality photographs helped the participants to become more aware of their surroundings and enjoy being outside. It was also noted that the GPS activity allowed for more of a social experience for the teen-aged children, an important factor for that age group. Implications for this finding are that if children are engaged in an activity and enjoying time with friends, they may relate that experience to being outside and desire to replicate it in the future.

Similar results were achieved with a study by Rivet and Schneider (2004) where children used digital photography as a means to enhance their study of the health of a

local stream ecosystem. Students used digital cameras to photograph features of the stream and surrounding environment to be later analyzed as predictors of the health of the stream. The students then took measurements of the water quality and compared this evidence with details they found in their pictures (litter, man-made structures, water line, plant species, etc.). The results were posted and discussed on a website designed to be viewed by members of their community. Students reported that using the photographs allowed them more time to study the detail and notice things about the ecosystem that they did not notice while there. They were enthusiastic about using the cameras and reported that they took the time to reflect on what were important aspects of the stream to be captured in photographs. Some groups enjoyed the effects they got from photographing interesting ripples in the stream, allowing them to notice more subtle aspects of the ecosystem. In reporting their results on the website, students expressed the usefulness of the photographs as an effective way to convey their findings to the community. Other researchers report similar successes in regards to the use of PDA's (Hsieh, Jang, Hwang, & Chen, 2011; Uzunboylu, Cavus, & Ercag , 2008) and GIS (Emmanouloudis, Myronidis, Lambova, & Tzanerikou, 2008; Ramasubramanian & Logie, 1999).

Wildlife Value Orientations

A theory of wildlife value orientations (WVO's) provided a guiding framework for this study (Manfredo, Teel, & Henry 2009). This theory builds from a cognitive hierarchy model, a value-attitude-behavior framework in which each cognition builds upon one another, with values serving as the foundation (Homer & Kahle, 1988). Fundamental values formed early in one's life shape basic beliefs which in turn form

attitudes, evaluative cognitions that affect human behavior (Ajzen & Fishbein, 1980). Prior research has shown that WVO's can be used to predict and understand people's attitudes toward issues that involve wildlife and in turn individual behavior toward wildlife related situations (Fulton, Manfredo, & Lipscomb, 1996; Teel & Manfredo, 2009).

Literature suggests that people fall somewhere between a *domination* (traditionalists/utilitarians) and a *mutualism* orientation toward wildlife (Manfredo, et al., 2009; Teel & Manfredo, 2009). While a *domination* orientation defines wildlife primarily as a resource to be used and managed for human benefit, a *mutualism* orientation perceives wildlife as capable of relationships of trust with humans and as life forms deserving of rights and caring. Though two people may have the same fundamental value, the humane treatment of animals for example, their individual WVO type might lead them to engage in significantly different behaviors. A person with a *domination* WVO, for example, is more likely to engage in activities such as hunting and fishing than someone who is of the *mutualism* orientation who might prefer wildlife viewing or photography. An individual who has a high likelihood to possess tendencies toward both the *domination* and *mutualism* orientations is classified as a *pluralist*, whereas an individual that possesses neither a *domination* nor *mutualism* orientation is labeled as *distanced* (Teel & Manfredo, 2009; see Figure 1). According to WVO theory, people with a *distanced* WVO type tend to be less interested in wildlife and wildlife related issues.

		Domination	
		High	Low
Mutualism	Low	***Traditionalists/Utilitarians.*** Have a domination orientation, believing that wildlife should be used and managed primarily for human benefit. They are more likely to prioritize human well-being over wildlife in their attitudes and behaviors. They are also more likely to find justification for treatment of wildlife in utilitarian terms and to rate actions that result in death or harm to wildlife as acceptable.	***Distanced.*** Do not have either a mutualism or a domination orientation. As their label suggests, they tend to be less interested in wildlife and wildlife-related issues.
	High	***Pluralists.*** Have both a mutualism and a domination value orientation toward wildlife. The influence of the two value orientations is believed to be situationally-contingent, meaning that which orientation plays a role is dependent upon conditions of the given issue or situation (Tetlock, 1986). For certain issues, Pluralists are likely to respond in a manner similar to that of traditionalists, whereas for other issues they may behave more like Mutualists.	***Mutualists.*** Have a mutualism orientation, viewing wildlife as capable of relationships of trust with humans, as if part of an extended family, and as deserving of rights and caring. They are less likely to support actions resulting in death or harm to wildlife, more likely to engage in welfare-enhancing behaviors for individual animals, and more likely to view wildlife in human terms.

Figure 1

Understanding WVO's can help wildlife agencies in their decision-making concerning important wildlife issues. The WVO concept has proven to be successful in understanding a wide range of public interests in relation to wildlife and thus can help practitioners with management decisions by anticipating public reaction to management strategies and better representing diverse opinions and interests (Bright, Manfredo, & Fulton, 2000; Manfredo,Teel, & Henry, 2009; Teel & Manfredo, 2009). For example, research revealed that many of the staff representing the North Dakota Game and Fish Department held quite different WVO's than those of the people they served (Gigliotti & Harmoning, 2003). This knowledge was helpful for agency managers to understand that differing values and desires between themselves and the population they make decisions for could affect public-agency relations.

Further research suggests that as society transitions toward a more *mutualism* orientation, managers must learn to deal with increased human-wildlife conflict issues in new, creative ways to appeal to the changing values of their constituents, for example, less support for traditional techniques like lethal control (Teel et. al, 2010). WVO's are intended to be used as predictors of behavior, allowing agencies to gauge how a particular group of people might feel about a management decision before the decision is made (Teel & Manfredo, 2009). In Colorado, for instance, it was learned that many constituents, defined by their WVO's, would prefer to participate in non-traditional (wildlife viewing, photography, education) rather than traditional, consumptive recreation activities (hunting, fishing) (Bright, Manfredo, & Fulton, 2000). This knowledge will help develop an array of activities geared towards different value types, as well as provide knowledge for how to properly market these activities.

Study Purpose

This study aims to understand the extent to which WVOs can influence the development of nature and wildlife based educational programming. Though research indicates WVO's have implications for how people respond to wildlife related educational programming (Bright, Manfredo, & Fulton, 2000), no prior research has been conducted to explore how an understanding of these orientations can be used to develop more targeted educational programs. For this study, the North Carolina Wildlife Resources Commission (NCWRC) was specifically interested in attracting more residents of Wake County to their nature programs. More specifically, the agency was interested in more effectively reaching the *distanced* WVO type due to a sentiment that this population was underserved. The *mutualist* WVO type was also of interest to the agency, though the primary focus was on the *distanced* population. This mixed methods case study used a quantitative survey to identify WVOs of residents of Wake County, North Carolina, and a qualitative approach to assess interest in nature programs and the effectiveness of technology as a potential programmatic tool to connect youth and families to nature. Concerned that members of their community are increasingly disconnected and distanced from opportunities for exploring natural spaces and learning about wildlife, this study was guided by the following research questions: *What are the characteristics of a successful nature program for a "distanced" WVO type, specifically a program that incorporates technology? How do these characteristics differ from those for a "mutualist" WVO type?*

METHODS

Survey

A private sampling firm was used to gather contact information for residents in Wake County with children ages 5-14. Specific zip codes were selected from an urban, high-tech part of Wake County, with close proximity to numerous technology employers and higher incomes than the median for the area. This population was selected in part to target families that would be more likely to have high familiarity with and use of technology. A pre-test was conducted (n=43) to evaluate the viability of the survey instrument. After minor adjustments were made based on the pre-test, a modified Dillman (2007) approach was used in which mail-back surveys were sent, a reminder post-card distributed two weeks later to non-respondents, and the full survey was resent to non-respondents two weeks after the postcard. An abbreviated phone survey consisting of key items of interest was then conducted with a sample of 53 non-respondents in order to compare respondents and non-respondents.

Variables measured.

WVO's. Measurement of the *domination* and *mutualism* value orientations was derived from survey items identified by prior research to elicit basic belief dimensions representing the core beliefs of each WVO (see Manfredo & Teel, 2009). A *domination* orientation was defined by two belief dimensions: (a) appropriate use of wildlife and (b) hunting, with three to four survey questions comprising each dimension. Example items for this WVO include "Humans should manage wildlife populations so that humans benefit" and "We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing". Survey items revealing the belief dimensions of caring

and social affiliation were used to identify a *mutualism* orientation. Example items for this WVO include "I value the sense of companionship I receive from animals." and "Animals should have rights similar to the rights of humans". Respondents rated their level of agreement with these various belief statements on a scale from 1 (strongly disagree) to 7 (strongly agree).

Interest in nature and nature programs. General interest in nature was measured on the survey by the respondent rating to what extent they felt their children were interested in *nature*, *wildlife*, and *fish* on a scale from 1 (not at all interested) to 7 (extremely interested). Interest in nature programs was measured by the respondent rating the appeal of programs to their family that integrate technology (in general), GPS, how scientists track wildlife (radio telemetry), and nature photography. These items were also recorded on a scale from 1 (not at all appealing) to 7 (extremely appealing). A separate open-ended question asked respondents to identify their primary concerns with participating in a nature program.

Data analysis. Survey data were entered into a statistical analyses software program (SPSS) and analyzed using a number of descriptive and comparative statistical tests. Respondents were categorized into WVO types by calculating their responses on the *domination* and *mutualism* dimensions, utilizing a process developed from prior WVO research (Teel & Manfredo, 2009). Based on their responses to statements for these two dimensions, a respondent was categorized into one of four groups: those who scored high on the *domination* orientation and low on the *mutualism* orientation were categorized as "traditionalist"; high on both orientations, a "pluralist"; low on *domination*

and high on *mutualism*, a "mutualist"; and low on both were categorized as "distanced" (see Figure 1).

Descriptive statistics of demographic variables were analyzed to determine the socio-demographic characteristics of the sample respondents. The dependent variables measuring interest in nature programs and programs incorporating technology were each recoded to a scale ranging from -3 to 3 to easily distinguish between positive and negative responses to the survey items. In addition, a one-way ANOVA statistical test was run to compare mean scores of the four WVO groups against the seven variables used to measure interest in programs and integration of technology with programs. Results from these tests were used to get a sense of the differences between all WVO types and to guide the development of focus group questions.

Focus Groups

Survey results allowed the researchers to identify respondents' WVOs to then recruit *distanced* and *mutualist* individuals to participate in a focus group and pilot program. These two groups were selected based on the agency's assessment that they were not sufficiently served by their current programming. Though the primary target was the *distanced* participants, the *mutualists* were chosen because not only did the agency feel they were also underserved, but they could be used to compare against responses from the *distanced* participants. Focus groups were moderated by one researcher while two others attended for note-taking. In the focus groups, participants were asked about (a) their interest in programs about nature (b) concerns and barriers to participation and (c) how participants felt about incorporating technology into these programs.

