Being outside learning about science is amazing: A mixed methods study

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BEING OUTSIDE LEARNING ABOUT SCIENCE IS AMAZING:
A MIXED METHODS STUDY

by

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A dissertation submitted in partial fulfillment
of the requirements for the

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ABSTRACT

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by

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This study used a convergent parallel mixed methods design to examine teachers’ environmental attitudes and concerns about an outdoor educational field trip. Converging both quantitative data (Environmental Attitudes Scale and teacher demographics) and qualitative data (Open-Ended Statements of Concern and interviews) facilitated interpretation. Research has shown that adults’ attitudes toward the environment strongly influence children’s attitudes regarding the environment. Science teachers’ attitudes toward nature and attitudes toward children’s field experiences influence the number and types of field trips teachers take. Measuring teacher attitudes is a way to assess teacher beliefs.

The one day outdoor field trip had significant outcomes for teachers. Quantitative results showed that practicing teachers’ environmental attitudes changed following the Forever Earth outdoor field trip intervention. Teacher demographics showed no significance. Interviews provided a more in-depth understanding of teachers’ perspectives relating to the field trip and environmental education. Four major themes emerged from the interviews: 1) environmental attitudes, 2) field trip program, 3) integrating environmental education, and 4) concerns. Teachers’ major concern, addressed prior to
the field trip through the Open-Ended Statements of Concern, was focused on students (i.e., behavior, safety, content knowledge) and was alleviated following the field trip. Interpretation of the results from integrating the quantitative and qualitative results shows that teachers’ personal and professional attitudes toward the environment influence their decision to integrate environmental education in classroom instruction.

Since the Forever Earth field trip had a positive influence on teachers’ environmental attitudes, further research is suggested to observe if teachers integrate environmental education in the classroom to reach the overall goal of increasing environmental literacy.
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I have had the opportunity to work with Dr. Lisa Bendixen throughout my masters and doctoral degree. Thank you Dr. Bendixen for supporting me throughout the many years I have known you. You helped me transition from a master and doctoral student into a professional and hopefully someone you are proud to call a colleague. Your knowledge in classroom teaching, classroom assessment, teacher beliefs, and research have been instrumental to me.

Working as a graduate assistant with Drs. Olafson and Schraw led to working with the Public Lands Institute (PLI) at UNLV in the field of environmental education. Working at the Public Lands Institute gave me the inspiration for my dissertation topic. I have loved working on the Discover Mojave Forever Earth and Outdoor World programs. It is here that I found the continued support and encouragement of my final committee member, Dr. Peg Rees. Dr. Rees serves as the director at PLI and always provided me all types of support from encouraging words to flexible scheduling to resources needed to complete my dissertation. Thank you for providing me with such a wonderful opportunity working at PLI over the years and serving as my outside committee member.

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CHAPTER 1

INTRODUCTION

Background to the Study

“To orient oneself to a phenomenon always implies a particular interest, station, or vantage point in life” (Van Manen, 1990, p. 40). For the past few years, I have oriented myself to the phenomenon of environmental education from my vantage point within the Public Lands Institute at the University of Nevada, Las Vegas. Initially, I helped design and distribute assessments for two “Discover Mojave” environmental programs: recreation-based Outdoor World and curriculum-based Forever Earth. Later, I began facilitating field trips, and my main focus became the Forever Earth program. The basis of the Forever Earth program is a field trip designed to meet specific needs in outdoor research and education. Forever Earth is a 70 foot houseboat converted into a functional research laboratory and floating classroom at Callville Bay Marina, Lake Mead National Recreation Area along the Nevada and Arizona border, in the southwest United States. The Forever Earth vessel takes students onto Lake Mead to learn about science concepts through hands-on activities such as water quality monitoring. Field trip program activities are aligned with the Nevada State Science Standards and Clark County School District curriculum for grades 4 to 7.

While facilitating field trips, I often talked with the teachers. During these conversations, teachers revealed their concerns and questions about the field trip and environmental issues. Speaking with teachers led me to think about how to objectively measure their environmental concerns in order to improve the Forever Earth program and bring environmental literacy into the classroom setting. The literature has indicated that
teachers’ classroom activities reflect their attitudes toward the environment and teachers’ attitudes toward the environment influence children’s attitudes toward stewardship of the environment (Louv, 2008; Wilson, 2006). Consequently, measuring teachers’ attitudes are of primary importance given that as environmental educators we strive to increase children’s as well as adult’s environmental literacy and stewardship.

**Conceptual Framework**

Environmental education is becoming an increasingly important topic within education. As environmental issues and problems have populated the media, many educators have become concerned that children do not have the knowledge or skills to address important topics such as global climate change. Furthermore, children are becoming less involved in active, outdoor play and more attentive to technology and indoor video games (Roberts, Foehr, & Rideout, 2005). As a result, they are less connected to nature. Journalist Richard Louv (2008) coined the term “Nature Deficit Disorder” to describe a host of “symptoms” seemingly connected to children’s loss of outdoor play and their lack of interest in the environment. Environmentalists and many educators are concerned that as more environmental issues arise, future generations of environmental stewards will not have the awareness, knowledge, or interest to take care of our environment.

Research shows that children’s connection to nature can be largely impacted by environmental attitudes of adults around them (Halocha, 2005; Lang, 2006; Louv, 2008; Pergams & Zaradic, 2006; Wilson, 2006). Many parents in today’s society often do not have the time or resources to take their children on recreational activities outdoors. In addition, many parents have safety concerns for letting their children play and explore
outside without adult supervision; children kept indoors experience nature through their computers or television (Roberts et al., 2005). Thus, if parents have the attitude that nature is not worth spending time in or nature is unsafe, children will likely adopt these same attitudes (Louv, 2008).

Teachers spend a large part of their day influencing children. The teachers who are the main source of environmental education in most schools are usually science teachers (Ernst, 2007a; Legault & Pelletier, 2000; Pergams & Zaradic, 2006); they influence children’s learning about the environment. Physical and earth science subjects (the earth and its living environment) provide the best opportunity for integrating concepts of environmental education (Legault & Pelletier, 2000; Pergams & Zaradic, 2006).

Examining teachers’ environmental attitudes is important as their attitudes often affect their classroom teaching (Pettus & Giles, 1987; Smyth, 2006). Measuring teachers’ environmental attitudes is a way to examine their beliefs in the context of environmental education. Attitudes and behaviors are based on a person’s beliefs (Bruning, Schraw, Norby, & Ronning, 2004), therefore attitudinal surveys are a way to examine beliefs.

Measuring environmental attitudes of teachers attending the Forever Earth field trip may improve our understanding of teacher beliefs about science and environmental education. All teachers participating in the study were responsible for teaching science to their students. Science teachers’ beliefs often determine how they teach. What teachers believe affects their classroom instruction (Ozgun-Koca & Sen, 2006; Water-Adams, 2006).
Teacher beliefs can be affected by different factors related specifically to their students. Seeing their students actually learn material has a large impact on teachers and can alter their teaching beliefs. Research shows that teachers are willing to adjust their classroom instruction if they see their students engaged in a learning process that is successful (Johnson, 2006; Waters-Adams, 2006). Reforms in science education have placed a much larger emphasis on student-centered learning so teachers are adjusting their classroom instruction to provide more hands-on activities (Johnson, 2006). Providing hands-on activities makes science more meaningful to the students and gives them a context for understanding science concepts. Hands-on learning immerses students in the activities and helps them feel a part of their learning environment (Levitt, 2001; Nixon, 1997; Trumbull, Scarano, & Bonney, 2006; White & Stoecklin, 1998).

Another emerging concept relating to hands-on science learning is providing students the opportunity to study science concepts in nature. Actually touching and seeing (manipulating) subject material in the natural environment can have a positive impact on student learning (Brody, 2005; Ernst, 2007a; Lieberman & Hoody, 1998). For example, the evaluation of the FE program documented that students’ knowledge and attitudes increased substantially as a result of participating in the FE field trips. Statistically significant gains occurred at each grade level and there were large effect sizes for grades 4, 5, 6, and 7 (Olafson, Schraw, & Weibel, 2009). In addition to students feeling part of their own learning process, being out in the environment can help foster a connectedness in nature. Teaching science through hands-on activities within a natural setting provides a strong basis from which to introduce and expand on environmental science concepts (Brody, 2005; Kola-Olusanya, 2005; Nixon, 1997; White, 1998). Ernst
(2007a) described environmental-based education as a “form of school-based environmental education in which the instructor uses the local environment as a context for integrating subjects and a source of real world learning experiences” (p.15). Providing hands-on experience for students in science helps them relate science to their lives and world around them. Children learn from direct experience and connections to nature.

For my early observations, it was noted that many teachers were initially concerned about taking students out into nature, particularly on a boat at Lake Mead for the Forever Earth field trip. After teachers observed the enthusiasm students had being outdoors while actively engaged in learning science, teacher concerns shifted toward how they could implement hands-on learning in their classroom. In addition, teachers were interested in how to provide their students more opportunities to learn about science within the environment. Teachers’ environmental attitudes seemed to shift from one of apprehension to the desire to bring nature into the classroom and integrate environmental education into their existing lesson plans. Thus it became clear the importance of examining teachers’ environmental attitudes towards environmental education because it can influence their classroom instruction. In addition, if teachers believe environmental education is important to their students, they are more likely to integrate environmental education within their classroom, which is a primary goal of environmental educators.

In the design of this study, particular consideration was given to methodology selection. Researchers in teacher beliefs and environmental education literature have noted the need for more mixed methods studies and measurement scales with stronger psychometric properties (Pettus & Giles, 1987; Rickinson, 2001). This study used a convergent parallel mixed methods design to measure and examine teachers’
environmental attitudes and concerns toward an outdoor environmental science field trip using quantitative and qualitative outcomes collected at the same time. Mixed methodology provided a comprehensive approach to this complex study because it allowed for more breadth and depth of the results. Results from the quantitative data and qualitative data were integrated to provide a more extensive interpretation of the overall results. Merging the quantitative and qualitative results offered a holistic picture to the complex phenomenon of teachers’ environmental attitudes and how those attitudes and beliefs influence classroom instruction.

**Significance**

Environmental education is becoming increasingly important and is addressed more often in scholarly literature (Rickinson, 2001). While more researchers are focusing on the importance of environmental education, research has shown that environmental education research has gaps both methodologically and conceptually (Rickinson, 2001). One area lacking in the scholarly research is the examination of teachers’ environmental attitudes and concerns related to outdoor educational field trips in the environment. Barriers and the difficulties implementing environmental education in the classroom have been addressed in the literature (Ham & Sewing, 1988; Johnson, 2006; Levitt, 2001), but teacher concerns and their environmental attitudes have not been addressed as fully. This study examined teachers’ environmental attitudes and concerns related to a specific outdoor educational field trip program, the Forever Earth field trip, coupled with the implementation of related environmental education within the classroom.

The Forever Earth field trip is a hands-on, student centered program teaching students about science on Lake Mead. The literature shows that children often learn more
about science concepts when they are actively involved with their own learning through hands-on activities and student inquiry (Ernst, 2007a; Waters-Adams, 2006; White & Stoecklin, 1998). Being immersed in the environment where they can actually use their own observations, students connect to what they are learning and to nature. Research has shown that people who connect to nature by being out in the environment have a stronger sense of stewardship (Brody, 2005; Louv, 2008; Wells & Lekies, 2006; Wilson, 2006).

A teacher who feels strongly about environmental issues will try to find ways to implement environmental education in the classroom. Having a positive attitude about environmental education, teachers will influence students to become more environmentally literate and to have a stronger sense of stewardship into adulthood (Halocha, 2005; Lang, 2006; Pergams & Zaradic, 2006).

Examining teachers’ environmental attitudes and concerns is important because teachers have a major role in influencing future generations. Gaining more insight into teachers’ concerns, environmental attitudes, and factors responsible for changing their attitudes about integrating environmental education into their classroom instruction will provide valuable insight to produce more environmentally literate students.

**Purpose of the Study**

The purpose of this study is described using Creswell and Plano Clark’s (2011) framework. This mixed methods study addressed teachers’ environmental attitudes and concerns regarding an outdoor education field trip, Forever Earth. A convergent parallel mixed methods design was used; quantitative and qualitative data were collected in parallel, analyzed separately, and then merged. Quantitative data included the Environmental Attitudes Scale (EAS) and the teacher demographics questionnaires were
used to measure teachers’ attitudes toward the environment. The qualitative data from interviews and open-ended statements of concern explored environmental issues and concerns for teachers attending the Forever Earth field trip at Lake Mead. Collecting both quantitative and qualitative data allowed the results to be merged for greater insight into the topic than would be obtained by either type of method conducted alone.

Research Questions and Hypotheses

There were four key research questions examined during this study. Both quantitative and qualitative research questions were utilized. According to Creswell and Plano Clark (2011), “They are necessary in a mixed methods study because both quantitative and qualitative data collection are central to this form of inquiry” (p. 162). The quantitative research questions follow:

1. Do teachers’ environmental attitudes change following the Forever Earth field trip?
2. What teacher demographic characteristics are related to a change in environmental attitudes?

The qualitative research questions were:

1. What concerns do teachers have toward an outdoor environmental education field trip?
2. How does the experience of an outdoor environmental education field trip impact teachers?

Hypotheses for each of the quantitative research questions were also developed. The first hypothesis related to research Question 1: Teachers’ environmental attitudes will change following the intervention of the Forever Earth field trip. The second hypothesis related to Question 2: Teacher demographics will not have an impact on changes in teacher attitudes.
Definition of Terms

For the purpose of this study, the following terms will be understood using the definitions given below. *Environmental education* was defined by Sosu, McWilliam, and Gray (2008) as the teaching of environmental issues within the curriculum to develop students’ knowledge, attitude, skills, and experiences enabling students to make informed, responsible decisions and actions about the environment. The term *belief* was defined as something important to the person that they want or accept to be true, without needing verification (Murphy & Mason, 2006). And finally, the definition of *concern* comes from Newlove and Hall (1976): the “composite representation of the feelings, the preoccupation, thought and consideration that is given to a particular issue or task” (p. 6).

A definition of *environmental attitudes* was developed for the purpose of this study:

Environmental attitudes are how a person feels and responds to situations in and about the environment or impacting the environment.

Summary

This study addressed issues relevant to the area of environmental education that focuses on the impact of outdoor field trips on teachers’ attitudes and concerns about environmental education on the Forever Earth field trip program. Using the theoretical framework of teacher beliefs to study teachers’ environmental attitudes, I review in Chapter 2 the environmental education and teacher belief literature relative to this study. Chapter 3 identifies the methodology and research design used in the study, including a description and rationale for the use of mixed methods. Chapter 3 describes the contextual setting, participants, and instruments used. And finally, Chapter 3 addresses the procedures used to analyze the data. Chapter 4 provides the results of analysis for
each instrument used. First, the results are given for the EAS and teacher demographics and second, the results and themes found from the interviews and Open-Ended Statements of Concern are provided. Then, as typical of convergent parallel designs, the results from both quantitative and qualitative analysis will be merged in the integration phase leading to the final interpretation of results. Chapter 5 is the final chapter, summarizing the overall study. Chapter 5 discusses practical implications of the study, limitations of the study, and future research.
CHAPTER 2
LITERATURE REVIEW

Environmental education is becoming increasingly important because of concerns about environmental issues such as overpopulation, water levels and droughts, and global warming. The natural and social science behind these environmental concerns are prevalent in popular media, yet many do not understand the issues. For example, as reported through CBC News (Canadian Broadcast Corporation, 2010), an online survey of Americans conducted by Knowledge Networks showed that 75% of those who took the survey would like to know more about global climate change. Only 50% of Americans realized that global climate change was the result of human activities. Most importantly for this dissertation study, 75% felt that children should be taught about the issue in school. Government, private, and professional organizations and programs have been emphasizing the need for environmental education and environmentally literate citizens.

Environmental education is often associated with the science curriculum (Ernst, 2007a; Pergams & Zaradic, 2006). Because science has been added to federal testing requirements for schools’ Adequate Yearly Progress, science has been emphasized more. With this emphasis on science in the classroom, many educators hope environmental education will be systematically integrated within the classroom context. Educators, organizations, and policymakers understand the importance of students and teachers developing greater knowledge and awareness of environmental issues (National Science Foundation, 1999; www.cbf.org; www.neefusa.org). “There is a need to encourage changes in the formal educational system to help all students, educators, and education

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administrators learn about the environment, the economy, and social equity as they relate to all academic disciplines and their daily lives” (National Science Foundation, 1999, p. 28). Educational reform movements and societal pressure to be “earth friendly” are some of the major reasons why environmental education has become more of a focus.

For example, the National Science Foundation organized a taskforce in the late 1990s to encourage and support environmental aspects through science and was disseminated through research, education, and scientific assessment. Environmental education activities supported by the task force included 1) teacher preparation and professional development; 2) development and dissemination of educational resources; and 3) informal projects such as museum exhibits or televisions series (National Science Foundation, 1999).

One organization that focused on the need for environmental education within the classroom was No Child Left Inside (NCLI). NCLI is a coalition of numerous groups and businesses formed in 2007 to “alert Congress and the public to the need for our schools to devote more resources and attention to environmental education” (www.cbf.org/page.aspx?pid=895). NCLI proposed funding for teacher training in environmental education, incentives for states to develop their own environmental literacy plans, encouragement for educators and administration to make time and resources available to all students, and provide environmental education integration across core subject areas (www.cbf.org). Maryland is one state explicitly moving toward this initiative and now requires environmental education within the curriculum. Maryland public schools incorporate “comprehensive, multi-disciplinary” environmental education to maximize the potential for environmental literacy among its high school graduates.
Colorado is another state pushing for environmental education within the classroom. Colorado school districts plan to integrate environmental education within their social studies and science standards when adopted in 2011 (www.cbf.org).

Other organizations and foundations have provided a variety of programs, resources, and networking possibilities focusing on environmental education. One major organization encouraging environmental literacy for adults and youth is the North American Association for Environmental Educators (NAAEE). NAAEE is a professional organization established in 1971 that emphasizes the importance of environmental literacy and education. It provides a variety of resources, including programs and activities for environmental educators, environmental literature, and an annual conference for environmental educators.