A proposed pilot program tracking box turtles using radio telemetry was then described to the participants. They were asked about their level of interest and ultimately requested to participate in a pilot of the program with their families. Interviews were transcribed and coded using open-coding to identify major themes.

Pilot Program

Based on focus group results, researchers and NCWRC staff adapted an existing box turtle tracking program to integrate the use of varied technologies discussed with the participants (e.g., telemetry, GPS, photography). A three-hour program was developed that included an introductory video and orientation to the program followed by going outside in a wooded area to track the turtles using radio telemetry. Once turtles were found, participants took GPS coordinates of the location and collected atmospheric data and the turtle's body temperature with a hand-held electronic device. The program was offered a total of three times, with 17 total adult participants and 22 children; each program consisting of either *mutualists* or *distanced* families, but not both together. Two researchers were present for each program, acting as participant observers.

Evaluation. Evaluation was conducted using three strategies. First, cameras were distributed to parents and families were instructed to take pictures that expressed "*I like what we are doing right now*", or "*I am enjoying this*". After the program, the photographs were printed and codes were devised by two researchers to categorize the images.

In addition, a 32-item evaluation survey was completed by each adult participant. The survey questions consisted of items inquiring about participants' satisfaction, enjoyment, and knowledge acquisition in respect to the program on a one to five scale, as

well as four open-ended questions asking the *most important* and *best part* of the program. Means were calculated for the scale items to determine participants overall reaction to the program and then means were compared between the *mutualists* and *distanced* differences between the two groups. Open-ended questions were coded for common themes.

Lastly, to further evaluate participants' reaction to the program, short focus group discussions were conducted at the completion. One researcher moderated the discussion with the adult participants; questions inquired of participants included their favorite part of the program, what they believed was the best part for their children, and suggestions for improvement in the future. The other researcher worked with the children, inquiring of them their favorite part of the program and improvements that could be made in the future. All analyses followed the same open coding methodology as prior focus groups, studying the transcripts for common themes.

RESULTS

Survey

A total of 2,201 residents received the survey, yielding 282 responses and 81 non-deliverables, for a response rate of 13.3%. A sample of 53 non-respondents were surveyed by phone, and subsequent analyses indicated only marginal variation between respondents and non-respondents on questions addressing interest in nature and wildlife, interest in nature programs, and programs that incorporate technology.

WVO's and demographics. Reliability analyses yielded high internal consistency among the sets of survey items used to determine wildlife belief dimensions and WVO's. A total of 36.5% of respondents were classified as *traditionalist*, 11.3% as

pluralists, 28.4% as *mutualists*, and 23.8% as *distanced*. A frequencies analysis showed that 92.9% of the sample was Caucasian, 92.5% received a four year bachelor's degree or higher and 79.6% earned $75,000 per year or more. These results indicate a highly educated, predominantly wealthy, Caucasian socio-demographic in this sample, which was the targeted demographic for the research.

Interest in nature and nature programs. The one (1) to seven (7) scale was re-coded to -3 to 3 to more easily distinguish between positive and negative responses. The mean response to interest level in nature and nature programs was positive for all variables measured across all four WVO types, indicating a general interest in all items for all groups. The *distanced* group generally showed slightly lower interest for all items measured compared to all other groups, with an exception of their interest in nature and interest in wildlife in which the *distanced* mean (1.71, 1.69) was slightly higher than that of *traditionalists* (1.59, 1.61; see Table 1).

Table 1. Average Interest in Nature, Wildlife, Fish, and Nature Programs Incorporating Technology by Wildlife Value Orientation.

	Wildlife Value Orientations[1]						
Survey item	Traditionalist	Mutualists	Pluralists	Distanced	*F*-value	*p*-value	Eta
Interest in nature	1.61[a]	2.16[b]	2.1[b,c]	1.69[a,c]	4.09	.007	.206
Interest in wildlife	1.59[a]	1.78[b]	2.15[a,b]	1.71[a]	3.50	.016	.191
Interest in fish	1.10	1.26	1.34	.99	.898	.443	.098
Interest in programs with technology	1.40[a]	1.35[a]	1.53[a,b]	.87[b]	3.48	.017	.202
Interest in programs with GPS	1.32	1.59	1.30	1.02	1.66	.175	.133
Interest in programs with wildlife tracking	1.48[a]	1.59[b]	1.97[a,b]	1.27[a]	5.08	.002	.228
Interest in programs with nature photography	1.48	1.69	1.84	1.42	2.52	.058	.163

1. Means with different superscripts are significant at $p < .05$ based on LSD method.

Statistical significance ($p < .05$) was found for four of seven variables analyzed by WVO type, though practical significance was minimal in all relationships (as determined by the Eta value). Post hoc comparisons revealed that *distanced* respondents differed significantly from either the *mutualists* or *traditionalists*, or both, on all of the statistically significant items: interest in nature, interest in wildlife, interest in programs that incorporate technology, and interest in programs that track wildlife. Interest in nature was significant at $p = .007$, with Eta = .206. Using the LSD method for post hoc comparisons, *utilitarians* differed significantly on this item from *mutualists* and pluralists, whereas *mutualists* differed from *distanced* as well. Significance was found in the interest in wildlife variable at $p = .016$ with Eta = .191. Though this was the only variable where the mean for *distanced* was larger than any of the other WVO's (in this case, *traditionalists*), this difference was not found to be significant; post hoc comparisons found that only *mutualists* differed significantly from *traditionalists* and *distanced*. Interest in programs that incorporate technology in general was significant at $p = .017$ with Eta = .202. Post hoc comparisons found the *distanced* orientation differed significantly from both *mutualists* and *traditionalists* on this item. Interest in programs that track wildlife was significant at $p = .002$ with Eta = .228. *Mutualists* differed from both *traditionalists* and *distanced* on this item. In a separate open-ended, qualitative question asking people's biggest concern when attending a nature program, *distanced* people expressed more concern with safety (32%) than respondents of the other wildlife value orientations (19%; see Table 2).

Table 2. Distanced and non-distanced responses to "*What is the greatest concern about your child spending time in nature?*"

	Value Type [1]	
	Non-Distanced	**Distanced**
Response Category	(n=130)	(n=52)
Safety	**18.6%**	**32.6%**
Environmental threats	7.6	7.6
Physical injury / Medical concerns	6.2	7.6
Strangers	1.0	0
General safety	3.8	15.4
Practicalities	**19.2%**	**28.7%**
Time	13.8	19.2
Cost	5.4	3.8
Location/Transportation	0	5.7
Biased / Inappropriate Content	**11.8%**	**3.8%**
Program Quality		
Undesirable program format (day, time)	3.0	1.9
Uncertainty about staff/host organization	4.6	1.9
Program quality in general	3.8	0
No concern	**39.2%**	**30.7%**
Totals	**130**	**52**

[1] Cell entries are percents

Focus Groups

Four focus groups were conducted with a total of 17 participants; two focus groups with the *mutualist* participants and two focus groups with the *distanced* participants. Focus groups were moderated by one researcher while two others attended for note-taking. In the focus groups, participants were asked about their interest in programs about nature, concerns and barriers to participation, how participants felt about incorporating technology into these programs and reaction to the agency's box turtle telemetry program.

Interest. Both *mutualist* and *distanced* participants expressed a high level of interest in nature based programs. Some similarities between the different WVO types explained that interest was based on opportunities programs afford to provide an educational opportunity as well as introduce potential career opportunities (M = Mutualist, D = Distanced):

> M: I think the reason I responded to the survey was because I think any program that can broaden kids' education is great and wildlife is an important thing to learn about and our kids are interested in it already, but I don't think there is enough local education.
>
> D: … *(in reference to a hunting course)* he enjoyed that class because there was so much information he got out of it.
>
> D: … when my son went to that hunting thing, some guy came in whose job it was to go around and checks the ponds to make sure that there is fish in there and counts the deer in such and such land, but my son was so interested in it that he's thinking about majoring in biology now, which just floors us.
>
> M: My daughter likes to go hiking, we've explored all the parks in the area and she very much likes animals and wants to be a zoologist when she grows up. She'd like to see what people are doing. She likes the idea of learning who is protecting it and actually getting to know the people

> doing the stuff in the field and maybe learning, like following in their footsteps for a day or something.

Though overall interest in nature programs was strong for both WVO types, some comments expressed obvious differences as well. *Mutualists* voiced a greater interest in science in general and a desire for programs to encourage stewardship and appreciation of nature:

> M: I really want (*name of child*) to be learning about the natural environment, you know, just the world we live and science is really exciting, so any part of nature is science, as far as I'm concerned.
>
> M: I homeschooled my kids for three years and we did programs here; that was sort of our science really, was going to different kinds of programs focused on nature.
>
> M: Yeah, I think a concern that I have and that I would like to get conveyed to younger people at an earlier age….is the idea of good stewardship of the land, because I think learning about the various critters and then, is one thing, but the impact of man on his environment.

Comments from the *distanced* group were more ambivalent toward the topic of nature as having an influence on their interest levels in programs. For this segment, the reasons for their interest were more varied but noticeably not based as much on nature and science.

> D: I guess I felt like it's sort of my role to teach them about that stuff (*nature/science*). I sort of saw myself as being in that role but maybe it would have been better to take advantage of those programs.
>
> D: I don't know that we look for nature programs, we look for activities that we can do and sometimes they might be nature-related, but that's not really what drives us.
>
> D: I mean I still remember when we were living in Nebraska and we went on an owl prowl, I mean as a family, it was at night, we were walking through the woods, and we learned the owl calls, and we were a group as a family and that is a very defined memory for me even today and so I think when you create things that the family can do as a whole it's nice to try to bring everybody back together.

Barriers and Concerns. Many parents expressed *time* and *cost* as limiting factors for participating in programs. These two themes appear as the most significant barriers to program participation in previous literature (Benetti & Marcelo de Carvalho, 2002; Christenson, 2004; Kim &Fortner, 2006; Ham & Sewing, 1988; Mckeown-Ice, 2000).

> D: Well, expense is certainly a factor.
>
> M: More opportunities, there are so many different places, and then you come across all these other issues, the time, and the expense sometimes.
>
> D: And the time too, the time that it's offered, you know, if the kids are older, is it summer time during the week or is it vacation time.