The National Environmental Education Foundation (NEEF), was chartered by the U.S. Congress in 1990 through the National Environmental Education Act of 1990 to provide a more public friendly organization complementing the Environmental Protection Agency (EPA). NEEF works in conjunction with various professionals in fields such as health, land management, education, and meteorology creating numerous public-private partnerships. NEEF’s goals focus on programs directed at both youth and adults. One specific goal aimed toward K-12 students is “Environmental education in our schools: Core environmental literacy for America’s children while improving their overall academic success.” This goal is accomplished through a project called “National Environmental Education Week,” which takes place prior to Earth Day. The annual event provides K-12 students with a variety of learning activities both in the classroom and through field trips to nature centers, zoos, and aquariums (www.neefusa.org).
In science education, classroom reforms have focused on student-centered learning (Ernst, 2007b; Johnson & Fargo, 2010; Levitt, 2001; Waters-Adams, 2006). With the emphasis placed on environmental literacy for future generations, an emphasis is also on incorporating environmental education within the curriculum. Enhancing teachers’ environmental literacy and their awareness of environmental attitudes is an important step because teachers’ attitudes or beliefs can affect how and what they do in their classrooms (Haney, Lumpe, Czerniak & Eagan, 2002; Ozgun-Koca & Sen, 2006; Trumbull, Scarano & Bonney, 2006; Waters-Adams, 2006). Therefore, it is important to change teachers’ attitudes and beliefs toward environmental literacy to influence classroom instruction toward student learning about the environment.

This study examined teachers’ environmental attitudes and concerns related to an outdoor environmental education field trip. The first section of this chapter reviews relevant literature examining environmental education. The second part of this chapter reviews literature examining teachers’ beliefs. Some of the literature shows that teachers’ beliefs toward areas in education can affect classroom instruction. This section will review the concept of beliefs related to teachers in various subject areas and then focuses on science. Finally, measurement concerns, such as types of methodology and scales of measurement will be discussed.

**Environmental Education**

The field of environmental education has grown as a discipline over the last few decades. The results of social awareness of environmental issues and academic pursuit of environmental literacy are reflected in the research. While the terms “environmental” and “education” are often used together in the literature, there is no one, clear definition. Sosu
et al. (2008) defined the teaching of environmental education as “the teaching of environmental issues (litter, waste minimization, water energy, school grounds, health and well-being, biodiversity, and transport) within the primary curriculum this year with the aim of developing pupils’ knowledge, skills, attitudes, and experiences to enable them to develop informed and responsible environmental behavior” (p. 173). This definition influenced the definition of environmental education used in the current study described in Chapter 1.

More recent publications demonstrate not only that there is a lack of clarity about the definition, but also there is a need to continue and improve evaluation and research in the field of environmental education. Smyth (2006) stated, “The education response has indeed grown and developed but the rate of environmental change is growing faster, while some aspects of education are very resistant to change” (p. 248).

**Environmental Education in the Classroom**

Environmental education often falls under the umbrella of science. Thus, science teachers are the main source of environmental education in most schools (Ernst, 2007a; Pergams & Zaradic, 2006). Research shows that adults, such as teachers but also parents, have a strong influence on children’s attitudes regarding the environment (Halocha, 2005; Lang, 2006; Louv, 2008; Pergams & Zaradic, 2006; Wells & Lekies, 2006; Wilson, 2006). One example related to parents is provided by Pergams and Zaradic’s (2006) study of the decline in national park visits. They found electronic entertainment variables such as time spent watching TV or playing video games were significantly correlated with a decline in park attendance. While this study was correlational in nature it did show that
our cultural movement toward the increased use of technology and adult influences affect children’s opportunity to enjoy outdoor recreation at our national parks.

Science teachers’ attitudes toward nature and children’s field experiences influence the number and types of field trips teachers take. Smyth (2006) stated, “How educators perceive the needs for environmental education and how they respond are filtered like anything else, through their own attitudes, experience and capacities” (p. 257). The current study measured teachers’ attitudes toward the environment in relation to their concerns to participate in Forever Earth field trip.

Research has shown a relationship between teachers’ attitudes toward the environment and their behaviors. Pettus and Giles (1987) found that “an individual’s personal disposition may be viewed as having an environmental attitude component affecting his or her decisions and behaviors that impact on the environment” (p.128). Environmentally committed teachers are more likely to integrate environmental education experiences into their science curriculum. Interested teachers more successfully communicate greater enthusiasm in the environmental cause to their students (Legault & Pelletier, 2000; Louv, 2008).

Sosu et al. (2008) examined teachers’ commitment to environmental education using a mixed methods design allowing multiple types of data to be collected while exploring such a complex phenomenon. The study was composed of 164 females and 18 male elementary school teachers. They found that teachers’ perception of control was the most significant factor regarding teaching environmental education in the classroom. Life experience was not a predictor of teachers’ intentions or commitment to teaching environmental education. “Teachers who hold a favorable attitude toward environmental
education and those who experience pressure from significant others to engage in environmental education intended to teach more environmental education” (p. 179).

**Implementing Environmental Education**

A variety of approaches are used to implement environmental education. For the most part, science class is a primary area where environmental education is taught and environmental education and the science curriculum are strongly interrelated. Environmental issues are often learned, described, and examined in the areas of science (Barnett et al. 2006; Ernst, 2007a).

Ernst (2007a) describes environmental-based education as a “form of school-based environmental education in which the instructor uses the local environment as a context for integrating subjects and a source of real world learning experiences” (p.15). Providing “hands-on” experience for students in science helps them relate science to their lives and world around them. Children learn from direct experience and connections to nature.

For example, 40 schools, grades K-12, across 13 states participated in a program focusing on environmental education within the curriculum. The program acronym EIC was short for using the “Environment as an Integrating Context for learning.” The roundtable of researchers and educators reported in 1998 that providing hands-on outdoor activities in nature, outside of schools had an overall positive effect on students, and even teachers involved. In a comparison EIC and traditional students in fourteen of the involved schools showed that EIC students earned higher grades and scored better on general and subject-matter-specific tests. In addition, some of the schools also showed that EIC students had better attendance and less disciplinary programs than the control
group (Lieberman & Hoody, 1998). Research shows that field experiences outside the classroom provide a more cognitive and personal level of thinking that can influence children’s attitudes (Barnett et al. 2006; Brody, 2005; Kola-Olusanya, 2005; Louv, 2008).

Kola-Olusanya (2005) stated that providing children opportunities to explore their world let them “discover, explore and develop a personal understanding of the environment around them” (p. 299). Similarly, Brody (2005) found that “meaningful learning in EE takes place when learning is situated in real world events; it is a personal construction of knowledge through various cognitive processes mediated by social interactions” (p. 608). Barnett et al. (2006) stated “there has been increased interest in exploring how to engage students in science within and through interaction with their local environments…..when leveraged appropriately, outdoor experiences appear to be fruitful because they engage students in activities situated in real-world cultural contexts that enhance their local relevance” (p. 4). Barnett et al. (2006) found that implementing a field-based urban science program helped increase students’ attitudes toward science and stewardship of the environment. While there was no statistically significant results between the posttest; gender effects did show to be statistically significant. Male participation in the program appeared to maintain interest in science, improve understanding of science processes, and promote stewardship to the environment.

Research also shows that real-world experiences in nature help foster a sense of connectedness and stewardship towards the environment (Louv, 2008; Nixon, 1997; White, 1998; White & Stoecklin, 1998) that can influence a lifetime of positive regard for the environment (Wilson, 2006). White and Stoecklin (1998) found that “through children’s handling, manipulation and physical interaction with materials and the natural
environment, they learn the rules and principles that make the world operate” (p.5). Field experiences with nature seem to have the most impact on environmental attitudes for middle school children around the ages of 10-11 (Halocha, 2005; Lieberman & Hoody, 1998). For example, Halocha (2005) studied five classes of 11-year old children in attempt to find a way for children to communicate what they learned and enjoyed after field trips. Teachers provided children 30 minutes to journal their thoughts following an outdoor field trip using writing and drawings. Results showed that field experiences can be beneficial to student understanding of classroom instruction. Halocha (2005) called for future studies continue working on a valid and reliable way to assess students’ cognitive and affective learning following environmental field trips.

The Forever Earth field trip is scheduled most often by fourth and fifth grade elementary school teachers, elementary school gifted and talented education teachers, and middle school science teachers. The Forever Earth field trip is different from the usual science field trips to the museum, zoo, or conservatory (Kola-Olusanya, 2005). Students are taken out into the environment on a floating classroom on Lake Mead, at the Lake Mead National Recreation Area, to do science experiments such as water quality testing. Students benefit from the experience of “being scientists” conducting their own hands-on experiments, using professional equipment, and understanding how their activities relate to the environment around them. Part of the Forever Earth mission is dedicated to providing standards-based, hands-on experiences in a nature setting at Lake Mead to educate about the environment and promote environmental stewardship (Discover Mojave Forever Earth SOP 2010/2011 edition).
The literature shows that for teachers to feel the importance to implement environmental education in the classroom it must be beneficial for their students. One aspect guiding teachers is seeing the importance of hands-on, interactive learning of students (Ernst, 2007a; Waters-Adams, 2006). Providing students the opportunity to be immersed within activities allows students to enjoy and feel a part of their learning environment. In addition, being able to actually connect with nature can have a positive impact on student learning about environmental education (Nixon, 1997; Wells & Lekies, 2006; White, 1998; White & Stoecklin, 1998). Whether it is bringing materials or supplies into the classroom for hands-on activities or being able to actually go into nature helps foster a connectedness for students. Providing field trips like Forever Earth allows teachers the opportunity to implement aspects of environmental education within their curriculum setting. The field trip allows students to interact with nature by doing hands-on activities while learning about science.

**Barriers to Implementing Environmental Education**

Science instruction is a subject area that seems to provide an opportunity for environmental education. Physical and earth science curricula correlate well while studying the earth and its living environment. Hence, it is science teachers who often focus on the concept of environmental education (Barnett et al., 2007; Ernst, 2007a; Legault & Pelletier, 2000; Pergams & Zaradic, 2006).

Lack of resources, time, funding, and administrative support are the barriers most often identified when implementing environmental education (Ernst, 2007b; Ham & Sewing 1988; Johnson, 2006; Keys, 2005; Levitt, 2001). Johnson (2006) addressed this specific topic following a professional development program for teachers. Seven middle
school science teachers in the study completed an inquiry-based professional development program based on requirements in the National Science Education Standards focusing on student-centered, inquiry-based learning experiences. The key research question asked, “What barriers do science teachers encounter when implementing standards-based instruction while participating in effective professional development experiences?” Following classroom observations and teacher interviews, teachers identified the same key areas of concern. Barriers included resources for science teachers, funding to provide resources and training, time to prepare new lesson plans, and support from administrators to implement this type of learning in a science classroom.

Teachers’ barriers to teaching environmental education have been addressed throughout the years in the literature (see Ernst, 2007b; Ham & Sewing, 1988; Levitt, 2001). For example, specific barriers identified included transportation, funding, relevance of field trip to science standards and classroom instruction, and field trip preparation (Ham & Sewing 1988). Money, materials, and time to prepare lessons have been identified by teachers as major constraints to student-directed, hands-on teaching of science (Levitt, 2001). These studies, however, did not identify teacher concerns about environmental education but only barriers that hinder implementation within the classroom setting. The current study addressed this gap in the environmental education literature by specifically asking participants to describe concerns, not only barriers, they face when implementing environmental education in the classroom.

Teacher Beliefs

Conclusions from research on teachers’ beliefs have revealed some common characteristics. The studies described below show that for meaningful change to occur,
teachers need to see their students experience reflection, hands-on experiments, and learning. This section summarizes literature in the field of teacher beliefs. Examining teacher beliefs provides a theoretical construct relating to teachers’ attitudes.

The concept of belief is often identified as a difficult construct to study because there is no one clear definition of beliefs. Definitions vary due to the type of study and subject area (Pajares, 1992; Palak & Walls, 2009). Pajares (1992) discussed various issues surrounding the study of beliefs, and he described the discrepancy of belief meanings as “messy”:

Educational psychology does not always accord its constructs such precision, and so defining beliefs is at best a game of player’s choice. They travel in disguise and often under alias – attitudes, values, judgments, axioms, opinions, ideology, perceptions, conceptions, conceptual systems, preconceptions, dispositions, implicit theories, explicit theories, personal theories, internal mental processes, action strategies, rules of practice, practicum principles, perspectives, repertories of understanding, and social strategy to name but a few that can be found in the literature. (p. 309)

Murphy and Mason (2006) defined beliefs as all that one accepts as or wants to be true. Beliefs do not require verification and often cannot be verified (e.g., opinions). A special characteristic of beliefs is that individuals attribute a valence of importance to them, and therefore, individuals are prepared to act on beliefs, and to hold to them in the face of conflicting evidence. (p. 307)
This study examined teachers’ environmental attitudes before and after an outdoor, curriculum-based field trip—Forever Earth. Measuring teacher attitudes is a way to uncover their personal and professional beliefs. Attitudes and behavior are based on a persons’ beliefs (Bruning et al., 2004) so attitude surveys are a way to measure belief. For example, a persons’ attitude toward homosexuality may be based on their religious beliefs. Their religious belief directly affects their attitude, which can lead them to have a negative attitude toward homosexuality (Adamcyzk & Pitt, 2009).

Teacher Beliefs and Practices

This section examines relevant literature focusing on teacher beliefs and how they may impact classroom instruction. One area of study on beliefs is the relationship between teachers’ beliefs and classroom instruction. Empirical studies seem to differ on whether teacher beliefs actually influence classroom instruction. Lumpe, Czerniak, and Eagan (2002) did an in-depth review looking at teacher beliefs and teaching styles examining the literature on both sides of the debate. Researchers tend to agree that teacher beliefs are important, but the major distinction is whether or not they influence classroom instruction.

Several studies suggest that teacher beliefs influence their instruction in the classroom (Haney et al., 2002; Lumpe et al., 2002; Ozgun-Koca & Sen, 2006; Trumbull et al., 2006; Waters-Adams, 2006). Haney et al. (2002) looked at elementary teacher beliefs about teaching science and their ability to effectively implement science instruction. Using a survey and interview questions, they identified specific profiles for teachers during a summer professional development program. Two teachers were found to possess what researchers coined “vulnerable” belief profiles while two others were
“tenacious” and the last two “robust.” Researchers then conducted ten classroom observations of each teacher that year to see if teacher beliefs affect classroom instruction. Based on the classroom observations for each type of belief profile, Haney et al. (2002) confirmed that there is a relationship between what teachers believe and their classroom instruction. The profiles reflected the type of classroom instruction rated for the observation. For example, robust and tenacious teachers provided stronger, carefully planned, effective, and interactive classroom lessons than did vulnerable teachers who described themselves as unsure or lacking desire to teach science.

Trumbull et al. (2006) also addressed the issue of teacher beliefs impacting inquiry based learning in science with two middle school teachers. It was found that science can be seen in different ways based on teachers’ experience, training, and beliefs. The research emphasized the importance of understanding teacher beliefs because their beliefs will affect their actions in the classroom with science instruction.

On the other side of the argument, researchers assert that teachers’ views and beliefs often have no influence on classroom teaching (Keys, 2005; Levitt, 2001; White, 2000; Wilcox-Herzog, 2002). Keys (2005) conducted a qualitative study using interviews, focus groups, and classroom observation to research teachers’ beliefs and classroom instruction in science. With the reform in science education, teachers are altering their science instruction. Classroom observations showed that teachers did not always act on their expressed beliefs. When these observations were shown to the teachers, they cited issues such as time constraints, resources and professional development. The study (Keys, 2005) found that one main factor influencing change in teacher instruction was the need for a sense of control, which includes on-going support.
to implement the change. For teachers’ roles to change, along with classroom instruction, teachers need to believe they have control.

Wilcox-Herzog’s (2002) study showed no connection between teacher beliefs and behavior in the classroom. One concern found using the self-report questionnaire and classroom observations is how free teachers feel to act upon their beliefs. This was identified as one major constraint. “Scholars interested in the attitude-behavior relationship assert this lack of clarity is due to the fact that researchers often fail to account for factors that potentially influence the link between beliefs and actions” (Wilcox-Herzog, 2002, p. 83).

The research on the ways teacher beliefs affect classroom instruction is mixed. An important point made by the researchers within this debate though, was that examining teacher beliefs is crucial within educational research. Teacher beliefs can be examined from a broad perspective looking at personal or professional attributes and more specifically based on certain subject areas.

**Teacher Beliefs in Specific Subject Areas**

Teacher beliefs have been studied in various subject areas. Some studies of teacher beliefs have been broad and investigated general areas of teaching and instruction (Haney et al., 2002; Murphy & Mason, 2006; Pajares, 1992; Waters-Adams, 2006). General beliefs can include the aims of teaching, the way children learn, the way the curriculum should be structured, and appropriate pedagogy (Waters-Adams, 2006). Other research has focused on specific subject areas. Narrowing the focus to a specific subject can provide a more in-depth view of specific belief. As Pajares (1992) noted, “Subject specific beliefs, such as beliefs about reading, mathematics, or the nature of
science, are key to researchers’ attempting to understand the intricacies of how children learn” (p. 308).

Areas of research on teacher beliefs range throughout various subject areas. Teacher beliefs have been examined in technology (Palak & Walls, 2009), literacy (Barnyak & Paquette, 2010; Poulson, Avramidis, Fox, Medwell & Wray, 2001), math (Beswick, 2007; Speer, 2005), social studies (Olafson, Schraw, & Vander Veldt, 2011) and science (Levitt, 2001; Lidar, Lundquist, & Ostman, 2005; Roberts, Henson, Tharp, & Moreno, 2001; Waters-Adams, 2006). The focus of the current study is on teacher attitudes in environmental education so the emphasis in this section will focus on teacher beliefs related to science. Often environmental education is taught during the science lesson. Environmental science is most closely related to areas such as earth and physical science. Since teacher beliefs often lead to what and how teachers teach in the classroom (Keys, 2005; Trumbull et al., 2006; Waters-Adams, 2006) the next section identifies specific studies examining teacher beliefs directed at science.

**Teacher beliefs about teaching science.** Levitt (2001) examined elementary teachers’ beliefs about teaching science to see if those beliefs reflected current science reform expected in the classroom. She identified five patterns in teachers’ statements about teaching science: 1) engage students in hands-on activities; 2) have students as active participants in learning science; 3) make learning science personally meaningful to students; 4) foster positive attitudes toward science; and 5) have the role of teacher change to accommodate focus on students. One important belief found was that teachers believed that teaching science needed to be learner-centered. Levitt (2001) concluded that
“Teachers’ beliefs about teaching and learning affect their likeliness to enhance student learning and interest in all subject areas” (p. 4).

Waters-Adams (2006) studied four science teachers, examining their beliefs toward teaching science and how it affected their classroom styles. Through observations and dialogue with teachers following the classroom observations, this study found a wide range of beliefs that affected classroom instruction. The general beliefs included 1) the aims of teaching, 2) the way children learn, 3) the way the curriculum should be structured, and 4) appropriate pedagogy. The study found that in teaching science, teachers and their own life experiences are important to student learning. “Understanding the nature of science, goals for science teaching, and wider beliefs about learning and teaching are locked together in a lived dialectical reality in which all elements relate to each other and in which the wider beliefs are probably dominant” (p. 938). One teacher realized that how the students learned (i.e., focusing more towards student-directed learning) increased student knowledge of the subject material. Instead of always focusing on the right answer from students, the teacher developed a confidence in “how she could legitimately encourage children to explore, think, and change their understanding as they carried out their science work” (p. 933).

Johnson (2006) studied seven teachers from two different middle schools. The purpose of the research was to identify barriers teachers have while implementing new classroom styles required by educational reform movements within science. Various barriers were identified by the teachers such as a lack of resources for science teachers, time, funding and administrative support. One key element that determined teachers change toward the educational reform was the nature of their beliefs. Teachers needed to
see success from their students to continue changing within the classroom (Johnson, 2006).

Keys (2005) found similar results in her qualitative study. Teacher beliefs influenced classroom change when implementing new types of instruction within curriculums, including science. Interviews, focus groups and classroom observations found that teacher do not always act on expressed beliefs. Some barriers to classroom instruction included time constraints, resources, professional development and on-going support.

Two teachers studied over a period of three years lead to the same conclusion regarding educational beliefs. Understanding individual teacher beliefs is important because it will affect their actions in the classroom. Triangulation of observations, interviews, and field notes for each teacher showed that science can be seen in different ways based on teacher experience, training and belief (Trumbull et al. 2006).

The importance teachers place on student learning can help change beliefs. Teachers may alter their beliefs when seeing that students are learning the material. If different strategies or techniques that teachers implement, yet are not completely comfortable using in classroom instruction work to improve student knowledge, then what the teacher believed can change (Johnson, 2006; Keys, 2005; Waters-Adams, 2006). Another theme most teachers’ believed is that the teaching and learning of science should most often be student directed. Providing a student-centered, hands-on learning environment provided a stronger classroom setting for students to understand science concepts (Levitt, 2001; Trumbull, et al., 2006; Waters-Adams, 2006).

**Measurement Concerns**
Pajares (1992) stated that “as a global construct, belief does not lend itself easily to empirical investigation” (p. 308). Likewise, the construct of belief does not lend itself easily to the investigation of environmental education. This section examines measurement concerns that impact studies of belief and environmental education, and it emphasizes the importance of using mixed methods in environmental education. This section concludes with the need for measures with stronger psychometric properties within environmental education research. The literature reviewed in this section supports the need for a mixed methods approach in the current study.

Reviews of belief studies in education find that many of them are qualitative in design, often with low subject size (see Calderhead, 1996; Pajares, 1992). Even the past decade shows various studies looking at beliefs toward science and environmental education with small sample sizes using mostly interviews, focus groups or observations (Davis, Petish, & Smithey, 2006; Johnson, 2006; Keys, 2005; Levitt, 2001; Trumbull et al., 2006; Waters-Adams, 2006). Qualitative methodology lends itself to more in-depth, time-consuming methods that accounts for the small sample sizes. For example, Davis et al. (2006) conducted a review of the literature focusing on challenges new science teachers face when implementing science education in the classroom. Studies with elementary and secondary teachers were included. Davis et al. (2006) reviewed 112 articles from seven different journals. For measurement purposes, they found that much of the literature had small participant numbers and focused more on qualitative designs such as case studies. In addition, a need to focus more on in-service teachers was addressed because much of the literature examined pre-service or professional development participants.
The literature addressed a need to improve methodology in environmental education (Gough & Reid, 2000; Russell, 2006; Smith-Sebasto, 2001) and a need to do more mixed methods type of studies to examine environmental and educational beliefs (Rickinson, 2001; Sosu, McWilliam, & Gray, 2008; Wilcox-Herzog, 2002). Teacher beliefs related to their classroom instruction is a complex phenomenon that requires a variety of data collections and analysis. Mixed methods research provides this wealth of information and allows depth of understanding with the breadth of larger sample sizes.

Sosu et al. (2008) used a mixed methods study to examine teacher beliefs and their commitment to environmental education. Researchers followed Creswell’s (2003) framework using sequential and concurrent procedures. Data collection was sequential using a quantitative survey to test theories followed by the qualitative interviews. The survey provided guidelines of information to ask teachers about specific areas during the interviews. The sequential process allowed for elaboration from one finding to the other. Analysis of the quantitative and qualitative data were done concurrently. Using different types of methods offered through mixed methods research provided a “holistic understanding of teacher commitment to environmental education” (p. 169).

Numerous articles (see Kozub & Lienert, 2003; Lang, 2006; Rickinson, 2001; Russell, 2006; Schindler, 1999; Walsh-Daneshmandi & MacLachlan, 2006) address the need for better methodology in environmental educational research. Many studies focus on program outcomes more than describing the methods used to collect or analyze data. Another problem is that many scales used to measure attitudes and behaviors of self in the environment do not provide, or even give consideration to psychometric properties.
One key emphasis in the literature is a call for further research to determine validity and reliability of scales being used.

Rickinson (2001) compiled a “systematic, comprehensive and analytical” (p. 207) review of over 100 environmental articles, books, and reports published between 1993-1999. The review examined various methods used, variables examined, and purposes of the studies. In a follow up article about the methodological challenges, Rickinson (2003) stated “It was recognized from the outset that a review focusing on the evidence bases would need not only the report on recent research findings, but also to evaluate and comment upon their quality” (p. 260).

Many studies use nonvalidated, unreliable scales to measure environmental attitudes. More recently in the literature, description and development of psychometric properties have been discussed in environmental attitude scales (Pettus & Giles, 1987; Walsh-Daneshmandi & MacLachlan, 2006). For example, Pettus and Giles (1987) developed a way to measure people’s environmental attitudes. One of the scales used was the Environmental Attitudes Scale (EAS). Using statistical psychometric procedures, they gathered data on the reliability and validity of the finalized 31-item scale. The scale was able to help measure environmental attitudes compared with different types of personality characteristics. Because environmental attitudes may influence environmental education implementation, this scale was used as the quantitative measure in this study.

Summary

This mixed methods study addressed some of the gaps in the literature regarding design and measurement concerns. Specifically, a convergent parallel mixed methods design was used to incorporate both quantitative and qualitative data. The measurement
instrument used, the EAS, has strong psychometric properties. Furthermore, the types of data collected and analyses conducted allowed for a large enough sample size to provide strength to the results. Merging the results from the quantitative and qualitative data also provided deeper, more detailed information for a more holistic picture. Chapter 3 Methodology will describe in greater detail the design and measurement aspects of the study.

In addition to the design and measurement gaps in the literature, there is little evidence in the literature to suggest that beliefs change in practicing teachers who are not in a university setting. Many of the studies reviewed have occurred within the context of undergraduate or graduate teacher education classes or teacher programs. This study of elementary school teachers, however, addressed the gap. This study also addressed the need for mixed methods research in environmental education as discussed in the literature. Previous studies using both quantitative and qualitative research have provided more information into a diverse and complex phenomenon.

Current social and scholarly literature related to environmental education emphasised the importance of producing environmentally literate students, as future stewards (National Science Foundation, 1999; www.cbf.org; www.neefusa.org). Teachers’ attitudes and beliefs are shown to have an influence on their classroom instruction and student learning (Haney, et. at., 2002; Ozgun-Koca & Sen, 2006; Waters-Adams, 2006). Since environmental education strongly relates to science subjects, science teachers are more often responsible for finding ways to influence student attitudes and learning about environmental issues in the classroom setting (Ernst, 2007a; Legault & Pelletier, 2000; Pettus & Giles, 1987; Smyth, 2006). The Forever Earth outdoor field
trip provided practicing teachers hands-on, student directed science concepts and activities related to nature to bring back into the classroom.

The next chapter, which focuses on the methodology used in the study, begins by discussing mixed methodology in general to gain a clearer insight why it was the best choice in this study. The research questions and hypotheses are given, including a table showing what type of data collection and analysis were used to answer each question. Next the convergent parallel research design used is explained in addition to describing the unique site of the study, participants, instruments and tools used. Finally, implementation for data collection and analysis procedures are discussed.
CHAPTER 3

METHODOLOGY

This study utilized a convergent parallel mixed methods design to investigate teachers’ environmental attitudes and the rationale for using mixed methods will be described below. Both quantitative and qualitative data were gathered for this study. Research questions and hypotheses were generated. The research design section describes the methods of this study including each instrument used. Finally, in the implementation section, each phase of the study is addressed. The three phases of data collection will be described in detail.

Rationale for Mixed Methods Design

Traditionally, most environmental education studies have used one of two generally accepted approaches: quantitative or qualitative. This study utilized a mixed methods approach. In a mixed methods approach, the researcher employs strategies of inquiry that involve collecting quantitative and qualitative data (Creswell, 2003). Quantitative research is often defined by values and statistical outcomes that are definitive, and results are often given in numerical form before they are defined in the text. Qualitative research often provides data that are descriptive and explanatory in nature and results are often given in narrative form (Creswell, 2003).

Recently, interest has grown in mixed methods research (Creswell & Plano Clark, 2011). In mixed methods research, the main idea is to integrate various methods and/or techniques from quantitative and qualitative approaches to provide a better, more comprehensive understanding of a particular research question. Creswell (2003) described mixed methods designs as “procedures for collecting, analyzing, and linking
both quantitative and qualitative data in a single study or in a multiphase series of
studies” (p. 53). Advocates of mixed methods designs encourage researchers to focus on
specific design formation and consensus for specific types and uses of mixed methods
research in educational and social research (Greene & Caracelli, 1997; Tashakkori &
the third research paradigm in educational research” (p. 14).

Greene and Caracelli (1997) questioned what exactly mixed method approaches
include. In addition, other researchers have addressed various ways mixed methodology
can be used within research studies. Mixed methods may consist of strategies identified
by one methodology and incorporated during data collection, data analysis, or post
analysis comparison. Mixed methods may also consist of an assortment of quantitative
and qualitative data collection methods that are used separately throughout the analysis
for comparison. Finally, a mix of methods from both methodologies may be integrated
during the collection or analysis phases (Riggin, 1997; Smith, 1997).

In general though, mixed methods research involves combining components or
phases from both quantitative and qualitative research. Integration of the two types of
data can occur at various stages of data collection, analysis, and interpretation of findings.
According to Creswell (2003), quantitative and qualitative models are mixed together in
two main ways. The first mixed methods design is identified as sequential; one type of
data method is used (such as quantitative) and then the other is used (qualitative). The
second type of mixed methods design is identified as concurrent; the researcher
“implements both the quantitative and qualitative strands during a single phase of the
research study” (Creswell & Plano Clark, 2011, p. 66). This study utilized a concurrent design.

The purpose of this concurrent mixed methods study was to better understand elementary and middle school teachers’ environmental attitudes and field trip concerns by converging both quantitative data (EAS and teacher demographics) and qualitative data (Open-Ended Statements of Concern and interviews). In the field of environmental education, researchers such as Sosu et al. (1998) have addressed the importance of mixed methods research and the need for more studies that use mixed methods. For example, Sosu et al. (1998) used both sequential and concurrent strategies following Creswell’s mixed method design. They found that using a mixed methods design provided a wealth of information and allowed for a more thorough analysis of teachers’ commitments to environmental education. Accordingly, a mixed methods design in this study seemed most appropriate to address each of the research questions.

**Research Questions and Hypotheses**

Both quantitative and qualitative research questions guided this study. According to Creswell and Plano Clark (2011), “Both quantitative and qualitative data collection are central to this form of inquiry” (p. 162). Four key research questions were constructed and examined.

**Quantitative Research Questions**

1. Do teachers’ environmental attitudes change following the Forever Earth field trip?
2. What teacher demographic characteristics are related to a change in environmental attitudes?
Qualitative Research Questions

1. What concerns do teachers have toward an outdoor environmental education field trip?
2. How does the experience of an outdoor environmental education field trip impact teachers?

Quantitative Hypotheses

For each of the two quantitative research questions, a hypothesis was developed. The first hypothesis related to research question one about environmental attitude change. H 1: Teachers’ environmental attitudes will change following the Forever Earth field trip. The second hypothesis related to research question two about teacher demographics and change. H 2. Teacher demographics will not have an impact on the change in teacher attitudes.

To answer the research questions, a variety of quantitative and qualitative data collection and data analysis methods were used. To compare teachers’ attitudes and concerns related to the Forever Earth field trip before and after they participated, a one-group pretest-posttest design was employed (Creswell 2003). Interviews were conducted to collect qualitative data. The additional qualitative information informed the quantitative data from the EAS responses. Results derived from quantitative and qualitative data were integrated into and provided support for the answers to the research questions (Johnson & Onwuegbuzie, 2004). See Table 1 for a summary of data collection and analysis techniques for each research question.
Table 1

**Summary of Data Collection and Analysis for Each Research Question**

<table>
<thead>
<tr>
<th>Number</th>
<th>Research question</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUAN 1</td>
<td>Do teachers’ environmental attitudes change following the Forever Earth field trip?</td>
<td>Pre and Post EAS, SPSS, Descriptive statistics, Paired t-tests, One-way ANOVA</td>
</tr>
<tr>
<td>QUAN 2</td>
<td>What teacher demographic characteristics are related to a change in environmental attitudes?</td>
<td>Demographics, SPSS, Descriptive statistics, Paired t-tests</td>
</tr>
<tr>
<td>QUAL 1</td>
<td>What concerns do teachers have toward an outdoor environmental education field trip?</td>
<td>Open-Ended Statements of Concern questions, Interviews, Content analysis</td>
</tr>
<tr>
<td>QUAL 2</td>
<td>How does the experience of an outdoor environmental education field trip impact teachers?</td>
<td>Interviews, Rubin &amp; Rubin (2005) coding ATLAS.ti</td>
</tr>
</tbody>
</table>
Research Design and Method

Procedures for Convergent Parallel Design

This study utilized a type of concurrent design called the convergent parallel design of mixed methods. This design is often thought of as “triangulation” and was previously called the convergence model (Creswell, 2003). In this convergent parallel design, both quantitative and qualitative data were collected and independently analyzed, then integrated and interpreted (Creswell & Plano Clark, 2011). Following the separate analysis of all quantitative and qualitative instruments, in a mixed methods study, the results are then merged and integrated to form inferences. Inferences in mixed methods research are conclusions or interpretations drawn from the separate quantitative and qualitative strands of the study as well as across the quantitative and qualitative strands (Creswell & Plano Clark, 2011).

Consequently, the trustworthiness of the findings could be enhanced because multiple sources and types of data made triangulation possible. For example, qualitative data from the interviews expanded on quantitative data from the survey. Creswell and Plano Clark (2011) recommend a procedural diagram of the convergent design to convey the complexity of a mixed methods design. See Figure 1 for this study’s procedural diagram.
Figure 1. Procedural diagram of convergent parallel design.

Data Collection

The mixed methods approach integrated both quantitative and qualitative data into the findings. Data were collected in three phases (see Table 2). In the first phase, quantitative data were collected using the Environmental Attitudes Survey (EAS) and the teacher demographics questionnaire. Qualitative data were collected using the Open-
Ended Statements of Concern. In the second phase, quantitative data were collected from the posttest EAS. Finally, in the third phase, qualitative data were collected from interviews with teachers who had participated in the Forever Earth field trip. Interviews were conducted within two weeks of field trip completion. Initially, only teachers completing the first two phases of the study were included during the interview phase. Due to low numbers, however, any teacher attending the Forever Earth field trip was asked to participate in an interview.

Table 2

<table>
<thead>
<tr>
<th>Data Collection Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of data</td>
</tr>
<tr>
<td>QUAN</td>
</tr>
<tr>
<td>QUAL</td>
</tr>
<tr>
<td>Phase 1</td>
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<tr>
<td>EAS (Pre)</td>
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<tr>
<td>Open-Ended Statements of Concern</td>
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<tr>
<td>Teacher Demographics</td>
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<tr>
<td>Phase 2</td>
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<tr>
<td>EAS (Post)</td>
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<tr>
<td>Phase 3</td>
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<tr>
<td>Interviews</td>
</tr>
</tbody>
</table>

Note. QUAN = Quantitative; QUAL = Qualitative; EAS = Environmental Attitudes Survey

Study Site: Forever Earth

Because of the unique nature of this study, it is important to first describe the site of the study. Forever Earth is an environmental program managed by the University of Nevada, Las Vegas (UNLV) Public Lands Institute (PLI). According to the mission statement, the PLI is “dedicated to strengthening the national fabric that is essential for
the protection, conservation, and management of public lands.” The three areas of focus include research, education, and community engagement.

Forever Earth is a 70 foot houseboat converted into a floating classroom and research laboratory. The use of the vessel was donated by Forever Resorts, Inc., a management company that is a concessionaire at Callville Bay Marina at Lake Mead National Recreation Area where the vessel is berthed. The houseboat was outfitted for the purpose of science education and research.

The Forever Earth field trip provides school groups (grades four and up) the opportunity to learn about their environment through science and participate in it firsthand. Four specific school field trip curriculums are aligned with state and district science standards for grades four through seven. The curriculum, in sequence, included: The Water Cycle: Just Passing Through (Las Vegas Water Cycle - 4th grade), Finicky Fish Finish Last (native and non-native fish – 5th grade), Invasive Species (quagga mussels in Lake Mead – 6th grade), and Crime Scene Investigation/Geology Scene Investigation (Lake Mead geology – 7th grade).

Teachers registered for a field trip date using the Forever Earth website. Pre and post field trip classroom activities were provided to the teacher for each curriculum. A pretrip visit was conducted approximately one week prior to field trip date by a PLI staff member. Pretrip visits included a brief PowerPoint presentation describing Forever Earth and the activities, field trip logistics, and safety rules on the boat. A field trip schedule of activities, logistics, directions, and fee entrance waiver to Lake Mead was provided to the teachers. Teachers were asked to participate in the current study during the pretrip visit following Institutional Review Board (IRB) approval in March 2008. The consent form
and Phase 1 instruments were administered to the teachers. Teachers were made aware that their participation was voluntary and were then instructed to complete Phase 1 instruments (EAS, demographics and Open-Ended Stages of Concern) prior to attending the field trip.

**Participants**

Participants were selected using a purposeful sample (Creswell, 2003). Any teacher participating in a Forever Earth field trip between March 2008 and January 2009 was asked to volunteer for the study. Teachers were recruited during the pretrip classroom visit occurring approximately one week prior to the field trip. Teachers taught in a large urban school district in the southwestern United States.