Another theme addressed by participants from both value types was that some programs are not age appropriate (i.e., younger and older children should be in separate groups):

> D: The way I feel about it as a parent in terms of a concern is that often times the language that's used isn't age appropriate necessarily and I don't know how to go about doing that, to make the information kind of friendly for both, for at least two different age groups.
>
> M: And also, I'm gonna add in there, more age focused I guess, so I mean, my kids are 13 and they really don't want to be and probably shouldn't be in a group with 5 or 6 year olds, because it's just so different and sometimes the age groups are too big and they are like the oldest kids there and they are turned off because they feel like they're kind of in a kiddie camp or a kiddie program.

Parents from both groups expressed the need for instructors to be well-trained and to provide accurate information and a safe environment.

> M: Just that they're getting accurate scientific information I think is good. I think correct and accurate and up to date is important.
>
> D: Well, if it was something that I wasn't there, who runs it? And the training that those people have … will they be safe while they're there?

However, regarding these perceptions of staff preparedness and training, the length of these discussions and frequency of their comments differed between the two WVO types. *Distanced* participants more often expressed concerns about safety and the need for protection from potentially dangerous animals and plants while in the outdoors. Some comments also display a sense of fear of the outdoors often seen amongst *distanced* WVO types, usually explained by a general lack of understanding and knowledge of the natural world.

> D: I think as long as you know that (the nature of the program) before you went so you could dress appropriately, a little education before you went. (*Imitating a program leader*)"You're going off trail; tuck in your pants, you know, provided there are ticks"
>
> D: I have some slight concerns around safety, specifically ticks, and just really being able to make sure that the folks who are out there running these programs are prepared for potential bee stings….I know that most wilderness people could care less about safety, but I do feel a little concerned about some of those unexpected nature elements.
>
> D: Just back to the safety piece, you know, I mean depending on who's supervising, if there are trained people with the children and if they're going off the beaten track, I wouldn't want them to run into a bear or something, so, or snakes or, as long as they're with someone who's trained.

Another difference between the two groups was that people of the *distanced* WVO type mentioned the difficulty of getting to the location where the program is being offered.

> D: If stuff is close enough, that is a factor, is convenience and how easily you can get to it.
>
> D: It seems like a lot of the programs are at a location, you know you have to get in your car, pack everybody up, and drive somewhere…it's hard, at least for a parental standpoint going somewhere, so it would really be nice if programs kinda came to some of the communities.

Integration of technology.. The prevailing feeling among participants was that technology is "just a tool" and if used properly, creates enormous educational

possibilities. Though this sentiment was shared by most of the *mutualist* and *distanced* participants, some comments were made suggesting the increased use of technology in today's society is having an adverse effect on children:

> D: I have three children and I feel like they spend way too much time in front of screens, and I'm very concerned about that… So as a parent, for me it's really about trying to get children and adults out of that internal place that technology has somehow overtaken.
>
> D: I think it's really important and I think that there's a whole generation of children and families who are…I'm not sure what we're gonna look like, you know, 10 years 20 years down the road, this generation that's growing up today and I don't know how to get off or to disengage from what seems to be the critical mass of technology.

Despite these comments, parents generally viewed the integration of technology in school and education in general, as well as the agency's box turtle program, as a very positive aspect, and believed it would inspire and encourage their children's participation.

> M: They're immersed in it just from, almost from the get go. And they pick it up like, It's amazing to me. I remember when I first started learning about just a basic computer and we were so excited to have one, and now they have several, I mean even in preschool they have them and they're just so comfortable and they love it, so yeah, that would definitely appeal to them.
>
> D: I'm not worried about them having too much. They're not spending hours on Facebook. But I think to discard technology is almost ignorant in a way, that's how our society is and it's not going away.
>
> M: I mean my kids, they're 13 and … they're in technology class at school, they love the different aspects of the different modules and every single one they're just as excited about as the last and, I mean it is, that is their life, and it's going to be their future so it's very important, I mean they love anything like that….
>
> D: I think it would encourage children's participation, it would keep them engaged, and adding that layer on and tying the two together I think is terrific cause kids are so focused on technology and so comfortable with it, I think it's just terrific.

Participants also felt the combination of technology and being in nature would capture children's interests and teach them how technology is used in real life situations involving science and research.

> M: Combining technology with wildlife I think is definitely intriguing to kids these days.
>
> D: I think it's a really neat program and that would be great to do as a family I think, again, bringing technology with nature, I like that idea, rather than the two being separate, bring them together and then ultimately they can make some connections around why we do something like this, what are the overall benefits and how would this manifest itself on a larger scale, rather than just tracking the turtle, what does this mean, why are we doing it, why is this even relevant.
>
> M: …when we're talking about programs, none of us said, "Well we'd like one that combines technology" and now I'm like I'd really like to have more programs like that you know that kinda combine, especially again for my age the kids that I have, that would be even more of a draw for them to have technology related to the program….
>
> D: The telemetry is cool, I love box turtles, I think they're terrific creatures, just fascinating, the telemetry is great, GPS, I work some with GPS in my work and it just sounds like a great program, it would be great fun, cause you could go find turtles, I love seeing box turtles and this is an opportunity to actually go track something down.

Pilot Program

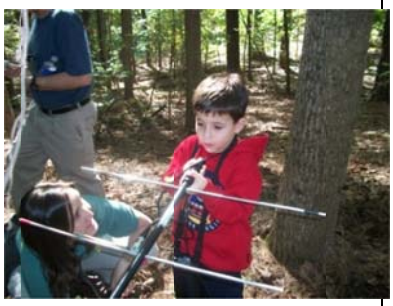
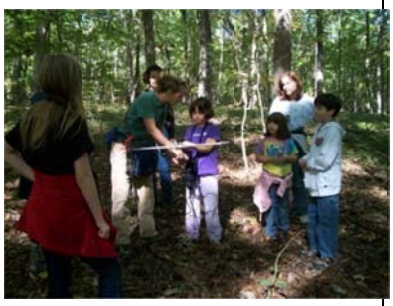
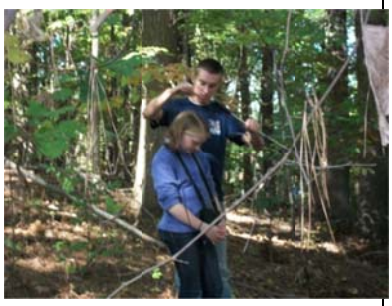
Based on the high level of interest from both groups in programs about technology and nature, agency staff adapted an existing box turtle telemetry program to account for input from the focus group to develop a three-hour program offered on a weekend for families. Results from the initial focus groups indicated a high interest from both groups to incorporate technology into programs. Results also indicated a strong concern for safety from the *distanced* group. The box-turtle program was offered three times; families of the *mutualist* and *distanced* participants attended at separate times.

Photographs. Participants in the *distanced* group took fewer photographs each (mean = 20) on average than participants in the *mutualist* group (mean = 41). After reviewing all photographs, researchers identified three main thematic categories: *turtles*, *technology* and *nature*. Examples of photographs for each category are included in Figure 2. Comparisons between the two groups in terms of categorization of photographs proved remarkably similar: *turtles* comprised 41% of the *distanced* and 48% of *mutualists* photographs; *technology* comprised 17% for *distanced* and 15% for *mutualists*; and *nature* comprised 22% for both *distanced* and *mutualists*.

Turtle examples



Technology examples

Nature examples

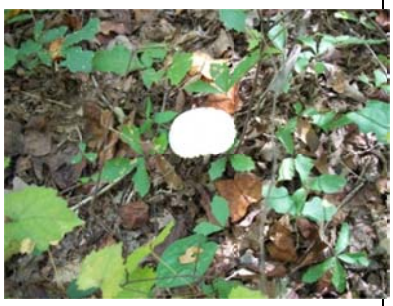




Figure 2. Example Photographs.

Focus groups and final survey. During the focus group interviews and on the surveys, both the *mutualist* and *distanced* participants expressed enjoyment of the program. The aspects of the program both WVO type participants commonly noted as the "best part" included the interactive, hands-on activities for the children through 1) the integration and use of *technology*, and 2) finding *turtles*, and a third theme addresses 3) being outside in *nature*.

> M: I think just engaging the kids. They were very engaged and it was great having something to do for all the kids, they could use, the ones who were not tracking could use the cameras, that was very wise, so everybody was busy, everybody, it oriented the kids who weren't really used to wildlife for instance, and I think it was good, I think they really enjoyed it, the way they wouldn't have necessarily done in other settings.
>
> D: I think finding the turtle, that was like, they loved that.
>
> D: Using the technology and how it's used for tracking and the overall objective I think is good for them to be learning about.
>
> M: Getting outside. It's great to get outside with my family, cause you asked what we liked, and I think, I enjoyed getting outside. Rather than sitting in a classroom, just hearing it. Actually getting outside, hands-on.
>
> D: Mostly being outside (*lots of agreement and laughter*).

On the evaluation survey, respondents from both groups generally agreed on major variables regarding satisfaction with various parts of the program. However, d*istanced* participants expressed less satisfaction with safety issues on an open-ended survey question about how the program could be improved. An example of this comment by a *distanced* participant clearly illustrates this difference:

> D: Let us know ahead of time that we will be deep in the woods and should consider insect repellant; several emails ahead of time with more detailed information.

Comments from the children show the same enthusiasm and enjoyment as those from the adults as well as the same three most common responses for both groups as to their favorite part of the program (C = Children):

C:The technology.

C: Finding the turtles.

C: Being outside

DISCUSSION

Results from this case study reveal three key findings: (1) WVO's can successfully guide educational nature programming for wildlife agencies (2) Interest in nature programming is high amongst all WVO types, though a successful nature program for individuals within the *distanced* WVO group should pay greater attention to safety issues and (3) Interest in technology as an educational tool is high amongst all WVO types and can be a positive adjunct to nature programming.

WVO's and Nature Education

Understanding WVOs of a population has proven to be an important method for guiding resource management decisions (Bright, Manfredo, & Fulton, 2000; Manfredo,Teel, & Henry, 2009; Teel & Manfredo, 2009), yet until the project of which this study is a part of, WVO's had never been used to guide the direction of educational programming. Our findings support the use of WVO's as a viable tool in the development of nature and science educational programs. Knowledge of the participants WVO types allowed for aspects of the pilot program to be adapted specifically for that particular group (i.e. safety concerns of *distanced* population). In this study, though interest in nature programs was high amongst both WVO types, *mutualists* were motivated to participate in nature programs more for educational and environmental

reasons whereas *distanced* participants were motivated due to the educational, career, and family opportunities nature programs can provide. Practitioners wanting to address the educational needs and desires of their community can benefit by better understanding their targeted populations' values and beliefs toward nature and wildlife. In this way, practitioners can also better market their programs to the correct individuals, increasing participation. With increased participation in nature and science programs comes increased revenue and a better educated society on the issues of conservation and land stewardship.

Interest in Nature Education

Our study also revealed that within the population sampled, interest in participation in nature and science programs is high amongst parents of all WVO types. This is consistent with findings from other studies within this same larger project as well as prior research studies (Bruyere, Billingsley & O'Day, 2008). Though interest was high within all four WVO types, variation did exist in the degree of interest in wildlife and nature related programming. Survey results and focus group findings suggest that individuals of the *distanced* group show slightly less interest in these programs than do the other WVO types, with *mutualists* showing the greatest amount of interest. Nature education practitioners wishing to attract and meet the needs of individuals holding a *distanced* type should design programs to be hands-on, inter-active, allow for the entire family to participate, and present accurate, accessible information. Most notably, individuals holding a *distanced* type express a greater amount of concern with safety and comfort in regards to nature, therefore developers of programs wishing to dissuade these

fears should pay particular attention to safety and dispelling misconceptions on the dangers of the outdoors.

Technology as a Tool for Nature Education

Technology was regarded in a positive light by the respondents on the survey and participants in the focus groups and pilot program. The integration of technology into nature and science programs was seen as a beneficial addition for educational purposes on a variety of levels. Parents recognize that their children are engrossed by technology and that it is a significant aspect of their everyday lives. Incorporating interesting technologies into programs was viewed as an effective way to engage children's attention and interest. Using technological equipment and recording data was also seen as a constructive method for teaching youth how scientists do their work. This aspect of the program was seen as a possible avenue for exploring potential careers in science, something parents of both value types expressed as important. The use of the equipment increased the children's engagement and enthusiasm and allowed the children to discover the turtles, which then became the focal point for learning. The equipment was essential to the success of the program and enhanced enjoyment rather than detracting from the overall experience of being in nature and interacting with wildlife. Though there was some sentiment that it is difficult at times to disengage children from technology and focus on the world around them, most participants expressed that technology "is their future" and if used properly as a tool has immense educational capabilities.

Suggestions

It is evident that parents are interested in their children learning about science and nature and understanding a populations WVO's can help ensure appropriate topics and

themes are addressed. Technology is an integral and fundamental aspect to modern society and when used properly can enhance these programs. Funding and future research should therefore focus not on whether parents are interested or whether technology should be used in nature programs, but on how to address the interests of all WVO types and in turn increase participation and awareness of these programs. Potential studies should focus on specific types of technologies and attempt to reveal which are most capable of enhancing an outdoor nature experience, not just from a knowledge acquisition standpoint, but as a means to develop an environmental ethic and connection to the natural world.

CONCLUSION

Research shows that parents of all WVO types, cultures and backgrounds feel that science and nature education is important for their children. Though support for increased science and nature educational programming is positive, there are definite variations in interest and degree of importance amongst people with different value types. Individuals who themselves feel deeply passionate about science and nature naturally will place great value on science and nature education for their children, and vice versa. Similarly, parents who believe that learning how to practically engage technology is important will feel it to be an integral aspect to science learning for their children. Though again there may exist varying degrees of importance within individuals who hold differing values, evidence from this study suggest that parents express a positive attitude toward the integration of technology into nature and science programming. Results from this study suggest that despite the rhetoric vilifying technology as a deterrent to nature experiences, technology can in fact be used as a motivator and effective tool for engaging

youth in the outdoors. More research needs to be done on which types of technology are best suited toward enhancing a nature experience. The research should investigate methods for ensuring that the technology does not become the focal point itself, but serves to heighten engagement and enthusiasm such that the overall experience of being outdoors is regarded positively. Research shows that positive experiences in nature lead to an increased environmental awareness and connection which in turn can ultimately affect the positive stewardship of our planet.

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III. INCORPORATING ENVIRONMENTAL EDUCATION INTO AN URBAN AFTER SCHOOL PROGRAM: A CASE STUDY IN NEW YORK CITY

INTRODUCTION

Awareness of environmental issues has grown tremendously over the last decade as modern science and a globally conscious population continues to enlighten individuals to our ultimate connection to the planet. Along with globalization have also come population growth and urbanization as well as fragmentation and land area loss, creating a divide between people and the natural environment. Through contact with and learning about natural areas we can begin to bridge this gap and restore our balance with nature. Environmental Education (EE) has the potential to facilitate experiences that can ultimately contribute to an environmentally aware and literate society and a deeper understanding of the natural world. Time spent in nature, especially for children, strengthens our natural connection to the Earth, as well as likely facilitating an environmental ethic.

Exposure to nature, either through structured EE, or unstructured play, has many proven benefits to children's physical health (Binns et al., 2009; Cleland et al., 2008; Lester & Maudsley, 2006), mental health (Wells, 2000; Wells & Evans, 2003) and academic achievement (Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998), as well as enhancing a person's conservation ethic and environmental stewardship (Chawla, 1999;

Palmer, 1993; Palmer, Suggate, Bajd, &Tsaliki, 1998). Yet despite the benefits of EE, many barriers exist to its incorporation into formal and informal educational settings.

Direct experiences in nature, commonly integrated into EE lessons, are crucial in the development of an individual ethic toward environmental stewardship (Chawla, 1999). However, research suggests a current trend that fewer children engage in outdoor play and therefore fewer children experience nature directly (Clements, 2004; Rivkin, 1995; Singer, Singer, D'Agostino, & DeLong, 2009). Richard Louv (2005) argues that as children spend less time playing in nature, we lose our connection to the Earth which has created an epidemic he refers to as "*nature deficit disorder*". Louv claims that as we become more alienated from the natural world, people, children in particular, suffer from "diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses" (p. 36).

A common reason for children and families not engaging in outdoor activities is a perceived lack of time due to the greater stresses of society (Benetti & Marcelo de Carvalho, 2002; Kim &Fortner, 2006; Ham & Sewing, 1988; Mckeown-Ice, 2000). Society in the United States has seen an increase in demands on the family; with parents working full time, more than 14 million children are on their own after-school and 6.5 million are in after-school care programs (Earle, 2009). After-school programs provide an important opportunity for children to do homework and have the potential to support and enhance what youth learn in the formal K-12 classroom, even leading to higher levels of achievement in academic standards (Viadero, 2007). With an increasing need for after-school care, there is an unprecedented opportunity for educators in these settings to incorporate EE and reach vast numbers of children annually. After-school programs lend

themselves to informal, experiential approaches and opportunities to develop well-designed hands-on projects and program activities (Weisburd, 2005).

Another reason for lack of exposure to natural areas stems from a shift towards more urbanized living (Satterthwaite, 2000). With a greater portion of the population living in urban environments, experiences in and health benefits from natural areas are limited due to the lack of green and natural spaces available in many cities (Verheij, Maas & Groenewegen, 2008). Likewise, resources available to urban families, schools, and after-school programs make funding for trips to natural areas quite difficult (Benetti & Marcelo de Carvalho, 2002; Ernst, 2007; Middlestadt, Ledsky & Sanchack, 1999; Ham & Sewing, 1988; Mayeno, 2000). These issues are especially pronounced in a highly urban area such as the Bronx in New York City, the site of this study. Although substantial challenges exist exposing urban youth to natural areas, many innovative and plausible methods have been and continue to be developed as a means to overcome these barriers.

Statement of Purpose

As part of a large scale effort by the Western Association of Fish and Wildlife Agencies (WAFWA), Colorado State University (CSU) researchers partnered with six state wildlife agencies (Nebraska, Montana, South Dakota, Hawaii, North Carolina, and New York, with the ultimate goal of connecting children and their families to nature. This particular qualitative case study examines an after-school program administered by The After-School Corporation, Inc., Committee for Hispanic Children and Families, and United Neighborhood House. The guiding research questions were: 1) *"What is the parental and educator interest in nature lessons (EE) in a highly urban after school*

program?”, 2) *“ What are the barriers to nature education in an urban-based after-school program?”* and finally, 3) *“How can EE be effectively integrated in the after school program?”*

Benefits of Environmental Education

Previous research has revealed many benefits of EE in a variety of formal and informal settings such as classrooms, nature centers, residential outdoor camps and others. Research shows that students who are exposed to EE perform at higher levels on standardized tests as well as in regular classroom activities in all subjects (Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998). An additional benefit of EE is increased student engagement, enthusiasm, interest, and knowledge (Christenson, 2004; Dresner, 2002; Ernst, 2007; Glenn, 2000; Lieberman & Hoody, 1998). Lieberman and Hoody (1998) found that in schools that integrated EE, students gained knowledge more effectively, retained it longer, showed increased critical thinking and problem solving skills and became enthusiastic, self-motivated learners.

Another outcome of EE is its positive effect on environmental stewardship. While definitions of and theoretical understandings about EE do not explicitly cite experiences in nature as a requirement for a program or lesson to be considered “EE,” such experiences are often included in EE programs and can result in positive environmental stewardship. Research has consistently shown that positive experiences in nature as a child help foster a connection to the natural world and lead to environmental stewardship as adults (Chawla, 1999; Palmer, 1993; Palmer, Suggate, Bajd, &Tsaliki, 1998). Chawla’s (1999) study revealed that direct experience with nature as a child through lessons passed on by a prominent adult, inspiring teachers, and memorable field

trips can have a significant influence on an individual's environmental attitudes and behaviors as well.

Motivations to Integrate EE

There are many reasons educators of all demographics and from a variety of settings are motivated to use EE. One important motivation is an educator's own ethic toward environmental stewardship which can inspire him/her to teach environmental topics (Lamb & Bruyere, 2009). Other cited reasons for interest in integrating EE include the desire to encourage youth to respect the natural environment, providing opportunities for professional growth, the challenge of learning new subject matter, strengthening teaching skills and the flexibility to try new things (Ernst, 2007; Lieberman & Hoody,1998). Research shows educators using EE report a greater enthusiasm and revitalization in their teaching (Christenson, 2004; Dresner, 2002; Ernst, 2007; Lieberman & Hoody, 1998). Ninety-five percent of the teachers interviewed in Lieberman and Hoody's (1998) study expressed rejuvenation in their teaching and some participants regarded environmental concepts and teaching strategies as a highlight of their teaching career.

In a study conducted by Ernst (2007), results suggest that an opportunity to affect environmental literacy, knowledge, skills and sensitivity are among the most influential reasons why teachers persist in incorporating environmental topics in their lessons. A study conducted by Middlestadt, Ledsky and Sanchack (1999) showed that many teachers incorporated EE because they believed it was necessary for their students to understand the need to be responsible caretakers of the environment prepared to protect and preserve it for the future. Teachers from Lieberman and Hoody's (1998) study report that through

using EE, students were able to better understand the connection between the natural world and socio-cultural systems.