Because the purpose of the study was to directly compare two sets of findings about a single topic, the individuals who participated in the quantitative sample were asked to participate in the qualitative sample (Creswell & Plano Clark, 2011). A total of 67 teachers were asked to participate in the study. Fifty two of them completed the first phase only and 36 teachers completed phases one and two of the study. Thirty two participated in the third phase of the study, interviews. Of the 36 participants 30 were female. The majority (64%) were between the ages of 26 and 45. It was an equal distribution among participants for years teaching but many more were new at teaching science. Nearly two thirds of science teachers had seven years or less of teaching. More than one third were in their first three years of teaching science. Details about teacher demographics are in Appendix A and the questionnaire is in Appendix E. A summary of teacher demographics is in Table 3.
Table 3

Summary of Teacher Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>% (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>83</td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Less than 25</td>
<td>8</td>
</tr>
<tr>
<td>26-35</td>
<td>39</td>
</tr>
<tr>
<td>36-45</td>
<td>25</td>
</tr>
<tr>
<td>46-55</td>
<td>11</td>
</tr>
<tr>
<td>over 55 years old</td>
<td>17</td>
</tr>
<tr>
<td>Years teaching experience</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>25</td>
</tr>
<tr>
<td>4-7</td>
<td>31</td>
</tr>
<tr>
<td>8-12</td>
<td>22</td>
</tr>
<tr>
<td>13-20</td>
<td>14</td>
</tr>
<tr>
<td>over 20 years</td>
<td>8</td>
</tr>
<tr>
<td>Years teaching science</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>39</td>
</tr>
<tr>
<td>4-7</td>
<td>25</td>
</tr>
<tr>
<td>8-12</td>
<td>19</td>
</tr>
<tr>
<td>13-20</td>
<td>11</td>
</tr>
<tr>
<td>over 20 years</td>
<td>6</td>
</tr>
<tr>
<td>Current grade level taught</td>
<td></td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>33</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>25</td>
</tr>
<tr>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>19</td>
</tr>
<tr>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>0</td>
</tr>
<tr>
<td>high school</td>
<td>6</td>
</tr>
<tr>
<td>other (Gate, ESL, or Special Ed)</td>
<td>14</td>
</tr>
</tbody>
</table>
In this section, each instrument used in the study will be described and a rationale given for why it was chosen. A convergent design must address the same concept in both the quantitative and qualitative data (Creswell & Plano Clark, 2011). In this study, the concept was environmental attitudes. The quantitative data collection instrument will be described first.

**Quantitative Instrument: Environmental Attitudes Scale (EAS).** The EAS is a measure of attitudes towards the environment. The instrument has been used in previous research studies (see Pettus & Giles, 1987) with proven reliability and validity. Participants could quickly complete the 31 Likert-type items of which 30 items fell into three factors, and one item, #31, was used only for the overall scale. Factor 1, Environmental Responsibility, consists of 15 items such as “A lack of foresight and planning have gotten us into our present environmental dilemma.” Factor 2, Rights and Restrictions for Environmental Quality, consists of seven items such as “Individuals should be willing to separate their household refuse into four containers to help facilitate recycling and disposal.” Factor 3, Social and Governmental Actions for Environmental Quality, consists of eight items such as “People should be willing to make economic sacrifices for a better environment” (Pettus & Giles, 1987). Appendix B lists all EAS items for each factor and item #31. See Appendix C for the EAS instrument, which was based on Pettus and Giles’ (1987) 31-item scale.

Pettus and Giles (1987) found that EAS coefficients of the between-scores correlations showed a moderate relationship on all three factors. Each item, however, showed low relationships, which suggested that each measured a specific aspect of
environmental attitude. Cronbach’s Alpha of internal consistency estimates of reliability for the whole instrument yielded a value of .88 and for each factor .84, .69, .and 76, respectively (Pettus & Giles, 1987).

**Qualitative Instrument: Open-Ended Statements of Concern.** The Open-Ended Statements of Concern was used to identify teacher concerns toward this outdoor science field trip. As recommended by Newlove and Hall (1976), teachers answered the following open-ended question in narrative form: “When you think about the Forever Earth environmental education field trip, about what are you concerned about? (Do not say what you think others are concerned about, but only what concerns you now). Please write in complete sentences, and please be frank.” Teachers completed the Open-Ended Statements of Concern prior to the field trip, and, consequently, provided a more personal, descriptive account of their teacher concerns. See Appendix D, Open-Ended Statements of Concern, for the document completed by the participants.

**Demographics questionnaire.** In addition to completing the EAS and the Open-Ended Statements of Concern, participants also answered demographic questions. Items included gender, age, years teaching experience, years teaching science, and current grade level taught. The questionnaire can be found in Appendix E.

**Interviews**

A semi-structured interview strategy was used to gather data for a more in-depth understanding of teachers’ perspectives. Although potential questions were identified, the protocol allowed for changes such as using prompts and asking additional questions (Merriam, 1998). Standard questions could be asked at any point during the interview (Rubin & Rubin, 2005).
The interview was portioned into two areas of discussion. Questions about the Forever Earth field trip were asked first. Glesne (1998) stated, “Experience/behavior questions are generally the easiest ones for a respondent to answer and are good places to begin to get the interviewee talking comfortably” (p. 71). The second part of the interview moved to environmental education. Initially, teachers were asked about their professional perceptions of environmental education in general and then were asked about environmental education within the curriculum. Following the main components in the interview protocol, teachers replied to the standard questions.

The first part of the interview addressed the field trip with questions such as 1) Have students used information from the Forever Earth field trip in the classroom? 2) Do you have any suggestions to improve the field trip? 3) Did the field trip activities align with your science curriculum? 4) Did you tell anyone else about the field trip? and 5) Would you do another Forever Earth field trip?

The second portion of the interview addressed questions related to environmental education: Can environmental education be incorporated 1) within the curriculum, 2) in science, or 3) in your classroom applications? See Appendix F for the Teacher Interview Protocol.

**Implementation**

Data collection was conducted in three phases. The first phase was completed prior to teachers attending the Forever Earth field trip. The second phase was completed immediately after the field trip. The third phase was completed two weeks following the field trip. Each phase is described below in detail.
Phase 1

Teachers that agreed to participate received a research packet. This packet contained the consent form and all premeasures (EAS, demographics, Open-Ended Statements of Concern). The packets were distributed to teachers in person within a week prior to their field trip at the previsit. The teacher previsit allowed for discussion of field trip logistics, answer questions, and describe the dissertation research. Teachers returned the completed packet when they arrived at Lake Mead for the field trip.

Phase 2

Any participant who returned the packet during the field trip was given another EAS to complete following the field trip. Teachers were instructed to complete the EAS as soon as possible after their field trip. These surveys were returned during the interview. For teachers who did not participate in the interview, questionnaires were returned using a pre-paid envelope or picked up at their school by the researcher. The majority of teachers who completed the post EAS did so within a couple days of the field trip.

Phase 3

Phase 3 consisted of the one on one interviews. Interviews were conducted at the date, time, and location of the teacher’s choice. Glesne (1998) stated that as interviews are per the time and availability of the interviewee, they should be done per convenience of the interviewee. Teachers scheduled their interview with me in person at the end of the field trip day or via email and/or phone calls within days following the field trip. The completed posttest was collected during the interview. The majority of interviews were conducted at the teachers’ schools during their preparatory period. To encourage teachers
to volunteer their time and energy participating in the interview, each willing participant was interviewed only once. The interview timeframe allowed for specific questions relating to the field trip as well as questions focused on environmental education issues. Interviews allowed for further verification of teacher responses to the previous instruments and more breadth of environmental education issues. The interviews also allowed me to focus on specific areas of interest regarding the teachers and their feelings toward environmental education.

Thirty-two interviews were conducted, and each concluded in approximately 30 minutes. Some teachers were succinct in their answers. Others were unwilling to elaborate on certain areas, and they gave me the following two reasons: 1) They felt distant or distracted that day due to other pressing professional issues or 2) They felt it was an intrusion on their time and they were too busy. These interviews were directed more toward the field trip and their overall thoughts with environmental education. These interviews followed the interview protocol and had few follow-up questions.

Additional follow-up questions and prompts were used with teachers who expressed a keen interest in environmental issues personally or professionally. According to Glesne (1998), key informants are the type of participants best used for the in-depth interview; they are willing to meet again, have a keen interest in the topic, and are articulate. Follow-up questions were based on their experiences and their responses to the interview script. General follow-up questions were in the following areas: 1) personal feelings toward environmental education, 2) personal experiences outside of the classroom, 3) examples of environmental education within their classroom, and 4) teacher resources and/or training on environmental education.
Prior to the interview, I again thanked them for their time and for agreeing to participate in the study. I explained that I was going to ask about the Forever Earth field trip and environmental education in general, that I was interested in their opinions and feedback; and that there were no right or wrong answers about their perceptions. During the first part of the interview, I explained that teacher feedback allows the program to improve using teacher suggestions and opinions. During the second part of the interview, I focused more generally on environmental education. I explained that I was interested in teachers’ views toward environmental education relating to science both in the classroom and during outdoor learning.

All interviews were recorded using a hand-held mini tape recorder. In addition, written notes were jotted down on the interview protocol sheet during and after the interview. Interviews were transcribed verbatim by the researcher.

**Institutional Review Board (IRB)**

Informed consent and approval of all instruments and methodology was sought through UNLV’s Office for the Protection of Research Subject (OPRS). UNLV’s IRB gave approval on March 4, 2008. Participants were asked to read and sign a copy of the approved Informed Consent. Teachers were given the approved informed consent before study participation. A copy of informed consent was provided to all teachers. The teachers were assured that their participation or lack thereof would not affect or be associated with their Forever Earth field trip in any way. A copy of the IRB Approval Notice and the IRB-approved Informed Consent can be found in Appendices G and H, respectively.
Analysis

Quantitative

Environmental Attitudes Scale (EAS). Analysis of the EAS was completed using SPSS v. 16. The means and standard deviations were calculated for EAS overall and the three subscores of the factors. A one-way ANOVA showed any significance between the pre and posttest scores. In addition, paired t-tests were used to find any significance between EAS scores and all teacher demographics (i.e., gender, age, years teaching experience, years teaching science, current grade level taught).

Qualitative

Open-Ended Statements of Concern. Analysis of the Open-Ended Statements of Concern was conducted using content analysis. In content analysis, the Open-Ended Statements of Concern were grouped into various categories and specific frequencies of these relevant categories were calculated (Berg, 2001).

Interviews. Interviews were analyzed based on Rubin and Rubin’s (2005) sequential description for analyzing interviews. It is an in-depth, time-consuming process, but provides a wealth of information. The first stage of analysis is called recognition. This process looks overall at the interviews and recognizes general themes based upon the literature and research questions for study. In the second stage, these general themes provided an initial coding system to be used and then further revised into more specific codes. The final stage, for topical studies such as this, produced a “description of events that have occurred and then explain how and why” (Rubin & Rubin, 2005, p. 208).
To follow this sequence, first, all interviews were transcribed into Microsoft Office Word documents and then uploaded as primary documents into ATLAS.ti. ATLAS.ti is a software program for organizing qualitative data, including interviews. While it facilitated qualitative analysis, it did not automate the process (Muhr, 2004). After reading the transcribed interviews, general themes were established. An example of some codes that were developed included Concerns, Environmental Education Integration, Forever Earth Program, and Student Directed Learning.

Interview transcripts uploaded to ATLAS.ti were coded based on the initial coding scheme. For example, when Mr. Eddie was asked about environmental education in the classroom, he gave an example from his own practice, “Mostly I would deal with …issues that come out of the weekly reader, some issues have dealt with things on the environment and …we’ll talk about that.” Initially, that statement was coded as Environmental Education (EE). The coding units became more specific, however, as more interviews were completed. Mr. Eddie’s statement was recoded as EE Integration and then finally as EE Classroom. This process of refining codes was repeated once all the interviews were completed and the codes were established. The initial coding list was refined after a review of all statements within each code. Over 100 codes were established (see Appendix I). The initial coding system that was developed in the recognition phase was then used to further elaborate and refine the coding system within ATLAS.ti. The codes were then grouped together in a coding scheme showing a higher order of classification to form the major themes.
Summary

This study aimed to describe and understand how teachers’ attitudes toward environmental education may have changed after they and their students participated in a Forever Earth field trip. Using a mixed methods design known as convergent parallel, I collected both quantitative and qualitative data from assessments and interviews. Data were analyzed using both statistical and textual methods. The integrated data analyses facilitated identification of the findings and results that will be discussed in Chapter 4.
CHAPTER 4

RESULTS

As described in Chapter 3, this study utilized a convergent parallel mixed methods design. This design is often thought of as “triangulation.” Both quantitative and qualitative data were collected and analyzed independently. In Chapter 4, results will be presented in three sections. In the first section—Quantitative—I followed procedures for a convergent design by exploring and analyzing the data separately for each instrument used in both quantitative and qualitative data collection. Therefore, results from the quantitative EAS and demographics questionnaire are provided. In the second section—Qualitative—findings and major themes from the qualitative interviews and Open-Ended Statements of Concern instrument are addressed; specific quotes are included as examples of responses. In the third section of this chapter—Interpretation—results of the separate strands are converged, and the two data sets are integrated according to the merged data analysis display advocated by Creswell and Plano Clark (2011).

Compared to a single method approach, the mixed methods approach allowed for a more thorough analysis and interpretation of results and a greater insight into teachers’ environmental attitudes and concerns. In addition to focusing on teachers’ concerns regarding an outdoor environmental field trip, the results led to a description of teachers’ perspectives on integrating environmental education. The convergent design model (as shown in Figure 1 in Chapter 3) allowed validation of the results through triangulation in the interpretation phase. Triangulation was accomplished by using data responses to various measures to support other responses. Comparison of the data sets were based on
information found in the quantitative and qualitative results (Creswell & Plano Clark, 2011).

**Quantitative**

The quantitative data were derived from the EAS pre and post field trip and from the Demographics Questionnaire pretrip. Results from the EAS will be described for the overall pre and posttest scores for each of the three EAS factors, and finally, for the impact of demographics. To answer the research questions, the main focus will be the overall EAS score, but results from each factor will also be given.

Analysis of the EAS was completed using SPSS v. 16. Means and standard deviations were calculated for each pre and posttest EAS item, the EAS overall, and the three EAS subscores. Paired (or repeated measures) t-tests showed any significance between the various pre and posttest scores. Paired data analyses are appropriate when two scores are produced by the same individual and therefore are expected to be correlated due to common with-in subject variance. In addition, a one-way ANOVA was used to find any statistical significance between EAS scores and all teacher demographics (gender, age, years teaching experience, years teaching science, and current grade level taught).

The EAS consists of 31 Likert-type items that measure attitudes of participants toward the environment. Within the scale are three overall factors (Pettus & Giles, 1987). Factor one consists of 15 items labeled Environmental Responsibility (i.e., “A lack of foresight and planning have gotten us into our present environmental dilemma.”). Factor two consists of seven items labeled Rights and Restrictions for Environmental Quality (i.e., “Individuals should be willing to separate their household refuse into four containers...
to help facilitate recycling and disposal.”). And factor three consists of eight items labeled Social and Governmental Actions for Environmental Quality (i.e., “People should be willing to make economic sacrifices for a better environment.”) The purpose of this scale was to measure change in teachers’ environmental attitudes following the field trip intervention.

Quantitative Research Questions and Hypotheses

The two quantitative research questions were 1) Do teachers’ environmental attitudes change following the Forever Earth field trip? and 2) What teacher demographic characteristics are related to a change in environmental attitudes? The first hypothesis related to research question one: Teachers’ environmental attitudes would change following the Forever Earth field trip. The second hypothesis related to research question two: Teacher demographics would not impact the change in teacher attitudes.

Quantitative Research Question 1: Do teachers’ environmental attitudes change following the Forever Earth field trip? To compute this difference, I subtracted the posttest score from the pretest score, which yielded a gain score between them. A negative score indicates that the posttest score was larger than the pretest scores; thus, significant negative values correspond to significant gains over time. Results showed a statistically significant change in teachers’ overall environmental attitudes following the field trip. The mean rating and standard deviation difference from overall pre and posttests were -3.92 and 8.74, respectively. The difference was significant using a paired samples t-test, \( t(35) = -2.690, p < .05 \). Reliability for the study was established using Cronbach’s Alpha at \( \alpha = .903 \). See Table 4 for EAS overall composite scores and Table 5 for EAS pre and posttest item scores.
Each of the three individual EAS factors was also analyzed. Two of the three factors had statistically significant changes. The first factor, Environmental Responsibility, had a mean rating and standard deviation difference from overall pre and posttests of -1.92 and 4.67, respectively. The difference was significant using a paired samples t-test, \( t(35) = -2.460, p < .05 \). The second factor, Rights and Restrictions for Environmental Quality, did not show any statistically significant change with \( t(35) = -1.508, p > .05 \). The third factor did show a statistically significant change with mean rating and standard deviation difference from overall pre and posttests of -1.22 and 2.91, respectively, \( t(35) = -2.521, p < .05 \). Reliability for each scale pre and posttest follows: Factor 1 reliability pre and posttest was .78 and .87, respectively; Factor 2 was .82 and .82; and Factor 3 was .70 and .87.

Table 4

*EAS Overall Composite Scores from Pre to Posttest*

<table>
<thead>
<tr>
<th>EAS</th>
<th>( N )</th>
<th>( M; SD )</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>36</td>
<td>-3.92; 8.74</td>
<td>-2.69</td>
<td>( P &lt; .05 )</td>
</tr>
<tr>
<td>Factor 1</td>
<td>36</td>
<td>-1.92; 4.67</td>
<td>-2.46</td>
<td>( P &lt; .05 )</td>
</tr>
<tr>
<td>Factor 2</td>
<td>36</td>
<td>-0.63; 2.54</td>
<td>-1.51</td>
<td>n.s.</td>
</tr>
<tr>
<td>Factor 3</td>
<td>36</td>
<td>-1.22; 2.91</td>
<td>-2.52</td>
<td>( P &lt; .05 )</td>
</tr>
</tbody>
</table>
Table 5

*EAS Item Composite Scores from Pre and Posttest*

<table>
<thead>
<tr>
<th>Item number</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M; SD</td>
<td>M; SD</td>
</tr>
<tr>
<td>1</td>
<td>3.67; 0.53</td>
<td>3.78; 0.42</td>
</tr>
<tr>
<td>2</td>
<td>3.25; 0.65</td>
<td>3.31; 0.79</td>
</tr>
<tr>
<td>3</td>
<td>3.61; 0.55</td>
<td>3.58; 0.50</td>
</tr>
<tr>
<td>4</td>
<td>2.28; 1.14</td>
<td>2.42; 1.13</td>
</tr>
<tr>
<td>5</td>
<td>3.36; 0.76</td>
<td>3.44; 0.65</td>
</tr>
<tr>
<td>6</td>
<td>3.00; 0.79</td>
<td>3.17; 0.70</td>
</tr>
<tr>
<td>7</td>
<td>3.03; 0.77</td>
<td>3.08; 0.84</td>
</tr>
<tr>
<td>8</td>
<td>3.31; 0.75</td>
<td>3.47; 0.61</td>
</tr>
<tr>
<td>9</td>
<td>3.19; 0.92</td>
<td>3.25; 0.69</td>
</tr>
<tr>
<td>10</td>
<td>3.08; 0.73</td>
<td>3.28; 0.57</td>
</tr>
<tr>
<td>11</td>
<td>3.19; 0.71</td>
<td>3.28; 0.66</td>
</tr>
<tr>
<td>12</td>
<td>3.08; 0.65</td>
<td>3.33; 0.68</td>
</tr>
<tr>
<td>13</td>
<td>3.50; 0.65</td>
<td>3.64; 0.54</td>
</tr>
<tr>
<td>14</td>
<td>3.42; 0.69</td>
<td>3.50; 0.70</td>
</tr>
<tr>
<td>15</td>
<td>3.17; 0.85</td>
<td>3.53; 0.56</td>
</tr>
<tr>
<td>16</td>
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<td>17</td>
<td>2.86; 0.72</td>
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<td>18</td>
<td>3.25; 0.84</td>
<td>3.22; 0.72</td>
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<td>19</td>
<td>2.03; 1.00</td>
<td>2.17; 1.21</td>
</tr>
<tr>
<td>20</td>
<td>3.06; 0.89</td>
<td>3.19; 0.75</td>
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<td>21</td>
<td>3.31; 0.67</td>
<td>3.50; 0.70</td>
</tr>
<tr>
<td>22</td>
<td>3.22; 0.64</td>
<td>3.31; 0.58</td>
</tr>
<tr>
<td>23</td>
<td>3.11; 0.82</td>
<td>3.25; 0.81</td>
</tr>
<tr>
<td>24</td>
<td>3.72; 0.45</td>
<td>3.75; 0.44</td>
</tr>
<tr>
<td>25</td>
<td>3.58; 0.55</td>
<td>3.72; 0.45</td>
</tr>
<tr>
<td>26</td>
<td>3.36; 0.64</td>
<td>3.33; 0.59</td>
</tr>
<tr>
<td>27</td>
<td>2.61; 0.80</td>
<td>3.08; 0.77</td>
</tr>
<tr>
<td>28</td>
<td>3.36; 0.59</td>
<td>3.36; 0.59</td>
</tr>
<tr>
<td>29</td>
<td>3.25; 0.73</td>
<td>3.33; 0.68</td>
</tr>
<tr>
<td>30</td>
<td>2.36; 1.13</td>
<td>2.67; 1.12</td>
</tr>
<tr>
<td>31</td>
<td>3.08; 0.81</td>
<td>3.22; 0.72</td>
</tr>
</tbody>
</table>
The significance of the overall pre and post scale showed a medium effect size at .447. Effect size was calculated for the overall pre and posttest scale using the Cohen’s $d$ formula to show the magnitude of the differences between the two tests. I used the most common effect size statistic, which shows the standardized mean difference. The standardized mean difference expresses the mean outcome difference between tests in standard deviation units (Rossi, Lipsey, & Freeman, 2003). As cited by Lipsey (1990), Cohen classified effect sizes as small = .20, medium = .50, and large = .80 (p. 55). The effect size .447 in this study, therefore, can be considered a “medium” effect size.

Hypothesis one was supported by the data: Teachers’ environmental attitudes changed following the field trip intervention.

**Quantitative Research Question 2:** What teacher demographic characteristics are related to a change in environmental attitudes? Given the above results, this study focused exclusively on overall pre and posttest scores. With one exception discussed below, analysis did not show significant differences on the demographic variables. Each variable was compared with pre and posttest scores for overall and for each of the three factors within the EAS. The demographics that were analyzed were gender, age, years teaching, years teaching science, current grade level taught, and years teaching at current grade level. A Tukey’s post hoc test was conducted and showed specific groups with any significance. Generally, there was not a difference in the demographics, but there were two age levels within the years teaching and years teaching science at the pretest level. There was no difference found in the post results. See Tables 6, 7, 8, 9, and 10.

Hypothesis two was supported by the data: Teacher demographics did not impact teacher attitudes.
Table 6

*Gender Mean and Standard Deviation*

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n = 6 )</td>
<td>( n = 30 )</td>
</tr>
<tr>
<td><strong>EAS Overall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>99.67; 07.63</td>
<td>95.97; 12.72</td>
</tr>
<tr>
<td>Post</td>
<td>108.50; 16.25</td>
<td>98.90; 13.37</td>
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</table>

Table 7

*Age Mean and Standard Deviation*

<table>
<thead>
<tr>
<th>Age</th>
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<tbody>
<tr>
<td>&lt; 25</td>
<td>93.00; 7.00</td>
</tr>
<tr>
<td>26-35</td>
<td>92.08; 12.04</td>
</tr>
<tr>
<td>36-45</td>
<td>98.83; 12.79</td>
</tr>
<tr>
<td>46-55</td>
<td>93.50; 9.19</td>
</tr>
<tr>
<td>Over 55</td>
<td>104.67; 10.54</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>M; SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EAS Overall</strong></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>88.00; 7.00</td>
</tr>
<tr>
<td>Post</td>
<td>101.31; 16.43</td>
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Table 8

*Years Teaching Experience Mean and Standard Deviation*

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<th>M; SD</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>98.56; 8.05</td>
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<tr>
<td>4-7</td>
<td>90.64; 12.49</td>
</tr>
<tr>
<td>8-12</td>
<td>93.13; 12.26</td>
</tr>
<tr>
<td>13-20</td>
<td>112.40; 04.83</td>
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<tr>
<td>Over 20</td>
<td>95.33; 5.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>M; SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EAS Overall</strong></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>103.78; 14.48</td>
</tr>
<tr>
<td>Post</td>
<td>97.91; 16.02</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>M; SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EAS Overall</strong></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>96.13; 12.22</td>
</tr>
<tr>
<td>Post</td>
<td>110.00; 10.54</td>
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Table 9

*Years Teaching Science Mean and Standard Deviation*

<table>
<thead>
<tr>
<th>Years teaching experience</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
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<td>9</td>
</tr>
<tr>
<td>8-12</td>
<td>7</td>
</tr>
<tr>
<td>13-20</td>
<td>4</td>
</tr>
<tr>
<td>Over 20</td>
<td>2</td>
</tr>
<tr>
<td>n =</td>
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</tr>
<tr>
<td>EAS Overall Pre</td>
<td>96.00; 10.06</td>
</tr>
<tr>
<td></td>
<td>92.00; 12.02</td>
</tr>
<tr>
<td></td>
<td>93.14; 13.03</td>
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<td></td>
<td>114.25; 2.87</td>
</tr>
<tr>
<td></td>
<td>98.00; 2.83</td>
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<td>EAS Overall Post</td>
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<td></td>
<td>97.33; 13.44</td>
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<tr>
<td></td>
<td>95.71; 13.82</td>
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<tr>
<td></td>
<td>112.75; 9.88</td>
</tr>
<tr>
<td></td>
<td>102.50; 12.02</td>
</tr>
</tbody>
</table>

Table 10

*Current Grade Level Taught Mean and Standard Deviation*

<table>
<thead>
<tr>
<th>Current Grade Level Taught</th>
<th>M; SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th</td>
<td>12</td>
</tr>
<tr>
<td>5th</td>
<td>9</td>
</tr>
<tr>
<td>6th</td>
<td>7</td>
</tr>
<tr>
<td>7th</td>
<td>2</td>
</tr>
<tr>
<td>GATE4/5</td>
<td>6</td>
</tr>
<tr>
<td>n =</td>
<td></td>
</tr>
<tr>
<td>EAS Overall Pre</td>
<td>101.17; 10.64</td>
</tr>
<tr>
<td></td>
<td>90.56; 11.09</td>
</tr>
<tr>
<td></td>
<td>96.86; 8.88</td>
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</tr>
<tr>
<td></td>
<td>94.83; 16.46</td>
</tr>
<tr>
<td>EAS Overall Post</td>
<td>105.75; 12.75</td>
</tr>
<tr>
<td></td>
<td>96.44; 13.58</td>
</tr>
<tr>
<td></td>
<td>101.29; 14.06</td>
</tr>
<tr>
<td></td>
<td>100.50; 17.68</td>
</tr>
<tr>
<td></td>
<td>95.17; 17.61</td>
</tr>
</tbody>
</table>

**Discussion of Quantitative Results**

The quantitative results from the Environmental Attitudes Survey (EAS) answered both quantitative research questions. The results show a statistically significant difference in teachers’ environmental attitudes following the field trip. The first hypothesis was confirmed. There are two possible reasons for the significant difference
between the pre and posttest results following the intervention. One explanation is that
the program is effective due to its emphasis on a student-directed, hands-on approach to
learning. Second, program effectiveness might be explained by the context of the
program as it occurred in the environment.

The second research question was: What teacher demographic characteristics are
related to a change in environmental attitudes? The results showed that teacher
demographics did not influence changes in teachers’ environmental attitudes. The second
hypothesis that teacher demographic variables would not impact change in teacher’s
environmental attitudes was confirmed. The fact that years teaching and years teaching
science showed significance only on the pre and not the posttest leads to the conclusion
that it was most likely due to chance. Teachers with more years teaching overall and in
science might possibly have had stronger opinions initially from their experience. The
field trip intervention then balanced the years-teaching effect within all levels. In
summary, the Forever Earth field trip innovation seems to be the only variable relating to
teachers’ changing environmental attitudes.

**Qualitative**

The qualitative data results are divided into two sections. The first section
examines the results stemming from the interviews. Interviews were coded and examined
as the major themes emerged. Four major themes will be described along with specific
quotes given by teachers on the topic. The second section provides the results from the
Open-Ended Statement of Concern. All concerns given by the teachers were examined
and then quantified by major topic areas.
Interviews

Interviews were analyzed using Rubin and Rubin’s (2005) sequential description process. The first stage of analysis begins with an overall look at the interviews and a recognition of the coding system based on the literature and the research questions for the study. These general themes provided an initial coding system to be used and then further revised into more specific codes. The final phase for topical studies such as this produced a “description of events that have occurred and then explain how and why” (Rubin & Rubin, 2005, p. 208). The initial coding system and revisions were developed and labeled within a qualitative software system called ATLAS.ti, which was described in Chapter 3. Figure 2 graphically depicts how codes were identified and arranged within an organized scheme. See Appendix I for the ATLAS.ti Coding Hierarchy for all the codes identified.

Figure 2. Example of ATLAS.ti coding scheme for Forever Earth program.
From these interviews, the following four major themes were identified: Environmental Attitudes, Field Trip Program, Integrating Environmental Education, and Concerns. For example, Field Trip Program was identified as a major theme in the interviews. Within this theme were two key topics addressed by teachers: hands-on learning and connecting to nature. Table 1 lists and defines each major theme and subtheme with representative quotes from the participants.
### Four Major Interview Themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Representative quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Environmental Attitudes</td>
<td>General</td>
<td>I think it is important for students to learn what is happening in their environment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Who is responsible for teaching children about the environment? Should it be part of my responsibility?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We are all a part of the environment, yet kids are hardly outside anymore with all the technology and games they have.</td>
</tr>
<tr>
<td></td>
<td>Personal and professional experience</td>
<td>I did a lot outside growing up and it has always been a big part of my life. I do most of my recreational activities outside.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My previous school back east, we often took kids to the playground and outside areas by school to teach.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We focus at my house on being green so I guess that is why I hope to pass that along to my students.</td>
</tr>
<tr>
<td>II. Field trip Program</td>
<td>Overall</td>
<td>This is the best field trip ever! I want to do it every year!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I love that the field trip is aligned with our state science standards for our grade level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is so organized and everyone is so good with these kids.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It was fun to be a part of my students – I even learned things!</td>
</tr>
<tr>
<td></td>
<td>Hands-on learning</td>
<td>Love that the students were engaged and interactive the whole time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Even my sometimes more difficult students did not act up on this field trip; I think it was because they were so involved the entire time.</td>
</tr>
<tr>
<td></td>
<td>Connecting to nature</td>
<td>Being outside learning about science is amazing! I think it really helps the kids understand and learn in the environment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A lot of my kids have never been to a lake, so just actually seeing it was a memory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seeing the water line, with how low the water level is, really got some of my kids talking about ways they can help Lake Mead and their environment.</td>
</tr>
</tbody>
</table>
(…continued) Four Major themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Representative quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>III. Integrating EE</td>
<td>Within overall curriculum</td>
<td>If environmental education is implemented it should be throughout the curriculum and not just one subject area. With the emphasis on testing it would be hard to have it as a separate class as there just isn’t any more time.</td>
</tr>
<tr>
<td></td>
<td>Within science subject</td>
<td>Science seems like the easiest area to bring in environmental education. Science seems the most closely related subject but we do not even have that much time for science. I could see doing it in science but not sure about other areas.</td>
</tr>
<tr>
<td></td>
<td>Within the classroom</td>
<td>Training and resources would be valuable if I were to bring environmental education into my classroom. We talked about the Forever Earth field trip in the classroom. Some of my students used the Forever Earth field trip in their writing assignments.</td>
</tr>
</tbody>
</table>

IV. Concerns

I am concerned about my students’ behavior. I am worried about the weather and safety on the boat. My concerns were all alleviated.

Note. EE = Environmental Education.

Theme I: Environmental attitudes. As part of the first major theme, teachers expressed their attitudes and opinions toward the environment. This major theme was broken into two sub-categories. The first is general attitudes toward the environment that teachers addressed. The second is personal and professional experience related to their environmental attitudes.

General environmental attitudes. This section describes the general environmental attitudes of teachers. Teachers expressed a range of attitudes concerning environmental issues. These attitudes included issues such as use of public lands, recycling, and what type of car is best to drive. Most participants were aware of
environmental issues but did not articulate any strong attitudes. A few teachers held a strong passion for environmental issues. Others expressed a desire to understand more and to share more about environmental issues with their students. For example, Samantha said, “I think adults should learn how to take care of the environment more than students, I think students would do a better job you know, but……. I hope everything that we do helps them into adulthood.”

One teacher, Burtie, noted that it was important to develop an awareness of general environmental attitudes. Burtie recognized that developing awareness was the first step; oftentimes, people needed to be in a situation to realize the importance of it:

I think that teachers need to be educated more about it because I think we’re just as bad as the kids. When… it’s not affecting you one on one, directly, personally, you don’t really think that much about it. Just like anything, a lot of hard things happen to a lot of people, but unless you’re in the situation, you don’t seem to understand it. Bringing programs like this is going to make people more aware, and they’re going to be more conscious of what they’re doing to help the environment. …Sometimes you think, … if I turn off the water when I brush my teeth, is that really going to help? But if all of us are doing it, then yes it will. But I think we just don’t realize what an impact. We read the newspaper and we see things on the internet, but do you really believe it? I mean, how many times do you hear that the world’s going to end?

A predominant concept that the majority of teachers addressed was influencing students. Teachers noted that students are influenced by others in their lives such as other students, friends, parents, and teachers. Some questioned the extent of their responsibility
for producing environmentally literate students. A few, however, were passionate about environmental issues in their lives and felt strongly about the influence they had on future generations.

Linda felt strongly about her responsibility toward influencing her students’ general environmental attitudes, “because, we’re the leaders in the classroom, if we want to lead to taking better care of the environment, which obviously without a doubt needs attention, then we need to set an example and also lead them and open their eyes and give them opportunities to learn how to take better care of the environment and even though they’re 10 or 11 years old, they can make a difference.”

Rachel also expressed the need to be a role model in the classroom as an environmental steward: “Because we are the guides to these little people we’re setting the examples and as the guide and the example and the counselor all of it wrapped up into the word teacher we have to be the example.”

**Personal and professional experience.** Teachers described how their personal and professional experience had an impact on their current environmental attitudes. Teachers who were most passionate about environmental issues appeared to have had greater environmental awareness in their personal lives. This relationship was demonstrated by the personal stories teachers told about growing up, living in other parts of the country, and how they currently participate in environmental issues and activities. Dani shared,

We often take advantage of what we have until we don’t have it….Out here in Las Vegas I found it to be a lot harder….We come from California, we’re all about …let’s recycle, let’s reuse, let’s take care of our environment. But here it doesn’t
seem in Las Vegas…to be as a big a concern, because I find it a lot harder. I grew up recycling …get your bottles, get your cans, get your paper… take care of our earth… there’s no place to…bring it… you…put the buckets out and nobody picks it up….I’m like trying to…help the earth, yet there’s not support here. So I, I find it a little bit different here.

Teachers also expressed professional views and opinions related to environmental education. Their professional experiences had affected their awareness of environmental literacy from the teacher’s perspective. Linda shared her professional experience teaching in New York and the differences she faced in Nevada:

We lived in the country so we were able to go right out the doors and collect whatever we needed for nature or measure whatever we needed to measure. It was easily accessible although field trips… you were allowed two a year. You could take advantage of the environment out there.

This was not an isolated story. Other teachers addressed the desire to do more with students outside. They shared their frustrations regarding the barriers and restraints to taking students off school grounds, even just to a local park next to the school.

Other teachers described how both personal and professional experiences influenced their environmental attitudes. Growing up in a state with an emphasis on environmental issues had an impact in both professional and personal attitudes.

I’ve been fairly disappointed since I came to Nevada. I’m not sure there are a lot of environmental education programs out there. I grew up in San Diego, California, and I went to a school that really, really pressed environmental issues. You know we have recycling and at that time it was pretty new. I remember going
to trainings and or not trainings but things on the rain forest, and movies and… I guess I just felt that Nevada at this point kind of lacks a lot of that direction and it’s kind of sad because when I was a kid, I thought well, this is the jumping off point, and it’s going to get better from here. And then I moved here, and it’s worse than it was 20 years ago. (Neal)

**Theme II: Field Trip Program.** The second major theme identified is related to the field trip program. The field trip section is divided into three sub categories. The first discusses the overall program that identifies what teachers said involving the organization, content, and how they felt about the program as a whole. The next two subareas were separated out from the overall program because they were the two key aspects many teachers talked about regarding what they liked best about the field trip. One concept is that the program involves hands-on learning, also known as student-directed learning. The other is the connection to nature that students gained from the field trip. Hands-on learning and connection to nature were viewed as two strong differences in this field trip compared to other field trips. Both hands-on learning and connection to nature had the most impact on teachers and what was expressed by their students to the teacher.