Previous studies suggested that teacher trainings provide significant motivation to incorporate EE into curricula (Dresner, 2002; Kim & Fortner, 2006; Ham, Rellergert-Taylor, & Krumpe, 1988). In a study by Dresner (2002), the majority of teachers who participated in an EE training program reported increased enthusiasm from their students and in turn an increased motivation to continue implementing environmental based field projects in the future. Ninety percent of the teachers reported putting into practice or improving upon a field ecology project at or nearby their school as a result of the training. The training improved teachers' knowledge, skills, and confidence in implementing environmental based field projects. Findings from Kim and Fortner's (2006) study also suggest that trainings in EE can enhance content and pedagogical knowledge which in turn can facilitate the teaching of environmental topics.

Barriers to the Integration of EE

Ham and Sewing (1988) provided the initial foundation of literature on barriers to EE more than 20 years ago; the literature today reveals many of the same general findings. In their work, Ham and Sewing categorized the barriers to EE into four major groups: conceptual, logistical, educational and attitudinal. Three of these groups are used in the following section to explain prior research in EE barriers

Conceptual barriers. According to Ham and Sewing (1988), conceptual barriers are the result of a lack of agreement as to how to define EE and its purpose. These inconsistencies and misconceptions about EE and its role in education make it difficult to implement and incorporate into the school curriculum. Ham and Sewing (1988) found

that most educators tended to view EE as falling primarily within the scope of science, and few incorporated EE into other aspects of the curriculum. Research reveals that this conceptual barrier is perpetuated by the logistical barrier that the majority of EE materials available to teachers are science-based (Ham & Sewing, 1988; Kim & Fortner, 2006; Wade, 1996).

A second conceptual barrier is teachers' fear-based perceptions of nature (Simmons, 1998). Simmons interviewed teachers from the urban Chicago area, focusing on the perceived barriers to using natural settings as an educational medium. Although the deep woods and natural water areas were perceived as being the most appropriate place for EE, these locations were also associated with many hazards and safety concerns. Teachers' fear of getting lost, encountering dangerous animals or poisonous plants, and distance from help in case of an emergency were significant concerns with natural settings. Concern for safety was also noted in the urban setting. Lastly, the Simmons study also revealed that some teachers felt that nearby outdoor locations such as urban nature and county parks were not appropriate or viable places to teach EE because of the misconception that these settings are not natural and therefore do not represent "nature".

A third conceptual barrier emerged from research by Middlestadt, Ledsky and Sanchack (1999) in reviewing the data from surveys sent to teachers already using EE in their lessons. Though these teachers saw few barriers and disadvantages to teaching EE, 28% feared that environmental issues of high magnitude or severe consequences could seriously upset or overwhelm students, causing them to "become disillusioned, emotionally upset, feel helpless, worry that there were no solutions, become negative

towards EE, or feel unhappy or confused" (Middlestadt, Ledsky & Sanchack, 1999, p.15).

Logistical barriers. A great deal of literature identifies *time* as the strongest barrier to EE in schools (Benetti & Marcelo de Carvalho, 2002; Christenson, 2004; Kim &Fortner, 2006; Ham & Sewing, 1988; Lamb, 2009; Mckeown-Ice, 2000). Lack of planning time, actual time with the students, and time to fit EE into an already demanding curriculum all rank high on teachers reasoning for not using EE in their lessons in a number of studies (Benetti & Marcelo de Carvalho, 2002; Christenson, 2004; Kim & Fortner, 2006; Ham & Sewing, 1988; Lamb, 2009; Mckeown-Ice, 2000). In several studies, teachers complained that busy schedules made planning time so scarce that developing new curriculum or methods for incorporating EE into existing lessons was simply not feasible (Benetti & Marcelo de Carvalho, 2002; Christenson, 2004; Kim &Fortner, 2006; Ham & Sewing, 1988; Lamb, 2009; Mckeown-Ice, 2000). Benetti and Marcelo de Carvalho (2002) learned from their interviewees that many teachers work other part time jobs, making planning time even scarcer.

A second logistical barrier is a lack of funding for field trips and materials, and to develop new curriculum that incorporates EE (Benetti & Marcelo de Carvalho, 2002; Ernst, 2007; Middlestadt, Ledsky & Sanchack, 1999; Ham & Sewing, 1988; Mayeno, 2000). In a study conducted by Mayeno (2000), teachers expressed they would be five times more likely to participate in environmental programs outside of class if there was more funding available, especially for transportation and program costs. This is similar to a finding by other researchers in which educators cited a lack of access to outdoor spaces as a barrier (see Benetti & Marcelo de Carvalho, 2002; Simmons, 1998). Ham and

Sewing (1998) relate this finding to a conceptual barrier by educators who perceive EE as something that requires going off-site, as opposed to an activity that can occur on the school grounds. In a related study, Benetti and Marcelo de Carvalho (2002) found that additional funding concerns included lack of support for EE materials such as activity books, textbooks, videos, laboratory equipment and tools for exploration like magnifying glasses, binoculars and microscopes.

Educational barriers. Prior research also indicates that educators may not have sufficient ecological knowledge and training to effectively use EE in their teaching (Cutter-Mckenzie & Smith, 2003). This lack of knowledge and subsequent lack of confidence on the part of the teachers is a barrier to EE mentioned in numerous other studies (Benetti & Marcelo de Carvalho, 2002; Cutter-Mckenzie & Smith, 2003; Ernst, 2007; Ham & Sewing, 1988). The insufficient knowledge and misconceptions about EE can largely be attributed to a deficiency in training and workshops designed to inform educators how to integrate EE throughout their curriculum (Benetti & Marcelo de Carvalho, 2002; Cutter-Mckenzie & Smith, 2003; Ernst, 2007; Ham & Sewing, 1988; Mckeown-Ice, 2000; Wade, 1996).

Attitudinal Barriers. Finally, Ham and Sewing (1988) describe attitudinal barriers as personal beliefs that prevent educators from devoting energy on environmental topics. Some educators, for example, find environmental topics to be inappropriate for their particular instructional setting or they may have strong opinions concerning the subject matter that dissuades them from addressing these issues. The researchers in this study found limited evidence in the literature suggesting this is a major barrier to EE being taught.

METHODS

This research utilized a case study approach to investigate and assess the conservation aspect of an after-school program located in the Bronx area of New York City. The program serves 140 children in first through eighth grades, with one lead and one assistant instructor per grade level. The program is offered in the same school building the students attend during the school day. The majority of the school community is of Dominican descent; a significant portion of the students' parents speak little or minimal English and remain integrated in the Dominican culture. The neighborhood is in a highly urban area with limited natural green spaces.

Over the course of 18 months the program invested in building capacity to deliver EE at all grade levels. This included a series of three full day trainings about EE principles and best practices; role-modeling of numerous EE activities; and curriculum development for EE content to ensure age-appropriateness and an emphasis on place-based learning. The specific data collection steps in this case study included focus groups, staff training, and evaluations.

Focus Groups

Four focus group interviews were conducted; two with parents of the after-school students and two with the after school program instructors. The first focus group for each group occurred pre-program and consisted of a series of questions intended to determine the participants' interest in nature in general, interest in programs about nature and science for their children/students, and barriers to participation in more nature-based programming or curriculum. Discussions were moderated by one researcher while other researchers were present for observation and note-taking.

A second focus group was conducted post-program with each group to assess the lessons learned and outcomes of the program. Questions posed to the parents were intended to ascertain the level of awareness the parents had of the changes in the program, whether they noticed attitudinal or behavioral changes in their children, and whether changes were being made at home in response to the children's learning. Specific questions asked of the educators addressed the types of activities and EE they had incorporated into their program since the initial focus groups and trainings, which activities and themes worked the best and received the most interest from the students, and what they intended to do to continue expanding the use of EE in the curriculum in the future.

Staff Trainings

After the pre-program focus groups were transcribed and analyzed, results were used to develop three full day trainings for the staff implemented over the course of six months. The first training included development of an EE activities guide book and best practices designed specifically for the educators at the Bronx site with content and activities focused on adaptations and behaviors of birds, including species migration patterns between New York and the Dominican Republic (based on data from the focus groups). A second training three months later consisted of role modeling five EE activities followed by discussions of how those activities could support their curriculum in other subjects. The activities included dissecting owl pellets, making wildlife plaster tracks, pressing flowers, building birds' nests from materials gathered around the school grounds, and viewing insects through a magnified viewer. A third training three months later consisted of three additional activities: tree coring, fish prints, and water quality

testing, followed by a facilitated planning session to allow the educators to develop their individual EE curriculum for the 14-week Spring term. Staff were asked to complete evaluations of each training, including the value of each component and activity of each training session.

Data Analysis

Focus groups. Transcriptions from the pre-program focus groups about interest in and barriers to nature programs were analyzed and open-coded to identify major themes. The themes were compared with notes from the note-takers present for the discussion. When coding the transcripts, researchers used a set of themes generated from prior research including barriers to EE such as *time*, *funding*, and *lack of resources (outdoor space, supplies)*. (Benetti & Marcelo de Carvalho, 2002; Ernst, 2007; Middlestadt, Ledsky & Sanchack, 1999; Ham & Sewing, 1988; Mayeno, 2000). An open (non-scientific) analysis of the final focus groups was conducted by reviewing researchers' notes, listening to the audio recordings of the interviews multiple times to search for common themes, and discussing results with other researchers.

Trainings. Evaluation of the trainings consisted of short open-ended survey questions, a four-point scale where educators gave feedback on the different activities rated "not at all valuable", "somewhat valuable", "very valuable", and "extremely valuable". Also, as a means of assessment, the educators completed a monthly outcome evaluation form after conducting the first section of their conservation program. Responses were reviewed to assess the educators' interest level in the material, which activities they felt were most helpful and applicable, and what changes they implemented in their curriculum to expand upon the conservation program. Due to the small sample

size of the staff (14), simple descriptive statistics were generated for the scale items, and a non-scientific review of the open-ended responses was conducted in which answers were simply compiled.

FINDINGS

The results of this case study revealed three key findings. 1) Parents' and instructors' interest in EE for their students was high. 2) Perceived barriers for the after-school educators to incorporating EE were consistent with prior research, especially related to *time, funding, and resources*. 3) The trainings and subsequent incorporation of EE activities into the program were effective in creating positive change in the educators, students, and parents.