**Field trip program overall.** Teachers enjoyed discussing the overall field trip. They liked to share their views of the experience. Two main concepts that the majority of teachers brought up were 1) how much they loved the experience and 2) how well organized the field trip was. Teachers gave positive feedback about the overall program. For example, “I really enjoyed it… the kids really looked forward to it. It’s probably a very popular field trip once the kids and teachers have experienced it. I can tell that
people want to go on it numerous times” (Dani). Burtie summarized the overwhelmingly positive response, “I love it, I mean really, I don’t know how you could make it better.” Kelly agreed saying, “This is the best field trip I have ever been on in all my years of teaching!” Every teacher interviewed said they would go on another Forever Earth field trip. Teachers enjoyed seeing their students become scientists and use real, professional equipment on this field trip. Teachers explained in detail how their students observed, measured water, and then recorded that data. Some of the teachers took the student data sheets back to school to put up on a bulletin board or use for a review or continued assignment.

The second key concept repeatedly expressed by teachers concerned the organization of the program. “I like that it was highly organized, …there was a lot of movement with the two groups, and…the lessons were well planned. …Everybody knew what they were doing… and I think the kids got a lot out of it,” said Mary. With a well-organized field trip, teachers were able to enjoy the day with their students: “It was great just observing my students working together. I even learned things with them on this field trip that I did not know” (Kari). Linda described further, “There’s not just the academics. …Communicating with each other, working as a team, sharing …the whole experience, having fun, socializing…It was …a nice break outside of the classroom that was also meaningful, not just a wasted field trip.”

**Hands-on learning.** Teachers appreciated two aspects of the delivery of the program. One aspect was the site-based concept—being out in nature. Connected with that was the aspect of hands-on, interactive learning. The hands-on activities kept students active while they were having fun.
I think that they were very excited about the field trip because it was hands on and at the same time… they were excited to be able to have fun, not just on the boat, but whether we stopped for lunch or just on the way back, painting pictures … In some ways, they didn’t even realize they were learning. (Linda)

Teachers discussed how their students were completely involved and did not realize how much they were learning. While some of these comments were discussed earlier in the overall program section, this section focuses specifically on hands-on learning. Teachers had a lot to say about the interactive program and how it made learning so much fun for the students (and teachers, too). Rachel said the field trip “inspired them to actually go hands-on and touch it.” She added, “It’s different than holding a glass of water and saying this is Lake Mead as opposed to being out in the vastness of Lake Mead…where …there was just water and the mountain sides.”

All teachers agreed that hands-on activity was the best way for students to learn, but it was not always practical in the classroom. Sometimes, barriers prohibited or discouraged hands-on activities. For example, Bonnie said that although she would love to incorporate more hands-on activities in her classroom, she did not see it as realistic because it “takes more time…It’s hard to find that balance….Teachers want to do it, it’s just that you need the materials that take money,…you have to set it up and …it’s your unconventional classroom…but absolutely hands-on is definitely the best way.”

According to the teachers, students seemed to enjoy taking their own water measurements right at Lake Mead. They were excited that they used the same equipment as professionals and scientists, and that they did it themselves. “They… absolutely loved the whole field trip. They loved measuring for using the secchi disk…. And the plankton
they got to see through the microscope, pulling the net, actually pulling it out of the lake and looking at it” (Linda). Dani noted that her students using professional equipment and learning the language, “seems surreal to them, but they’ve got the experience of ‘wow, you really used that,’ and I think it’s a really neat experience for kids to … see the actual tool and hear the actual language.” Dani added, “In the proper setting…you gave them all the right tools and showed them.”

Many teachers talked about how well-behaved students were on the field trip, especially those who usually acted out in the classroom. Students were so involved doing the hands-on activities that they did not have to time to act out. Burtie elaborated:

The kids were awesome….Kids…would normally act out….[They were] in there … working just as hard as anyone….I think that’s why it’s good for those kids because they don’t do well in the regular classroom setting….You take them out into something where they can do hands-on, and they’re not having to sit quietly for ten minutes while you’re teaching….It’s something where they give you a little bit of information, now you do it, okay, you get a little more information, now you do it.

Neal appreciated not only the hands-on activities, but also that his students were acting as water drops out in nature. His students liked the fieldwork, getting out, and getting their hands dirty: “The experience of being outside and being interactive with the environment…with the elements, it’s hard to teach the water cycle without actually seeing the water cycle, … and… actually act out and do those things. I thought the kids had a good experience.” Other teachers also addressed the connection to nature students were provided. The program provided not only interactive, hands-on learning but also a
connection to the environment that students would not have had in learning science concepts inside the four walls of a classroom.

**Connecting to nature.** Connecting to nature is another subcategory of the major theme of the Forever Earth Program. Teachers addressed how they enjoyed taking their students outdoors to learn about science. Many teachers felt that students gained not only scientific knowledge, but also a better sense of the environment. Reactions from teachers were not limited to the enjoyment that they had taking their students out in nature. Some reactions from teachers were that they felt more connected to and had greater appreciation for Lake Mead National Recreation Area following the field trip. Burtie stated,

> I feel like I’ve learned a lot being on these field trip. You know it’s made me more aware of the resources that we’re losing and I think without seeing it you have a hard time of really grasping that idea. You know the rain forest are disappearing, well we don’t see a rain forest so we don’t really realize it’s going but when they go out there and they see the water in Lake Mead and they see that line around, wow that’s a lot of water we’ve lost you know it kind of makes me more aware of what it is that we need to start doing, the little things that we could all do, if we would all do it what it could, the impact it could have I guess.

The majority of teachers addressed the connection that they saw and heard between their students and nature, “I think it’s more memorable, and they’re using all their senses instead of just reading it out of a book” (Linda). Two key concepts were brought up by all the teachers who talked about their students connecting to nature. The first concept related to the hands-on subcategory. Teachers and students alike enjoyed
working hands-on in the field. This type of learning allowed students to experience their surroundings and use their senses; the experience became more real to them. The second concept in conjunction with the hands-on learning was that students and teachers connected to nature and saw the importance of taking care of the environment. They received environmental education without realizing they had; such learning can lead to stewardship, and, hopefully, more personal experiences outside in nature.

I think living in Las Vegas, it’s not…easy for the students to see how to look at the environment as closely as when you take them out on the boat and say okay this is our environment, this is the water we need to take care of….Getting them out of the city environment and putting them in a nature environment and opening their eyes to that whole aspect of …you affect this environment by what you use, how you dispose of your garbage even. …We need to take care of it, what are some ways we can take better care of it. And also, …teaching them an appreciation for it because a lot of them growing up in the middle of the city miss the appreciation of nature. (Linda)

Rachel said,

Some children never get out of the city. It was the perfect opportunity for them to experience not only the bus ride but experience actually being on the house boat….To be out in the middle of the lake is different than pushing on the sidelines because several of them have been there with family for picnics and fishing, but never been out on a boat. It just enhances their experience level.

**Theme III: Integrating Environmental Education.** The major theme of Integrating Environmental Education in the classroom was divided into three
subcategories. The first subcategory examined teachers’ opinions of integrating environmental education with the overall curriculum. Nearly all the teachers said that it would be impossible to add environmental education as a separate subject area. Many stated they would like or would be willing to try to integrate environmental education within other areas throughout the classroom day. While a few addressed working with environmental issues in areas such as social studies, writing, or math, the majority of teachers felt that science would be the best subject for integrating environmental issues.

Integrating Environmental Education within Science Subject is the second subcategory in this theme. Finally, the third subcategory examines how teachers have or would like to actually integrate environmental education within their classroom. There were several teachers who gave examples of ways that they integrate environmental concepts within their everyday teaching. Some other teachers expressed their desire to integrate more areas of environmental issues within their classroom. Many teachers who expressed the desire to integrate environmental education within their classroom addressed the need for training and/or resources that would be available to them.

**General curriculum.** Every teacher interviewed felt that environmental education could be integrated into the overall curriculum. Dani said, “Definitely, it can definitely be integrated, having its own entity would be very challenging because science alone is very hard to hit everyday and do justice to it. There is just not enough time in the school day to add another subject area.” Many teachers addressed the issue of time in their school day. Samantha noted that she could add another subject “if you expanded the day a half an hour or an hour you know, but it would be nearly impossible that’s why we do field trips like yours.”
In addition to the time commitment required, the other point many teachers made was that they feel that testing is emphasized as the most important aspect of their classroom instruction. Since environmental education is not an area emphasized on standardized tests, teachers did not necessarily have enough time in the school day to be teaching about environmental issues. While many felt that it was an important issue, they were not clear on how much emphasis should be placed on another subject area such as environmental education. Eddie felt that “environmental educational is crucial, determining when and where we can fit that in with the pressure, the pressures of the standardized test that these kids take now a days, trying to fit it in everywhere else, but yeah, definitely important -should be integrated in to the curriculum.”

None of the teachers believed that environmental education could be taught as a separate subject. Some teachers did address specific subject areas where they might be able to incorporate environmental education. While only some of the teachers discussed multi-subject integration, those teachers did address why it could be difficult. “I think it would be the teacher’s creativity getting in there and depending on the curriculum and the leadership of the school and how flexible they are would depend on when and how you can integrate that the flexibility of the administration saying it’s okay to veer off of the curriculum a little bit” (Linda). A few teachers gave some ideas and examples of ways it could be incorporated into math, reading, writing, arts, and social studies. Neal said

I really hope it can be integrated into existing curriculum you can, reading is reading if you want to read about environmental issues you can do that you can make persuasive writing papers about environmental issues or posters or campaign posters ….. Just little subtle reminders here and there and then integrated in the
curriculum hopefully it will give them - these kids’ minds an idea that this is the way I’m supposed to act about these things.

The overwhelming majority said that science would be the most logical subject area in which to implement environmental education.

**Science.** While the majority of teachers said that science would be the logical subject in which to implement environmental education, they already felt that science was being neglected as a content area. Teachers felt that they had to emphasize tested subjects in their instruction. Raine said, “I just feel a lot of pressure to boost up math, reading and writing grades and I mean if I could integrate science somehow then I would definitely love to do that…. and we’ve had a lot of testing lately so the focus has been on reading, writing and math and so sorry to say we haven’t really touched on science.”

Raine continued, “We have done like short science like little projects but not, not even projects just like we have those FOSS kits over there and I haven’t even got into them yet, so I-I’m still trying to get a grasp on everything else.” While science has been implemented recently into the testing program, teachers said they are still having a tough time trying to get it into the classroom. Science though is considered the easiest subject area in which to integrate environmental education.

Again, teachers addressed the time considerations in the classroom and all the additional material, content, and equipment that are involved in science projects. One reason teachers loved the Forever Earth field trip is because of the amount of information students were able to learn and retain within a four-hour field trip. In the typical school day, where science is neglected, there is not a lot of time to conduct science lessons or experiments within the classroom, and the field trip provided many science learning
opportunities for children. Dani stated, “You’re always trying to tie science in… I think the connection you guys give is a lot stronger than the connection that we can sometimes give in the classroom - just because of the fact of the time issue.”

The Forever Earth program supported the instructional needs of teachers since it is aligned with the state standards for science at four grade levels. Each grade level curriculum was created based upon the state science standards. Every teacher in fourth, fifth, sixth, and seventh grade said that the field trip was tied to the curriculum and appropriately represented what they were supposed to teach their students.

**Classroom applications.** Teachers described a variety of ways that they incorporated environmental education in their classrooms as a result of participating in the Forever Earth field trip. Some teachers used content from Forever Earth programming as introductions to or in review of science lessons. In particular, a couple fourth grade teachers mentioned the use of FOSS kits they had been given to help teach the water cycle. One teacher used the Forever Earth water cycle information to introduce the water cycle that they continued to discuss using the FOSS kits. Another teacher used Forever Earth as a cumulating experience to coalesce the topic of the water cycle.

Teachers talked about how they used the Forever Earth experience back in the classroom. They identified it as a good way to integrate environmental education within their classroom because they actually had some experience with it. One fourth grade teacher explained how she revisited the water cycle in the classroom. The students broke into smaller groups and “so we did talk about it… They shared their drawings of water cycle” (Rachel). The small groups presented the new pictures that they drew of the water cycle in class and the role they played in conserving water.
Another way teachers used the Forever Earth field trip was through writing. A couple of teachers used the Forever Earth field trip as a way to integrate environmental education across subject areas. A few elementary and middle school teachers had their student write about the Forever Earth field trip in their science journals. Some other teachers used Forever Earth in writing assignments. For example, several teachers had their students write thank you cards addressing certain areas (i.e., what the student liked the best, what they learned). One middle school English teacher and a couple of elementary teachers had their students write about Forever Earth and environmental education for a persuasive writing project.

Pre and post lessons plans were provided to teachers to be used in conjunction with the field trip. If interested and time allowed, teachers could go on-line to the website and download classroom discussion materials and lesson plans. These were not required for the field trip but some teachers found them helpful as a way to incorporate environmental education within their classrooms. Not many teachers utilized this resource because, as a few said, they did not have time and the majority did not realize this resource was available until it was too late to include it within their classroom.

Teachers identified specific needs in order to implement environmental education in the classroom. Suzi wanted some help with training and resources because sometimes teachers need to “just take whatever’s quick and easy so if you offer me a lesson plan I’m going to take, I’m like oh, okay, this is what we’re going to do. I don’t want to go out and spend an hour researching stuff trying to be creative, um, a nice way to present it. If you guys do that work and pass it on that would be awesome.”
Many would like to have some training in the area through professional development. But a few specifically pointed out that they would be upset if professional development in environmental education became mandatory training if they were not required to implement it instructionally. In order to integrate environmental education, teachers noted that it needed to be manageable in the classroom.

You always get good ideas when you go to those trainings about how you could do it but do it in a way that it’s practical not something that I’m going to have to go out and buy a million and one things to teach this lesson or teach this unit and something that you know is not going to take me five hours to figure out what I’m doing for one lesson. You know we have those things we have books, here are the books this is what you need to teach read about it figure it out, well you know realistically we have lives outside of school too so unless you’re really going, you know taking a class and learning this and promising to implement it you know there’s got to be some accountability, too. (Burtie)

The other main area most teachers addressed was the need for resources. Stan commented,

It’s important if there’s an outlet to let, somehow let teachers know this stuff……

I wish there was connectivity between it and our school - if there was something on there that had a link that you know …..research materials for environmental education, research materials for science education, something that teachers would use and honestly I wish that kind of stuff was at UNLV… if that sort of thing was available I’m sure that a lot of teachers would link onto it especially with this generation’s technological mind set.
The major type of resource teachers found helpful was on-line information and projects. A type of blog or instant messaging was another idea that a few teachers mentioned. Given the lack of teacher resources and time, Forever Earth appears to be a valuable tool that teachers can use to introduce environmental education within the classroom for fourth, fifth, sixth, and seventh grade.

**Theme IV: Concerns.** Teachers’ concerns prior to the field trip ranged from student behavior to the weather. Nearly every teacher expressed concern for their students. Some of the most common concerns were student behavior, safety, and involvement in the field trip. When I asked one teacher, Suzi, about her concerns for the students, she replied, “That the kids would be boogers…. they’re my kids…but they were so well behaved.” Concerns about student involvement were alleviated when teachers realized that it was a student-directed program. There were many hands-on interactive activities that kept the students involved. A couple of teachers addressed the issue of their “problem” students in the classroom. Burtie commented,

Just because I like to know, I ask the teachers, too, how did your …students that normally misbehave do? And they all said the same thing, so I don’t know how many behavior issues you have when you’re out there, but it just seems for us, and for my last school, they were never a problem.

Other concerns noted were minor. Teachers talked about time management—both during the field trip and preparing for the field trip—and having others facilitate their students, getting substitutes (when necessary), and the weather. After the field trip, nearly all concerns were alleviated. The only concerns teachers still had were focused on the sustainability of the field trip over the long term. Some teachers addressed concerns with
the financial aspect of keeping the program going. The other concern was the time and paperwork required for field trips by the school district. Sara described her concerns with future funding saying,

We had a wonderful PTA, they provided each grade level two field trips no matter where you were going. So this year, definitely not. Maybe next year. We’re already talking about the concern….Our kids really enjoyed [it], and I think the knowledge that you guys have and how much we actually pulled back into the classroom to deal with it, we’d want to go. But in terms of funding…”

Dani also addressed financial concerns saying, “My only concern would be…the budget crisis.”

While the above concerns addressed issues related specifically to the field trip, teachers had two main concerns about integrating environmental education into the classroom. Teachers often brought up one or both of these concerns. One was the lack of or need for training in environmental education or environmental concepts for the teachers. The other was the availability of resources such as handouts, lesson plans, and even online communication such as sites or blogs to discuss areas or topics of environmental education planning and implementing with other teachers or environmental educators. Some teachers did not want to feel forced to take more training, classes, or professional development outside of what they are already required to take. Some felt additional training needed to be an option, not a requirement.

**Open-Ended Statements of Concern**

Teachers completed the Open-Ended Statements of Concern prior to attending the field trip. The question asked of them was, “When you think about the Forever Earth
environmental education field trip, what are you concerned about?” Analysis of the Open-Ended Statements of Concern was conducted using content analysis. Responses were grouped into categories and frequencies of the relevant categories were calculated (Berg, 2001). After going through the overall list of statements and carefully identifying similar concerns, six major concerns emerged: Students, Teacher/classroom preparation, Environmental Issues, Forever Earth Program, None and Miscellaneous.

Teachers’ responses varied in how many concerns they listed. Some teachers did not give any concerns while others listed multiple concerns. Some statements involved multiple concerns. For example, “I am concerned about how the students will behave, and if they will be actively engaged the entire time.” This statement was coded as the Student major concern, but it included two subcategories of Behavior and Engagement. Instead of coding only one concern, the category was divided into two. In Table 12, representative quotes illustrate each major concern. Table 12 also provides the percentage of concerns in each major type of concern.
Table 12

*Representative Quotes for Teacher Concerns*

<table>
<thead>
<tr>
<th>Concerns</th>
<th>%</th>
<th>Representative quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(n = 75)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>36</td>
<td>- The safety of my students.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I hope they learn something about the subject area and the environment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I want them to be engaged and not have any behavior problems.</td>
</tr>
<tr>
<td>Teacher/classroom preparation</td>
<td>17</td>
<td>- Preparing for the field trip.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- That I have the right chaperones and enough of them.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- That the field trip connects to the curriculum and my classroom instruction.</td>
</tr>
<tr>
<td>Environmental issues</td>
<td>17</td>
<td>- The safety of our drinking water and levels at Lake Mead.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- That people do not take care of the environment.</td>
</tr>
<tr>
<td>Forever Earth program</td>
<td>12</td>
<td>- I hope it is well organized and knowledgeable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The weather.</td>
</tr>
<tr>
<td>None</td>
<td>12</td>
<td>- I have no concerns.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- No input given (blank).</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>5</td>
<td>- Will this program be available in the future?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I just want to enjoy observing my students.</td>
</tr>
</tbody>
</table>

The following section will describe each concern in greater detail, and will include teachers’ comments. The majority of teachers’ concerns were related to students. Nearly all teachers who listed a minimum of one concern identified with some aspect related to their students. The two largest concerns were student knowledge and student safety. For example, one teacher wrote, “My first concern is for the students’ safety” while another stated, “I am very excited and eager about the trip, but am worried about safety.” Related to knowledge, one teacher wrote, “Students take what they learn for the
long haul.” While student behavior could be grouped within student safety, it was identified as a separate entity because teachers specifically addressed behavior in addition to safety. For example, the teacher whose first concern was safety also listed student behavior as a separate concern.