Key Finding 1: Interest in Nature and EE Programs was High for Parents and Educators

Parents were overwhelmingly interested in EE programs for their children and there was consensus among educators in wanting to integrate EE into their lessons. Participants expressed a desire for the students to be exposed to nature for a variety of reasons (P = Participant):

> P: Well, living in the city, they not exposed to nature so much unless they go to park. Unless you get to woods, and you see wildlife for real, you don't really see nature.
>
> P: They get to appreciate the water, the freshness, the animals They get to realize that trees, that every living thing has feelings, even if it's a tree, it grows… everything has a story, how it's growing different because the water going or the sun is shining from that way, the angle, there are so many different things.
>
> P: Instead of reading it, they get to experience it, and I think experience is more learning than reading it in a book.

P: I think that some kids that age think that science is boring, and if you can introduce it through nature, maybe they'll…I know that kids love to be outdoors, playing and they are very observant of things and if you can introduce science through [nature] that would be great, because that would, you know, make them, get them interested in science.

P: I like teaching science, and conservation because I grew up in the Dominican Republic, very close to the river, [playing] with animals, with mud and stuff like that… and I think it's important for the kids to learn to have fun is not to be in front of a TV or video games… there are many things out there that nature can offer them, to learn, and at the same time have fun.

Many participants expressed an affinity for the natural beauty of their home country, the Dominican Republic; many parents stated they make an effort to bring their children there as much as possible. In referring to a recent family trip to the Dominican Republic, one participant commented:

P: … a lot of trees, a lot of parks so you're like, oh I'm in the Paradise, because you cannot see that here at all. There it's all the time, flowers, um the parks are always like green, and he loved that, he loved that.

Many participants agreed with this statement, indicating a sense of connection to the landscape from where they came. Another common theme shared by the parents and educators was a desire for the children to gain more knowledge and a stronger understanding of, as well as respect for, the natural world and its individual components. Parents felt that by visiting natural places their children would garner a sense of compassion, caring, and respect for nature and educators were interested in integrating EE into the program as a means to acquire knowledge and instill love and respect for the natural world.

P: …besides learning about nature and seeing what nature is about, but also learning how to take care of things that are in their surroundings, to learn where a tree comes from, also an animal… to

be kind and gentle to things in their surroundings because …they could learn how to love trees, how to love animals, and not destroy what's their surroundings…

P: And also, when we teach about conservation they're gonna be like "Why should I need to care about the Earth". We should teach them to love it first, and to have that love grow inside of them, they have to be exposed to it and then they can be "Oh yeah, I like trees. This is amazing; nature is awesome, because nature was there before me, not after me, so why destroy it.

P: They get really the respect. Once they know that nature has its course and how beautiful it can be, I think they got to appreciate it a little bit more.

Key Finding 2: Perceived Barriers for Educators to Integrating EE into Curriculum were Consistent with Prior Research

Time was a major barrier mentioned by many of the educators; it was lack of planning time and more notably, actual time during the after-school program that they perceived as obstacles to incorporating EE into their curriculum. When asked what limits the use of EE in their lessons, many people immediately and fervently said "Time!" all at once. There was much agreement that they simply did not have enough time with the students to take them to interesting outdoor places. One participant had this suggestion as a means to overcome the issue:

P: I guess if worked out something with the principal, we could pull the kids out earlier, and then still meet by 6 o'clock and there shouldn't be any problems with that.

In response to a follow up question inquiring about planning time, one participant had this to say:

P: Well we don't have time.

Planning time was limited, so the only time available to plan for EE programs would be on the educators own time. Even after the trainings were conducted and the staff had

begun to improve upon their EE curriculum, time management was still an issue raised in the evaluation of their lessons:

> P: One of my challenges is time management due to up-coming city tests some students are participating in often after school for test preparation, and by the time they return to the classroom, they miss the informative part of the nature activities.

Even if they could be afforded the time to take the students somewhere in the city, lack of *funding* to do so was expressed as another obstacle in the focus group discussions as well as the post-training evaluation questions:

> P: Yeah, maybe extra funding for all the programs that lets you go on trips like the Bronx Zoo, and expose the kids to the environment there. Or maybe like, going outdoors to the suburbs, botanical gardens…
>
> P: Because for money, you know they get stuck, so if there's places they can go we don't have to pay or we can encourage parents to tell them where they can go and also to try to find funding….
>
> P: ….more funding for trips, outdoor exploration and materials for hands-on activities…

Responses from participants generally expressed their desire for students to be exposed to nature programs as something that would occur in a natural setting. Though not expressly voiced, it seemed that the consensus was that nature education was something that occurred mostly in nature and not in the classroom. Therefore, lack of *natural places* to take the students due to their urban location was perceived as a barrier to utilizing EE. This was expressed in a comparison between the place some educators visited with their students in upstate New York and the city:

> P: We were with the fortunate kids that got to go to Goshen last year, and they got to realize, like, what's the difference between the atmosphere here and the city where we have a lot of pollution and the fresh air out there, and it's so different because your lungs feel different, and you're more energized. They got to also got to really see what a pond is. You don't see those around here. What you see are ditches.

The staff recognized this disconnectedness from nature they experienced through living in the city.

Key Finding 3: The EE Trainings Had a Positive Effect on Educators, Students, and Parents

Trainings. During the first training session, the staff described some of the changes they had made immediately following the initial focus group interview. Some of the staff began making changes to their lessons to incorporate more EE as well as taking their students on field trips to green spaces, the Bronx Zoo, and more. For example, these responses are from a survey question asking what the educators had been doing since the focus group:

> P: …getting the students outdoors overall helped the kids enjoy conservation more.
>
> P: The first graders had a field trip to the Bronx Zoo...They wanted to learn more and have by going to library and getting books for me to read!

Throughout the first training, the staff was receptive and attentive, showing genuine interest in the content and activities. The same enthusiasm carried over into the following training sessions. Responses to the final survey asking the educators how they felt about the trainings revealed a sincere appreciation for the new content:

> P: The most helpful part of the training was planning activities for spring.
>
> P: I loved having the opportunity to get ideas and plan for our activities. It gave me the opportunity to find out what might work with my class.
>
> P: We had time to actually look at what's coming in a few months & be more organized with our work. I had a chance to learn new, different, & exciting activities that I can present to the students.
>
> P: The most helpful parts of the training were the hands on activities and developing lesson plans which allowed us to get a sense of what we will be teaching the kids.
>
> P: I loved everything about the training, but most of all the activities we developed.

After the third training, staff developed lesson plan guidelines that they filled out in planning for the upcoming program. They expanded upon themes presented at the training by including games, activities, videos, and field trips into their curriculum. They then filled out a monthly outcome sheet to report challenges and outcomes they were experiencing in introducing the new lessons. Outcomes were all positive and expressed student engagement and enthusiasm for the lessons, as well as from the instructors:

> P: The students have all gotten very engaged in our lessons …. At the end of the school year, I think they will all have so much love and connection to the natural world around them. I'm looking forward to continuing with connecting youth to nature.

In evaluating the individual activities presented at the trainings, staff marked "very valuable" or "extremely valuable" for every activity. In general, the staff members were excited to be learning new activities and expressed a strong commitment to continuing to improve upon their conservation curriculum.

Final Evaluation. The final focus group interviews revealed a significant change in awareness and pursuit of knowledge pertaining to nature and environmental issues amongst staff, students, and parents. Comments made by staff and parents even suggest that positive changes in environmental behavior occurred as well, an important step toward environmental literacy. Both staff and parents expressed an overwhelming support for the increased incorporation of EE in the curriculum and were very pleased with the reaction of the students.

Parents. When asked what they knew of the new lessons in the program, parents expressed that though they were unaware of many of the specific activities the children were involved in, a noticeable change in awareness toward nature and environmental

issues was evident. Parents expressed joy in watching this change and interest in science and nature take place in their children.

> P: (*Spanish translator*) He's been observing that his child now cares for nature, that his child gets the opportunity in this program to approach nature more, to see nature, and he noticed that his kid is now very concerned. He brought home a plant and said please take care of it, water it. So he sees the difference, the caring, that his child was never like that, so he notices the difference. He notices a change in attitude, that it has nothing to do with age.
>
> P: (*Spanish translator*) She says she has plants at home and she used to take care of them, and she notices now that her daughter's taking care of them, she's picking out dead leaves and watering them (*the plants*). And she also notices that her daughter is recycling.
>
> P: They're bringing it home and I'm enjoying watching them learn.
>
> P: She's never been into those things before, like science and stuff, but now she's more into it. She likes it.
>
> P: Makes them more aware, like when we go shopping, she's like, "Mom, this is recyclable" or "This is made from recycled stuff.
>
> P: They've gotten them very involved and interested in nature.

To summarize the parents' feelings toward the changes in the program, this statement received agreement:

> P: I'm very wild about the after-school program. They're just more interested!

This awareness translated into changes in behavior on the part of both the students and their parents. The concern for the environment expressed by the children resulted in some new actions on the part of the parents, such as beginning to recycle, not litter, be more conscious of water use, and even make more of an effort to take their children to the park more. Parents expressed that because their children had taken an interest, they in turn had become more aware of topics they had not been previously.

> P: (*Spanish translator*) They don't throw garbage in the street.

P: (*Spanish translator*) He said he takes his kid out to the park more frequently.

P: (*Spanish translator*) She reuses water bottles. She is not letting the water run as much.

P: (*Spanish translator*) So they're recycling as well.

P: I'm learning new things every day.

P: I think the after-school program make the parents wonder. They make the parents eyes open more. You're basically going to school too.

One gentleman was emphatic about how his daughter's interest in nature and science had caused him to be more aware of things he had never thought about before and even got him to attend the focus group meeting, something he never would have considered in the past.

P: They force you to do stuff you never were interested in and thought you would do. I never thought I would be sitting here!

Parents were pleased with the greater concentration on the conservation program because they felt it was important to teach the next generation how to take care of the planet. They felt that an increased scientific and environmental understanding would serve their children well in the future.

P: She said that it's important because with global warming and everything that's going on, that for her children to learn this, they know how to take care of it and will have a brighter future.

P: So they could be more aware of what's going on in the world.

Educators. The final focus group interview with the staff revealed a significant change, both in their conservation program and their attitude toward the perceived barriers they had expressed at the onset of the study. The staff had incorporated a great deal of what they had learned in the trainings into their curriculum, implementing a variety of new activities.

P: We've actually used a lot of the conservation curriculum and what they seem to like most about it is the hands-on activities. That's how I know they learned because they actually enjoyed it.