Concerns about preparation were also relevant. Some of these preparation concerns were for the trip in general, such as “Getting organized,” or “Really not sure what to expect or how to prepare students for maximum benefit of the trip,” and preparing chaperones. Other concerns involved classroom instruction and meeting the school district curriculum. For example, one teacher was concerned that the program would not be aligned to the school district curriculum: “…the correlation with my curriculum. I would hate to make all the effort to go on a field trip and the trip not be an effective tool for instruction.”

Another area of concern for teachers related to environmental issues. Some teachers identified two or three specific concerns. Teachers mainly focused on two environmental issues. One was the focus on the water and the water levels at Lake Mead as our resource. “The drought has caused much concern. It is important to take care of all our resources, but water is the most important.” The other environmental concern involved people being responsible for and taking care of the environment. “I’m concerned about the indifference many people have toward our natural landscape by throwing trash out, dumping hazardous materials, and depleting our resources.” Another said, “My concern is we need to work a little harder to help young people understand the environment. The adults are not doing enough.”
Some teachers addressed concerns about the actual field trip or about the major theme of Forever Earth Program. The main concern was about the weather. Teachers wrote the word weather, addressed the temperature, or were concerned with how “weather will affect our trip tomorrow.” The other subtheme addressed nearly as often as the weather was organization of the trip: “That it will be organized to keep student interest.”

The final two concerns were None and Miscellaneous. None was a concern that was easy to identify. In this category there were only two options. Teachers either wrote down that they had no concerns or they did not give a response. If this question was left completely blank, it was tallied as a None, meaning that they had no identifiable concerns. Nine of the thirty six teachers did not list any of the 75 concerns given. A Miscellaneous category was needed for a few remaining concern statements that did not fit within the major concerns. For example “learning and having fun” was not specific enough to be identified a concern but seemed to be more of an afterthought written at the bottom of the page. Another response that was unclear stated, “Scheme of five park rangers.” While most of the major themes of concern statements were identifiable, a few were left in the Miscellaneous category.

Teachers expressed five main categories of concerns. The highest priority and most frequently listed concern was teachers’ concerns for their students. The fact that concerns about environmental issues were secondary to concerns about students was interesting. The wording of the Open-Ended statement clearly addressed teacher concerns related to the field trip, but many general environmental concerns were given.
The interviews and Open-Ended Statements of Concerns provided more insight and breadth of information regarding teachers’ attitudes and concerns relating to the Forever Earth field trip and environmental education. Results from the interviews identified four major themes addressed by teachers related to this study. Teachers mainly discussed their environmental attitudes from a personal and professional perspective and how it related to classroom applications of environmental education. While many teachers felt that environmental education is important for students, there were a couple of key reasons for not implementing environmental education in the classroom. Most teachers felt they did not have the time, training, or resources to add environmental education to their mandated curriculum. The majority identified science as the most likely subject area to be able to merge such concepts and topics related to the environment.

Forever Earth was identified as a valuable tool to introduce environmental topics and to experience nature in the outdoor setting. The key component teachers loved the most about the field trip was that students were learning about science concepts actually outside in nature. The title for this dissertation [Being Outside Learning About Science is Amazing] is a teacher quote that highlights this sentiment. The program offered a hands-on approach to learning allowing students to feel engaged and connected to the topic. Several teachers addressed the importance of allowing their students to learn outside the four walls of their classroom while still learning the required science curriculum.

While teachers did express concerns in both the Open-Ended Statements of Concerns and interviews, nearly all concerns regarding the outdoor field were alleviated. Teachers felt the program was well organized, aligned with their curriculum and kept
students actively engaged. Teachers said that student behaviors and safety are always a concern when taking kids out of the classroom, but the management of the Forever Earth program reduced those fears.

**Integration**

Following the separate analysis of all quantitative and qualitative instruments, in a mixed methods study, the results are then merged and integrated to form inferences. Inferences in mixed methods research are conclusions or interpretations drawn from the separate quantitative and qualitative strands of the study as well as across the quantitative and qualitative strands, called meta-inferences (Creswell & Plano Clark, 2011).

Process models can be utilized to integrate quantitative and qualitative results. A process model provides a visual connection of how results are merged in a mixed methods study, and “represents how events unfold over time” (Bernard & Ryan, 2010, p. 131). Process models allow us to identify interconnections between quantitative and qualitative results at a conceptual level. The graphical display maps out key findings of the study through merging results from all data sets (Bernard & Ryan, 2010). The following process model helps merge the results based on the type of data used through the process. Figure 3 shows how the data results at each phase were used to interpret overall findings from the separate quantitative and qualitative results.
Analyses of quantitative and qualitative data were merged at this point to provide interpretation about the overall results of this study. Results from the quantitative EAS survey identified a change in teachers’ environmental attitudes following the Forever Earth field trip intervention. Interviews conducted after the field trip found that teachers’ personal and professional views of environmental education had an impact on how they addressed environmental issues or concerns.

Results from the EAS scale showed that teachers had a statistically significant change in attitudes following the Forever Earth field trip intervention. Analysis of the interviews indicated that teachers were overwhelmingly positive about the Forever Earth program. Teachers stated three major reasons for participating in another Forever Earth field trip in the future: 1) interactive and hands-on activities kept students involved, 2)
program material was aligned with their required science curriculum, and 3) it was outside in nature and they observed a connectedness between some students and nature. With a convergent mixed methods design, all this information was captured. Attitudes did change following the field trip, and teachers identified why their attitudes might have changed.

Interviews with teachers after they participated in the Forever Earth field trip provided in-depth information regarding their attitudes toward environmental education. Many teachers felt that environmental education was important, but they did not know how to implement it in the classroom or how to provide their students the experience of being outdoors. Teachers stated that following the field trip they were thrilled to see how students reacted to being in an outdoor learning environment. Many students had never had the opportunity to enjoy nature or be in the outdoors away from the city. Watching their students and being out at the lake themselves impacted teachers’ awareness of environmental concerns. These environmental issues and concerns were addressed in both the Open-Ended Statements of Concern and interviews. One major concept addressed in both data sets had to do with the water. Teachers were concerned about both the health and the level of the water.

Merging the Open-Ended Statements of Concern and interviews also showed that concerns teachers initially had the about the field trip were mostly alleviated. One area of concern evolved following the field trip: Teachers expressed concerns with environmental issues and how they could be addressed in the classroom to provide more awareness and stewardship to their students. Even teachers who felt it was important to implement environmental aspects of education within their classroom found it was still
difficult. Their concern had shifted from taking students out of the classroom into nature to bringing the environment into the classroom.

Another process model was developed following the integration of all the data results. The following process model is a summary of the interpretation of results representing how events unfolded over time.

![Figure 4. Summary Process Model (Bernard & Ryan, 2010).](image)

**Interpretation.** Teachers’ personal and professional experiences influenced their attitudes about the environmental questions. The teachers completed the same survey following the intervention of the Forever Earth field trip. A statistically significant change in attitudes was found. The next progression was to then wonder if these changes would influence them to integrate environmental education within the classroom.

After the intervention, the teachers completed the EAS survey, then they participated in interviews. The interview data revealed more about the teachers’ attitudes toward environmental education, the outdoor field trip, and possible integration of environmental education within their classrooms. Teachers were concerned with how they would
implement environmental education within their classrooms. Teachers who were interested in implementing more environmental education within their classrooms, as a long term-goal, faced a lack of resources, time, and funding.

**Summary**

Chapter 4 described how the data were analyzed using quantitative and qualitative methods, and how the data analyses were then merged in the interpretation phase. Four themes emerged: Environmental Attitudes, Field Trip Program, Integrating Environmental Education, and Concerns. In Chapter 5, I discuss findings, implications, practical applications, recommendations, limitations, and directions for future research.
CHAPTER 5
DISCUSSION AND CONCLUSIONS

This chapter will discuss the findings of this dissertation research. To conclusively evaluate this work, the final chapter identifies implications and practical applications that are followed by recommendations based on the study. Limitations to the study and areas for future research also will be addressed.

Study Overview

The purpose of this study was to show how an outdoor science field trip on Lake Mead might influence teachers’ concerns and environmental attitudes toward outdoor education by using a convergent parallel mixed methods design. Quantitative data collection methods (EAS and teacher demographics) were completed prior to teachers attending the field trip, and the EAS was completed again post field trip. Qualitative data collection methods were also implemented. The Open-Ended Statements of Concern were completed prior to the field trip and interviews were conducted upon completion of the intervention creating more depth to this study regarding teachers’ environmental attitudes.

Results from the quantitative data analysis showed that teachers’ environmental attitudes changed following the field trip intervention. Integration of the results from the quantitative and qualitative data led to further interpretations that provided support for why teachers’ environmental attitudes may have changed. Analysis and interpretation of the interview data also led to further information concerning teachers integrating environmental education within their classroom setting.

Chapter 2 reviewed literature related to environmental education; teachers’ beliefs, specifically related to science instruction; and methodological concerns of
environmental and teacher-belief studies. Environmental education is most often associated with science as the subject area providing the best fit. Adults, such as teachers, can directly influence children’s environmental attitudes. Environmental education most often becomes the responsibility of science teachers. Teachers who believe in the importance of environmental education, not only possess positive environmental attitudes, but also are more likely to explore opportunities to increase knowledge such as outdoor education field trips as a means to incorporate science and environmental concepts beyond classroom setting.

Chapter 3 explained the rationale for using a convergent parallel mixed method design to examine teachers’ environmental attitudes and concerns related to the Forever Earth field trip. Mixed methodology provided a richer, more in-depth understanding of why teacher attitudes may have changed following the Forever Earth field trip. A more holistic view of such a complex phenomenon (i.e. teachers’ environmental attitudes, concerns, and experiences of the Forever Earth field trip) were provided through both quantitative (EAS, teacher demographics) and qualitative (Open-Ended Statements of Concern and interviews) data.

Chapter 4 presented the quantitative findings, qualitative findings, and integration of findings from each type of methodology. The quantitative results showed that teachers’ environmental attitudes did change following the Forever Earth field trip and that teacher demographics did not have an impact. The qualitative data identified four major themes recognized in teacher interviews related to the field trip and environmental education and six main concerns teachers had prior to the field trip. Integration of the results through process models allowed for a more in-depth interpretation of the results.
Analysis of all forms of data collection provided answers to the research questions addressed in this study.

**Research Questions and Study Summary**

Both quantitative and qualitative research questions were utilized. According to Creswell and Plano Clark (2011), “They are necessary in a mixed methods study because both quantitative and qualitative data collection are central to this form of inquiry” (p. 162). There were four key research questions examined during this study: two questions were quantitative and two were qualitative. The quantitative research questions were: 1) Do teachers’ environmental attitudes change following the Forever Earth field trip?, and 2) What teacher demographic characteristics are related to a change in environmental attitudes? The qualitative research questions were: 1) What concerns do teachers have toward an outdoor environmental education field trip? and 2) How does the experience of an outdoor environmental education field trip impact teachers?

A hypothesis was formulated for each of the two quantitative research questions. The first hypothesis related to research question one was that teachers’ environmental attitudes would change following the Forever Earth field trip. The hypothesis for research question two was that teacher demographics would not have an impact on the change in teacher attitudes.

Both hypotheses were verified. Regarding hypothesis one, results showed that teachers’ environmental attitudes changed following the Forever Earth field trip intervention. Regarding hypothesis two, no major significance was found when analyzing teacher demographics: the quantitative results showed that teacher demographics did not have an influence on the change in teachers’ environmental attitudes.
Results for the qualitative research questions were compiled by analyzing the Open-Ended Statements of Concern and interview data. Teachers expressed concerns in the Open-Ended Statements of Concern prior to the field trip indicating that teachers already had some issues on their mind before attending the field trip. The predominant concern reported by teachers related to student safety and student behavior. A specific safety concern identified by teachers was taking students out on a boat in the middle of Lake Mead because it was viewed as hazardous. Another concern addressed student behavior: teachers hoped that students would be actively engaged in activities while learning about science and the environment because they were worried that lack of engagement would result in poor or disruptive behavior. Interview results revealed that student concerns identified by teachers were alleviated upon completion of the field trip. The rationale for this change in perception related to the type of field trip the Forever Earth program gives, and is further addressed below.

Interviews provided a wealth of feedback from the teachers about how their concerns were alleviated and details of their experience of attending the outdoor field trip. Four major themes emerged from teacher interviews: 1) environmental attitudes, 2) reflection on the Forever Earth program, 3) integration of environmental education within their classroom, and 4) teacher concerns. The Forever Earth field trip had an impact on teachers’ environmental attitudes. Some key aspects of the field trip experience that impacted teachers had to do with the structure of the Forever Earth program. Teachers liked that the knowledge content was directly tied to their classroom curriculum. In addition, all activities conducted during the field trip day were student-centered allowing students the hands-on opportunities to engage in their own learning process. The hands-
on activities out in the environment also provided students with the opportunity to connect to nature. The connection to nature is an opportunity different from learning within the four walls of a classroom. The experience teachers had on the field trip also impacted their own views of environmental education and how environmental education could be integrated within their own classroom instruction. The integration of environmental education will be discussed more in the next section addressing practical implications of the study.

Implications and Practical Applications

This section identifies the major implications and practical applications gained from this study. Recommendations are provided in the following section based on the implications and practical applications that are designed to enhance environmental literacy of teachers and promote environmental education in the classroom.

Gaining a better understanding of teachers’ environmental attitudes or the importance teachers place on environmental issues based on their personal and professional beliefs is important to integrating environmental education within the classroom setting (Haney et al., 2002; Ozgun-Kocu & Sen, 2006; Trumbull et al. 2006; Water-Adams, 2006). Teachers in this study who held strong attitudes about environmental issues also wanted to influence their students to become more sensitive and aware of environmental concerns facing the world today and in the future. These teachers believed in the importance of protecting our environment and wanted to influence and produce an environmentally literate generation of future stewards. For example, Linda stated that “learning all the different aspects about different areas and
including that in the science ……I think it’s sometimes a personal experience, the 
teacher’s perspective or appreciation that affects it.”

The research shows that adults, including teachers, influence children’s attitudes 
regarding the environment (Halocha, 2005; Lang, 2006; Louv, 2005; Pergams & Zaradic, 
2006). Results from the current study showed that teachers believed that they could 
influence students’ environmental attitudes in the classroom. Various organizations and 
charters have also supported the role of the teacher as the key influence in students’ 
environmental literacy by advocating for environmental education in the classroom. For 
example, the NCLI coalition formed in 2007 has been instrumental in introducing and 
supporting acts through Congress to support funding for teacher training in 
environmental education and integration of environmental education across core subject 
areas.

As found in the literature (Barnett et al., 2007; Ernst, 2007a; Legault & Pelletier, 
2000) teachers most often associate the subject of science with environmental education. 
Teachers in this study stated that science provided the easiest context for integrating 
environmental education within the classroom. Many teachers in this study felt that 
environmental education should be integrated within their classroom, yet they expressed 
concerns and confusion as to how to accomplish it. Having the resources and some 
knowledge about environmental education were important to teachers. Additional 
training or resources that are simple to implement and are applicable to classroom 
instruction serve as motivators as supported by prior studies (Ham & Sewing, 1988; 
Johnson, 2006; Keys, 2005, Levitt, 2001). The Forever Earth field trip served as a useful 
tool with which teachers could take environmental concepts back into the classroom.
Additional outdoor education field trips focusing on curriculum-aligned science concepts incorporating environmental issues out in nature would provide additional strong resources to reinforce the integration of environmental education within the classroom.

Unlike previous studies (Haney et al., 2002; Stuart & Thurlow, 2000; Trumbull et al., 2006), this study showed that teacher attitudes can change during a short time period given the appropriate intervention. The Forever Earth field trip was only four hours in duration. Interviews of the teachers following the Forever Earth field trip provided a possible rationale for why attitudes changed within such a short time frame. One key factor was that the program focused on student-centered learning. Hands-on activities were conducted by the students with Forever Earth program facilitators simply providing guidance. Participant teachers were actively involved with the student inquiry and enjoyed both observing and working beside their students. For example, when students conducted water quality measurements, a Forever Earth facilitator would give student teams a water trap and then simply explain the function and how to set it. The students were the ones holding and setting the trap and then collecting their own water samples. During the collection of water samples student teams would turn to their classroom teacher to explain what they were doing, ask a question about the water in Lake Mead, or point out something around the lake that they noticed. Observing and being involved with the students’ hands-on activities were identified by the teachers as a worthwhile outcome of the field trip. Teachers were excited to observe their students’ enthusiasm for learning while conducting hands-on activities as supported in the literature (Ernst, 2007a; Levitt, 2001; Leys, 2005; Trumbull et al., 2006; Waters-Adams, 2006).
Another implication of this study was that the participants were practicing teachers volunteering their time and knowledge for the current research. Much of the research on teacher beliefs have occurred within the context of undergraduate or graduate teacher education classes or mandatory training programs (Johnson, 2006; Ozgun-Kocu, 2006; Stuart & Thurlow, 2000; Wright, 2010). For example, Olafson, Schraw, VanderVeldt, and Ponder (2011) studied graduate students in education and found that teacher beliefs were quite stable. However, in the current study all teachers were practicing teachers and had enrolled their classes or grade levels for the field trip. They were not required to participate in the field trip by their supervisors such as principal or university instructor in exchange for research credit. Voluntary participation in the study could be due to the teachers’ sense of control and belief that assisting in the research was important. Teachers exercising control over their decisions and actions regarding classroom students and instruction is important as shown in the research of beliefs and actions (Keys, 2005; Sosu et al., 2010). Keys (2005) found that if teachers felt a sense of control they were likely to adjust their usual behavior if they felt their actions were important enough to provide positive results. Teachers involved in this study often stated they either believed that the concept of environmental education was important or helping the researcher in this study was important so participating became worthwhile to them.