The staff continuously voiced appreciation for the trainings throughout the study. When prompted in the final focus group interview to share their thoughts on what aspects of the trainings they found most useful, the following comments received the most consensus:

> P: I feel that the kids actually enjoy it this time a lot more. Maybe because you touched on the fact that you have to make sure they care first, you know, we went through the empathy, the caring ideas. I tried to touch on that and it works… so I tried to implement that and I noticed it works. The kids were focused and they actually care and they enjoy what they're doing.
>
> P: …having them develop feelings for the animals has really helped a lot. They've done tons of research and drawings for the book and they really want to learn about their animals.
>
> P: I think what also worked was you said to connect it to their environment, so, we live in the city but we see nature here, and to relate it to the kids it's that connection to the outside world.
>
> P: I agree with that connection. Also, connecting them to their home, to where their family is from, that helped me a lot too. Making that connection helps because then they're like "I have seen that bird before, like in my grandmother's backyard." Or something like that.
>
> P: The hands-on activities helped a lot. That helped me. You gave us ideas on how to teach the class, to how to go about and then introducing the activity and then implementing the activity.
>
> P: I liked the fact that the activities allowed for all grade levels.
>
> P: The planning. I like to think ahead and make sure I'm prepared for everything I'm gonna do. So, I can go home and I'm "Oh, what am I gonna do next week" and I already have it planned out. And it makes me feel more confident.
>
> P: I love the fact that we have the flexibility to choose what worked for us; we had the opportunity to choose what we liked and what the kids liked.

Though most of the lessons and activities presented in the trainings had a positive outcome, some educators expressed difficulty making connections between the various topics:

> P: Sometimes it's difficult to link the activities, like to link the water testing to the birds, you know. You have to have some type of connection. I'm sure there's a connection, but….

P: Need time to figure it out to make the connections.

P: I'm doing marine stuff now, and so next how am I gonna bring bugs into that?

P: We need a lot of help on making those connections.

Suggestions to overcome this obstacle included ample time for instructors to make those connections by consulting various resources, as well as preparing lessons that flow into one another and to help the instructors make connections between different topics during the training sessions.

Many staff mentioned an increased confidence in their ability to teach about science and nature. There was a lot of agreement that the trainings gave them the basic tools with which to start an EE component to their program and the confidence to be successful.

P: I feel more prepared. In the beginning I was like oh my all this science. I mean, I would do science, but it's not really a subject I love. So doing all these hands-on activities makes *me* enjoy it more, and so now I feel more confident.

P: I agree. I feel ready. With all the workshops, trainings, I feel we have a lot of resources. I feel we have the help that we need. I feel more confident.

P: I was never interested in looking for a bird's nest. Now, when I leave my building it's the first thing I look for!

P: We've become more aware of nature, cause like before I was working here I was indifferent. The training that you gave helped a lot, personally.

P: More appreciation.

Staff felt that they were capable of effective EE instruction in their urban classroom environment, though many educators still voiced that direct experience in nature would be better. Lack of funding for zoos, the aquarium, etc., as well as lack of access to natural places was still expressed as a barrier:

P: It depends what you are working with. Most of them are doing birds, so you can go around and look for birds. But I'm doing marine life, so I can't go around and look for a whale (*laughter*).

P: We have been trying to go to the aquarium. The time is ok because they give us more through the school, but the money. Close to $1000 for the 40 kids just for the bus.

Despite these minor barriers, staff recognized the progress they had made over the year and were genuinely enthusiastic about the potential to expand upon their EE curriculum in the future.

DISCUSSION

The main purpose of this study was to determine the viability to increase the ability of an urban after-school program to incorporate EE as well as assess what methods were most effective at accomplishing this goal. It was necessary to first determine the interest in and barriers amongst the educators and parents of the students to incorporating EE into the after-school curriculum. Findings suggest that despite perceived barriers such as lack of time, funding, and outdoor spaces, effective EE is possible in an urban after-school program if motivation and interest is high amongst the educators and parents of the students. Capitalizing upon this interest by providing the basic tools for "good" EE can sufficiently jumpstart an effective conservation and nature program.

Components of a Successful EE Curriculum in an After-School Program

This particular case study involved the introduction to effective EE in the classroom within the context of an after-school program in the Bronx, New York. The researchers intend to remain involved with the program in the upcoming school year, providing support and further training in techniques, topics, and activities. The goal is to create a lasting and exemplary nature education aspect of the curriculum that could be modeled by similar after-school programs. Findings from this study reveal a few

fundamental components necessary for the successful implementation of EE into an after-school program.

First, genuine interest in having the students exposed to nature and natural science is essential on the part of the staff and parents. Having this support provides the basis from which to build an effective EE program. For example, at another after-school program in the Lower East Side of Manhattan, the researchers attempted to initiate a similar EE curriculum, yet support and interest from the staff and parents was minimal, and therefore no program was established.

It was apparent from the initial focus group interviews that both the parents and educators were highly interested in having the students exposed to the nature and science, both in the classroom and in the outdoors. The passion and energy of the after-school director, as well as her desire to create an exemplary program, created a community of learning and cohesion amongst the educators, allowing for retention in staff year after year. After addressing some perceived barriers to implementing EE in the classroom, it was this cohesion and genuine interest in providing quality education amongst the staff that contributed to the successful implementation of EE into the curriculum.

The strong interest in learning from and teaching about the natural world that was evident amongst the staff and parents had a strong root in the culture and origin of the community. A significant population of the school community hailed from the Dominican Republic, a Caribbean island whose natural beauty had an obvious impact on the participants' attitude toward nature. The participants recognized that the natural beauty of their homeland was not something that the students experienced day to day living in the Bronx. This connection to the land that the parents and some of the

educators felt growing up in the Dominican Republic played a significant role in their desire to have their students exposed to and connected to nature. Participants also expressed the importance for their children to learn how to take care of the planet to ensure their future well-being. There was consensus that the environmental problems facing humanity are real and serious and must be addressed. There was hope that having the students involved with EE would instill them with appreciation and respect for the natural world which would in turn provide them the foundations for dealing with environmental issues.

The staff remained motivated throughout the year to expand upon their conservation curriculum and took initiative to seek out new activities and topics based on their students' interest. They were highly receptive to the trainings, finding the majority of the activities presented to them helpful and applicable to their lessons. Most notably, they appreciated the planning aspect of the training which allowed them the time to create a template for which to work from throughout the school year. The engagement and enthusiasm that staff reported from the students served to accentuate their motivation to further explore EE in their program.

A *second* necessity for successful EE implementation is the importance of addressing myths about barriers to nature education. It was essential for the educators to understand that they can implement an effective EE curriculum in their classroom, playground, or gymnasium, and by providing an occasional field trip to local attractions such as zoos, museums, and parks. Lack of access to natural spaces is a common barrier mentioned in prior literature (Benetti & Marcelo de Carvalho, 2002; Ham & Sewing, 1988; Simmons, 1998; Wade, 1996). Though natural settings may indeed be the ideal

location for a lasting and valuable EE experience, this study demonstrates that effective EE is more than possible in an urban classroom. It was also important to ensure that the educators understand that incorporating EE into their lessons does not require an excessive amount of time. It is quick and easy to learn many EE activities and fit them into various aspects of an already existing curriculum and requires only the normal preparation time and skills of a quality educator.

Another barrier that was overcome in this study was the perception that there was not enough funding to do quality EE. Through the realization that EE can be taught in the classroom with minimal supplies, the staff involved with this study overcame this barrier. Another option is to inform program leaders of grants that are available for such educational initiatives. The director of this particular program was able to procure funding through such an avenue.

Third, if interest in EE is present, incorporating EE into an after-school curriculum is as simple as providing the basic tools for effective learning. In this study, the researchers gave an initial training on "good" vs "bad" EE which involved appropriate content as well as methods for student engagement for the correct grade levels. Once this was done, many activities focused on a variety of themes in nature were modeled, again with instructions for appropriate age level. As the educators became familiar with these activities, resources such as books, videos, and websites were provided such that they might expand upon the themes as they see fit and in accordance with student interest. As they attempt different types of activities and lessons, the educators will discover for themselves what they find most effective and are most comfortable teaching.

CONCLUSION

Research shows that parents of all cultures are interested in having their children learn about the natural sciences. Many studies have shown that schools that have adopted EE into their curriculum perform better on standardized tests as well as report greater enthusiasm for teaching and learning. Children raised in highly urban areas have little exposure to the natural world, yet this does not negate the inherent connection that all people have to nature. The urban disconnect from natural areas is all the more reason to expose urban children to the wonders of nature, even if that is done mostly in the classroom. By nurturing this appreciation of nature in children, they are more likely to become environmental stewards as adults. This study examined the successful implementation of EE into an after-school program in New York City. Modeling the effective methods of this study, similar programs could achieve the same positive results. The integration of EE into after-school programs has the potential to reach a vast number of children, and therefore contribute toward a transition to an environmentally literate, global society.

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CONCLUSION

Problems facing modern society such as resource depletion, biodiversity loss, and global climate change present an imminent environmental challenge. Although knowledge about these issues is widely accepted among scientists and a growing percentage of educated people around the world, solutions remain difficult in terms of gaining sufficient momentum and political will to implement. An important method for increased awareness and behavioral change lies with mass education. An environmentally literate society with compassion, respect, love, and connection to nature would likely make decisions that are sustainable for humanity's future.

Despite the innumerable barriers to EE's proliferation throughout the nation and world, as a greater number of agencies, educators, administrators and parents become enlightened to the benefits of EE, there is substantial hope that these concepts will become integral in our children's education. A great amount of work is still to be done in order to increase the scope of EE and the number of children that are reached, yet research has provided many feasible suggestions for how this can be accomplished (Ernst, 2007; Ham & Sewing, 1988, Lieberman & Hoody, 1998; Mayeno, 2000; Mckeown-Ice, 2000; Simmons, 1998; Wade, 1998).

Most of this work has been done in the formal school setting; we need to know more about the informal setting and the opportunities to reach millions of children that these programs offer. One potential for mass education in environmental issues that has yet to be fully realized is the various programs offered by national, state, and city forestry

and wildlife agencies. Millions of people of all ages and value types visit parks every year and participation in interpretive and educational programs is increasing. These settings provide the perfect opportunity for families to have a deep and meaningful nature experience together. Agencies must continue to strive toward expanding the scope of their educational programs to meet the needs of the varied interests amongst visitors. Incorporating technology into EE might provide the catalyst for reaching vast numbers of people of all ages. Technology will remain to be an indispensible aspect to the modern human's life as today's children begin using high-tech equipment almost immediately. EE programs should recognize and make use of the great potential technology has to offer as an educational tool, as long as the technology being used serves to foster a 'real' nature experience and not distract or detract from awareness of the surroundings.

Another avenue for exposing huge amounts of children to nature is through after-school programs. The informal atmosphere of the after-school program lends itself to the inclusion of fun, inter-active, hands-on EE activities that inspire children and capture their interest and attention. These activities can easily be incorporated into larger lessons that maintain students' enthusiasm and provides an opportunity to have fun while learning about something they care about. Despite some perceived barriers that EE can only be properly taught in a natural setting, there is much that can be done in an and around an urban classroom to connect children to nature. Nature is everywhere and exposing children to what is around them, even in the inner city, can have a positive effect on their environmental knowledge and behavior. Nature has no boundaries; it is the common bond that ties humanity together. By fostering a sense of wonder and connection towards nature in our children, they are likely to grow up to be ecologically

literate environmental stewards prepared to deal with the global environmental challenges we face as a species.

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APPENDIX 1: SURVEY INSTRUMENT

Nature Survey for North Carolina's Youth and Families

The North Carolina Wildlife Resources Commission in collaboration with Colorado State University is interested in your thoughts about your family's interest in programs about nature. Please answer the following questions to the best of your ability.

1. To what extent do you believe your child/children are interested in the following: **(Circle one number per item)**

	Not at all Interested			*Neither*			*Extremely Interested*
Nature	1	2	3	4	5	6	7
Wildlife	1	2	3	4	5	6	7
Fish	1	2	3	4	5	6	7
Technology (examples: video games internet)	1	2	3	4	5	6	7

2. While your responses to the following questions may differ depending on specific circumstances, please respond based on your ***general*** opinion. Please note that this survey refers to programs in the community such as those that occur at parks, zoos and science centers. **(Circle one number per statement)**

	Strongly Disagree			*Neither*			*Strongly Agree*
In the past year, my family has spent a significant amount of time in nature.	1	2	3	4	5	6	7
In the past year, my family participated in one or more community programs about nature.	1	2	3	4	5	6	7
My family is too busy to participate in programs about nature.	1	2	3	4	5	6	7
The cost of programs about nature is usually not a problem for my family.	1	2	3	4	5	6	7
Transportation to programs about nature is difficult for my family.	1	2	3	4	5	6	7
I am uneasy about having my child in a program where I do not know the staff.	1	2	3	4	5	6	7
I am unaware about programs about nature in my community.	1	2	3	4	5	6	7
I am comfortable having my child at a program about nature without me there.	1	2	3	4	5	6	7
My state wildlife agency is a trustworthy source for programs about nature.	1	2	3	4	5	6	7
I intend for my family to attend a program about nature in the next 6 months.	1	2	3	4	5	6	7

3. Please respond based on how the following would ***generally*** influence the likelihood of your family participating in a community program about nature. **(Circle one number per statement)**

	Much less likely to participate			*No effect*			*Much more likely to participate*
Programs that occur on weekends	1	2	3	4	5	6	7
Programs in which the whole family attends	1	2	3	4	5	6	7
After-school programs	1	2	3	4	5	6	7
Programs that occur near my neighborhood	1	2	3	4	5	6	7
Programs that expose my children to future career opportunities	1	2	3	4	5	6	7
Programs that occur when school is out of session	1	2	3	4	5	6	7

4. Thinking about possible options for community programs about nature, how appealing do you think each of the following would be to your child/children? **(Circle one number per statement)**

	Not at all Appealing			*Neither*			*Extremely Appealing*
In general, programs that integrate technology	1	2	3	4	5	6	7
a) Programs that include GPS technology	1	2	3	4	5	6	7
b) Programs about how scientists track wildlife	1	2	3	4	5	6	7
c) Programs that include nature photography	1	2	3	4	5	6	7

Part 2

For questions 1-3, please provide a short answer in the space provided.

1. What is the **one best way** to inform you about nature programs for youth and family in your community?

_____

2. What is the **best benefit** you can think of for your children to participate in programs about nature?

_____

3. What is the **greatest concern** you have about your children participating in programs about nature?

_____

4. Below are statements representing different ways that people might think about fish and wildlife. We're interested in knowing *your* views about fish and wildlife. **(Circle one number per statement)**

	Strongly Disagree			***Neither***			***Strongly Agree***
Humans should manage fish and wildlife populations so that humans benefit.	1	2	3	4	5	6	7
Animals should have rights similar to the rights of humans.	1	2	3	4	5	6	7
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.	1	2	3	4	5	6	7
I view all living things as part of one big family.	1	2	3	4	5	6	7
Hunting does not respect the lives of animals.	1	2	3	4	5	6	7
I feel a strong emotional bond with animals.	1	2	3	4	5	6	7
The needs of humans should take priority over fish and wildlife protection.	1	2	3	4	5	6	7
I care about animals as much as I do other people.	1	2	3	4	5	6	7
Fish and wildlife are on earth primarily for people to use.	1	2	3	4	5	6	7
Hunting is cruel and inhumane to the animals.	1	2	3	4	5	6	7
We should strive for a world where humans and fish and wildlife can live side by side without fear.	1	2	3	4	5	6	7
I value the sense of companionship I receive from animals.	1	2	3	4	5	6	7
Wildlife are like my family and I want to protect them.	1	2	3	4	5	6	7
People who want to hunt should be provided the opportunity to do so.	1	2	3	4	5	6	7

5. How many total children under 18 do you have? Include step-children or other children if you provide at least 50% guardianship/custody. _____

6. Please indicate the ages of all of your children under the age of 18.

_____ Child 1 _____ Child 2 _____ Child 3 _____ Child 4 _____ Child 5 _____ Child 6

7. Please indicate your ethnicity/race. **(Check all that apply)**

❒ Hispanic / Latino ❒ Native American
❒ Caucasian ❒ Asian
❒ African-American ❒ Pacific Islander
❒ Other: _____

8. What is your approximate annual household income before taxes? **(Check one)**

❒ Less than $10,000 ❒ $35,000 – 49,999 ❒ $100,000 – 149,999
❒ $10,000 – 24,999 ❒ $50,000 – 74,999 ❒ $150,000 – 199,999
❒ $25,000 – 34,999 ❒ $75,000 – 99,999 ❒ $200,000 or more

9. What is the highest level of education that you have received? **(Check one)**

❒ Less than high school diploma ❒ 4-year college degree
❒ High school diploma or equivalent (GED) ❒ Advanced degree beyond 4-year college degree
❒ 2-year associates degree or trade school

10. Are you? ❒ Male ❒ Female

11. What is your age? _____

12. We may be interested in gathering further input from parents about nature programs for children. Toward this end, we would like to know if you would be interested in providing input in the future by way of mail or email. If so, **please print your name and mailing address and/or email on a separate sheet of paper** and return it along with your completed survey.

Thank you for participating in this study!

APPENDIX II: FOCUS GROUP QUESTIONS

1. Please describe the level of interest you have in programs about nature for your family.
2. Describe any concerns you have about your family participating in programs about nature.
3. What are some reasons you can think of that would prevent or have prevented your participation in programs about nature in the past? (responses to this may be revealed in prior question)
4. Describe the type of program that would be appealing for your children and your family. What is the format? Topic? Duration? Time?
5. We're going to describe for you a program that the North Carolina Wildlife Resources Commission currently offers about box turtles. (read description from agency brochure, show brief video clip). What is your reaction to this type of program?
    a) What might this experience be like for you (your family) if it entailed spending time in the woods, hiking off-trail in some cases in hilly terrain?
    b) What would make this program appealing for your family? (if it doesn't come up in the response, ask: does the inclusion of technology make it more/less appealing?) How would you describe it to your children to get them excited about it?
6. In general, what do you think about kids' use of technology these days? How often do your children use technology such as computers, video games, etc.?
7. Is there anything else you want to add or comment on?

APPENDIX III: FINAL EVALUATION SURVEY INSTRUMENT

Evaluation of "Where's Waldo?"

How would you rate the <u>importance</u> of each of the following components from today's program:

	Very Unimportant	*Unimportant*	*Neutral*	*Important*	*Very Important*
Confirmation email with program information (e.g., what to wear, where to go)	1	2	3	4	5
Individual introductions by the staff	1	2	3	4	5
Discussion about precautions for the day	1	2	3	4	5
Presentation about the Eastern Box Turtle's status in North Carolina	1	2	3	4	5
Information about how technology is used to collect data about turtles & turtle habitat	1	2	3	4	5
Presentation about how to use radio telemetry	1	2	3	4	5
Staff providing examples of career opportunities	1	2	3	4	5
Hands-on learning opportunities	1	2	3	4	5
Exploring the woods	1	2	3	4	5
Opportunity to share your thoughts on a social media site / blog	1	2	3	4	5

How would you rate your <u>satisfaction</u> with each of the following components from today's program:

	Very Unsatisfied	*Unsatisfied*	*Neutral*	*Satisfied*	*Very Satisfied*
Confirmation email with program information (e.g., what to wear, where to go)	1	2	3	4	5
Individual introductions by the staff	1	2	3	4	5
Discussion about precautions for the day	1	2	3	4	5
Presentation about the Eastern Box Turtle's status in North Carolina	1	2	3	4	5
Information about how technology is used to collect data about turtles & turtle habitat	1	2	3	4	5
Presentation about how to use radio telemetry equipment	1	2	3	4	5
Staff providing examples of career opportunities	1	2	3	4	5
Hands-on learning opportunities	1	2	3	4	5
Exploring the woods	1	2	3	4	5

How <u>enjoyable</u> was each of the following components from today's program for you?

	Very Unenjoyable	*Unenjoyable*	*Neutral*	*Enjoyable*	*Very Enjoyable*
Tracking with radio telemetry equipment	1	2	3	4	5
Using GPS	1	2	3	4	5
Taking digital photographs	1	2	3	4	5
Collecting data about turtle habitat	1	2	3	4	5
Collecting data about the turtle(s)	1	2	3	4	5
Seeing a turtle up-close	1	2	3	4	5
Exploring the woods	1	2	3	4	5

How would you rate how much <u>you</u> learned about the following topics today?

	I did not learn about this	*I learned very little*	*I learned some*	*I learned quite a bit*	*I learned a lot*
Eastern Box Turtle's status in North Carolina	1	2	3	4	5
Habitat of Eastern Box Turtles	1	2	3	4	5
How technology is used to collect data about turtles & turtle habitat	1	2	3	4	5
Career opportunities	1	2	3	4	5
How to use radio telemetry	1	2	3	4	5
How to use GPS	1	2	3	4	5

1. What would you say is the most important thing you learned at the program today?

2. Do you intend to use the website that was shown to you about the box turtles? ____ Yes ___ No ____ Not sure

3. Overall, what was the best part of today's program for <u>you</u>?

4. What do you think was the best part of the program for <u>your children</u>?

5. ***What suggestions do you have for how to improve this program in the future?***