A key practical application of this study is the understanding that outdoor environmental programs and interventions need to be site specific and involve team collaboration. The Forever Earth program was developed through a partnership. Environmental and private organizations in addition to university and school district personnel worked together to create and then implement the hands-on, nature-based field
trip. Organizations such as the NAAEE and NEEF encourage the educators and other professionals to work together to support areas of environmental education. For example, NAAEE has an annual conference to gather people interested in promoting environmental education to share their ideas and resources available to encourage environmental education within the classroom and community settings. In addition, the NEEF works with various professionals in the field of health, land management and education to develop programs promoting environmental stewardship. For the Forever Earth program, the use of the Forever Earth vessel was donated through a private organization working on Lake Mead with the desire to provide environmental education and promote stewardship on public lands. The collaboration with private sponsors, environmental agencies such as the National Park Service, and university and school district educators provided a team collaboration to create and implement the Forever Earth program. All program activities created through university, school district, and environmental organizations staff were constructed for appropriate use in a 70 foot houseboat converted into a research laboratory and floating classroom on Lake Mead. The activities, knowledge content, and type of intervention (field trip) would need to be revised if implemented in a different geographical area based upon the type of environment. It is important to know the context of the study setting such as what public lands are available, school district standards, and how the public lands and curriculum can be linked to promote stewardship within education, which is discussed in more detail in the following Recommendations section.

The final implication I would like to address relates to methodology and emphasizes the importance of mixed methods use in environmental education studies.
(Rickinson, 2001; Sosu et al., 2008). Using a convergent parallel mixed methods design approach to this topic of study provided a wealth of information that could be integrated to provide stronger interpretation and more insight from the results. Merging results from both quantitative and qualitative data allowed for a stronger more insightful interpretation to the study. For example, analysis of the EAS alone would only show a statistical significance in teachers’ environmental attitudes. Adding the interviews provided more rationale and support for why these changes may have occurred. Data from both quantitative and qualitative sources were analyzed and then integrated to be interpreted together. Creswell and Plano Clark (2011) suggest using a convergent parallel design for the purpose of “synthesizing complementary quantitative and qualitative results to develop a more complete understanding of a phenomenon” (p. 77). This study adds current knowledge to the literature demonstrating the importance of using mixed methods within environmental education and providing another example of its use.

**Recommendations**

Teachers in the current study identified the Forever Earth field trip as the best field trip that they had taken their students on within their years of teaching science. The reasons given were because the field trip was aligned with the curriculum, their students were learning the material through hands-on activities, and the field trip took place out in the environment at Lake Mead National Recreation Area. Not many students or teachers have had an experience being out in nature to learn about science. In addition to providing students the opportunity to experience public lands, Forever Earth continued as a resource for teachers and students about environmental education. Teachers identified the Forever Earth field trip as a resource that not only encouraged but allowed them to
apply environmental knowledge (i.e., integrate environmental education) within their classroom setting. To enhance environmental literacy for teachers and students the following recommendations are made to provide these types of field trip opportunities.

It is important to know the context of the study setting such as what public lands are available, school district standards, and most importantly how the use of public lands and required classroom curriculum can be linked to provide learning opportunities and promote stewardship within education. Establishing a team of partnerships is crucial to provide this type of information. The team should consist of various organizations wanting to promote environmental literacy to the public and students. For example, the Forever Earth program consisted of university environmental educators from the Public Lands Institute, school district personnel from Curriculum and Development, environmental agencies such as NPS and Division of Wildlife, and other organizations and foundations such as Forever Resorts, Outside Las Vegas Foundation, and private investors.

It is important to know your community in order to build the right types of partnership. The program activities need to meet the needs of teachers’ required classroom instruction as defined by state standards and local school district curriculum. The program curriculum needs to complement traditional classroom studies with engaging, hands-on, interactive on-site activities in addition to support lessons teachers can use back in the classroom. The team partnership can develop these activities using the different agencies’ goals and missions in conjunction with school district personnel. For example environmental agencies can provide information about the environment while promoting stewardship and teachers want to provide a science lesson that meets
their curriculum requirements. Working together, the team establishes key objectives for the students at each grade level to create an interactive, hands-on activity aligned with the curriculum and correlated to the field trip program mission as defined by all partners.

Of course, the program has to be site specific. Team partners need to identify public lands available to conduct the activities. Forever Earth had Lake Mead as a resource and built the program around that site. Geographic areas differ depending on where the outdoor field site will be established. Local parks or mountain ranges may be used based on the geographic location and available use of natural resources, and the curriculum must be developed and adapted to reflect these varying locations.

It is also important to inform the community about the opportunities being planned out in nature. This communication can be accomplished through keeping the team involved within the school and community setting. Promoting the concept of environmental stewardship can be provided through community events and outreach opportunities. For example, team members can set up an information booth at a local carnival or fair, and can get involved with other organizations for environmental activities such as Earth Day or National Trails Day.

Identifying these recommendations to establish similar outdoor educational programs will provide environmental tools needed to promote environmental literacy. Teachers in this study identified the Forever Earth field trip as a resource to integrate environmental education within their classroom. As shown in this study and prior research, teachers have identified numerous concerns and barriers to implementing environmental education in their classroom (Ernst, 2007b; Ham & Sewing, 1988) even when they believe it is important. The Forever Earth field trip provides teachers a
resource to integrate environmental education. It is recommended that similar types of programs provide this needed resource to teachers to promote environmental literacy in teachers and students. In addition to the one day field trip it is also recommended to provide teachers with specific resources. Related to the field trip, pre and post lesson plans should be provided that complement the one day outdoor field trip. In addition, there are various websites such as NAAEE that provide information and lesson plans. Another recommendation is to develop a website providing lesson plans and connecting to local and national environmental organizations.

As the current research has demonstrated, teachers were very receptive to the outdoor-based field trip as a means to involve their students in learning about the environment. Once their safety concerns were alleviated, teachers responded positively to their experiences with the field trip. In particular, they were pleased about the hands-on experiences provided to their students that were directly connected to their science curriculum. The recommendations provided are aimed at developing similar programs that will hopefully produce similar success.

**Limitations**

As in most research, this study had some limitations that were beyond the researcher’s control. One limitation is that the data were all self-reported. Therefore, it is conceivable that teachers may not have answered truthfully or completely within the provided data collection packets (i.e., EAS, demographics, and Open-Ended Statements of Concern). Even with interviews, teachers may not have answered truthfully or completely for a variety of reasons. Additionally, as required by IRB, the entire study was based on voluntary participation through every phase of the study. Not all teachers
completed posttests or followed through the entire research project. In addition, some teachers did not complete the pre or post survey data forms but were willing to be interviewed following the field trip.

Another limitation relates to the study’s geographical location. Research was conducted in one large urban school district known for having a very transient population. The generalizability of the results may not be reflective for different types of populations and regions. Some examples of other types of populations to consider in future studies to increase generalizability might include rural areas, smaller school districts, and possibly different areas of the country or other countries.

The convergent parallel mixed methods design was used to try and minimize limitations to the study. Triangulation of data through the use of mixed methodology adds strength to the validity of the design, but possible limitations to the study need to be addressed.

**Conclusions and Directions for Future Research**

This study adds to the existing literature and knowledge in environmental education (Brody, 2005; Halocha, 2005; Ham & Sewing, 1988; Kola-Olusanya, 2005; Lang, 2006; Legault & Pelletier, 2000; Louv, 2008; Nixon, 1997; Pergams & Zaradic, 2006; Sosu et al., 2008; Well, 2006) by looking at teachers’ environmental attitudes to an outdoor field trip intervention. While the findings of this study are important to research in the area of environmental education and in connection to teacher beliefs related to science (Haney et al., 2002; Keys, 2005; Levitt, 2001; Lidar, Lundqvist, & Ostman, 2005; Roberts et al., 2001; Trumbull et al., 2006; Waters-Adams, 2006), there is a need for additional research. In addition to focusing on the topic of environmental education,
methodology concerns (Gough & Reid, 2000; Moorcroft, Desmarais, Hogan, & Berkowitz, 2000; Pettus & Giles, 1987; Rickinson, 2001; Russell, 2006; Schindler, 1999; Smith, 1997) addressed in the literature are identified as an ongoing process to improve future studies in environmental education. Future research suggestions are identified below.

This study showed that in-service teachers’ environmental attitudes can change following a four hour field trip out in nature with their students. Results indicated that specific aspects of program were influential to teacher attitudes. Three key concepts related specifically to the design of the Forever Earth program were identified by teachers in a positive way: 1) student-directed learning through hands-on activities; 2) connecting to nature by learning out in the environment; and 3) program topics aligned with their science curriculum. One area to consider for future research is how the site and type of program can impact teacher training or changes in attitude.

Following the field trip, many teachers expressed more interest in implementing environmental education within their classroom instruction. Teachers expressed the desire to integrate environmental education into their classrooms but were concerned about how to implement it within the restricted confines of their classroom instruction requirements. In addition to time constraints, the need for additional teacher training and resources were addressed by most teachers. Several teachers identified the Forever Earth field trip as a way to help incorporate environmental education within their classroom by using it as an example or reminder when discussing specific science concepts. While teachers expressed the importance of producing environmentally literate students by integrating environmental education within their classroom a longitudinal study is needed.
to determine the actual long-term effects of implementing interventions such as Forever Earth field trips. Will teacher beliefs, as measured by their environmental attitudes have long term effects as shown by evidence of integrating environmental education within their classroom instruction?

This study focused on teachers’ environmental attitudes. Another area to be addressed is students’ environmental attitudes. What are students’ environmental attitudes? Could outdoor field trips, like Forever Earth have a positive influence on students’ environmental attitudes in a study that equalizes the impact of teacher attitudes? Another area of future research could look at the relationship between teacher environmental attitudes and student environmental attitudes.

Finally, it is important to continue to refine the methodology and tools used in environmental education research. This study emphasized the importance of using a mixed method design to interpret all the results found. Future research could utilize other types of mixed methodology designs based on the appropriateness of the study. While the study of specific content areas, such as teachers’ environmental attitudes, are important in the field of environmental education, it is always important to identify the best design fit for the type of studying being conducted. I encourage researchers to focus a mixed methodology type of design best suited for future environmental research as mixed methods provides both breadth and depth to studies of such complex nature.

Specifically, mixed methods can be used to validate new and currently used environmental surveys to help strengthen psychometric properties of survey designs. Survey design is an important recommendation for future research looking at teachers’ environmental attitudes as the research shows there are not many psychometrically strong
surveys. One idea would be to create a survey focused specifically on teachers and find a way to measure the likelihood of integrating environmental education within their classroom curriculum. A Likert-type scale could measure how important certain areas of environmental education are to the teacher to implement within their instruction. Another type of Likert-scale could measure how much teachers value certain environmental issues as they would affect their students. For example how relevant do they feel specific environmental concepts are for their students to explore and understand. Another area is measuring student environmental attitudes and the influence their teachers’ have on their students’ beliefs in the classroom. In general, new or revised and improved environmental attitudes scales need to be constructed focusing on teacher and student beliefs.

The goal of high quality environmental education research may lead to more integration of environmental education in the classroom producing more environmentally literate teachers and students.
APPENDIX A

Teacher Demographics

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Note. GATE = Gifted and Talented Education; ELL = English Language Learner; SpEd = Special Education.
APPENDIX B

Environmental Attitudes Scale: Factors and Items
(Pettus & Giles, 1987)

FACTOR 1: Environmental Responsibility
1. Large financial penalties should be assessed from a company discharging pollutants into the environment. (1)
2. Environmental conditions are not as severe as many “alarmists” would have us believe. (16)
3. A lack of foresight and planning have gotten us into our present environmental dilemma. (8)
4. Industries should be required to return water to its source at least as pollution free as when they received it. (25)
5. Decisions to purchase land and set up trusts for land use should rely on the expert advice of scientist to prevent loss of natural sanctuaries. (12)
6. We have a responsibility not to purchase or use products that are known to be detrimental to the environment. (28)
7. If people truly cared for each other, our environmental problems would be fewer. (7)
8. It is unfortunate that there are fewer and fewer areas in this country where man has never set foot. (14)
9. More emphasis should be placed on determining the psychological and emotional effects of environmental conditions on people. (17)
10. Leisure activities that cause environmental pollution or damage the environment in other ways should be discouraged. (2)
11. Strict laws and guidelines should be developed and enforced for discharging wastes into the oceans of the world. (24)
12. Solving environmental problems is hampered by selfishness on the part of individuals. (10)
13. It is all right for humans to use and control the world’s resources as long as they plan for preserving environmental quality. (22)
14. There is a pollution crises which is endangering the health and welfare of our citizens. (5)
15. There are other social problems that need attention more than environmental problems. (27)

FACTOR II: Rights and Restrictions for Environmental Quality
1. The expansion of cities and industrial developments should not be allowed until the effects on wildlife communities and species are studied and considered. (20)
2. For developing communities to escape the fate of our presently crowded, unhealthy cities, city planners must be able to enforce strict laws that will preserve the environment. (29)
3. Laws should be passed to ban the use of nonreturnable cans and bottles. (23)
4. Individuals should be willing to separate their household refuse into four containers to help facilitate recycling and disposal. (3)
5. All commercial packaging materials and containers should be recyclable or reusable. (13)
6. Agreements should be initiated between nations of the world to prevent the pollution of outer space (areas beyond the earth’s atmosphere). (18)
7. Everyone has a right to enjoy an environment free from undesirable noises. (21)

FACTOR III: Social and Governmental Actions for Environmental Quality
1. More federal money should be spent on research and development to ensure higher standard of environmental quality. (11)
2. Information about stabilizing population growth through birth control should be stressed in high school. (30)
3. A guide should be prepared and distributed nationally on how to function and enjoy life in a way least destructive to the environment. (15)
4. People should be willing to make economic sacrifices for a better environment. (26)
5. A new federal center, independent of political and commercial pressures, should be established to test drugs, pesticides, and other substances and assess their impact on the environment. (9)
6. The inconveniences of using public transportation where it is available is a small price to pay for cleaner air and the conservation of resources. (6)
7. Because of critical population problems facing mankind, it is irresponsible to have more than two children. (19)
8. Because of population problems, our tax system should be redesigned to encourage small families rather than large ones. (4)

31. All disposal of hazardous wastes should be stopped until the long term effects of such disposal can be determined. (31)
## APPENDIX C

**EAS Instrument**

Name_______________________ Date_____________
Participant ID _______________________
School_________________________________________

Please mark how much you agree or disagree with each item.

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<th>Disagree</th>
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<th>Tend to Agree</th>
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<td>Large financial penalties should be assessed from a company discharging pollutants into the environment.</td>
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<td>Leisure activities that cause environmental pollution or damage the environment in other ways should be discouraged.</td>
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<td>3</td>
<td>Individuals should be willing to separate their household refuse into four containers to help facilitate recycling and disposal.</td>
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<td>4</td>
<td>Because of population problems, our tax system should be redesigned to encourage small families rather than large ones.</td>
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<td>5</td>
<td>There is a pollution crisis which is endangering the health and welfare of our citizens.</td>
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<tr>
<td>6</td>
<td>The inconvenience of using public transportation where it is available is a small price to pay for cleaner air and the conservation of resources.</td>
<td>1</td>
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<td>If people truly cared for each other, our environmental problems would be fewer.</td>
<td>1</td>
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<td>A lack of foresight and planning have gotten us into our present environmental dilemma.</td>
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<td>9</td>
<td>A new federal center, independent of political and commercial pressures, should be established to test drugs, pesticides, and other substances and assess their impact on the environment.</td>
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</tr>
<tr>
<td>10 Solving environmental problems is hampered by selfishness on the part of individuals.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>11 More federal money should be spent on research and development to ensure higher standards of environmental quality.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>12 Decisions to purchase land and set up trusts for land use should rely on the expert advice of scientists to prevent loss of natural sanctuaries.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>13 All commercial packaging materials and containers should be recyclable or reusable.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>14 It is unfortunate that there are fewer and fewer areas in this country where man has never set foot.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>15 A guide should be prepared and distributed nationally on how to function and enjoy life in a way least destructive to the environment.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>16 Environmental conditions are not as severe as many “alarmists” would have us believe.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>17 More emphasis should be placed on determining the psychological and emotional effects of environmental conditions on people.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>18 Agreements should be initiated between nations of the world to prevent the pollution of outer space (areas beyond the earth’s atmosphere)</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>19 Because of critical population problems facing mankind, it is irresponsible to have more than two children.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>20 The expansion of cities and industrial developments should not be allowed until the effects on wildlife communities and species are studied and considered.</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
<tr>
<td>21 Everyone has a right to enjoy an environment free from undesirable</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td></td>
</tr>
</tbody>
</table>
It is all right for humans to use and control the world’s resources as long as they plan for preserving environmental quality.

Laws should be passed to ban the use of nonreturnable cans and bottles.

Strict laws and guidelines should be developed and enforced for discharging wastes into the oceans of the world.

Industries should be required to return water to its source at least as pollution free as when they received it.

People should be willing to make economic sacrifices for a better environment.

There are other social problems that need attention more than environmental problems.

We have a responsibility not to purchase or use products that are known to be detrimental to the environment.

For developing communities to escape the fate of our presently crowded, unhealthy cities, city planners must be able to enforce strict laws that will preserve the environment.

Information about stabilizing population growth through birth control should be stressed in high school.

All disposal of hazardous wastes should be stopped until the long term effects of such disposal can be determined.

Note: Based on Pettus and Giles (1987, pp. 136-137)
APPENDIX D

Open-Ended Statements of Concern (page 1 of 2)

Name (optional) ________________________________________________

It is important for confidentiality and data comparison that we have a specific number with your initials of your first and last name and a unique number that you can remember. Please use

Initials with a four digit code: ___ ___ ___ ___ ___ ___

The purpose of the open-ended question on the next page is to determine what concerns regarding environmental education people who are participating in the Forever Earth field trip have.

Please respond in terms of your present concerns, or how you feel about your involvement with the innovation of a Forever Earth field trip. We do not hold to any one definition of this innovation. Remember to respond in terms your present concerns about your involvement with the Forever Earth field trip.
RESPONSE SHEET

WHEN YOU THINK ABOUT THE FOREVER EARTH ENVIRONMENTAL EDUCATION FIELD TRIP, WHAT ARE YOU CONCERNED ABOUT? (Do not say what you think others are concerned about, but only what concerns you now). Please write in complete sentences, and please be frank.

1.

2.

3.

Please place a check by the statement that concerns you most.
APPENDIX E

Teacher Demographics Questionnaire

Name: ___________________________ School: ___________________________
Participant ID: ________________________
Gender: _____ Male _____ Female
Age:
___ less than 25
___ 26-35
___ 36-45
___ 46-55
___ over 55 years old
Years of teaching experience:
___ 0-3
___ 4-7
___ 8-12
___ 13-20
___ over 20 years
Years teaching science:
___ 0-3
___ 4-7
___ 8-12
___ 13-20
___ over 20 years
Current grade level taught:
___ 4th
___ 5th
___ 6th
___ 7th
___ 8th
___ 9th
___ 10th
___ 11th
___ 12th
other (please identify):________________________
How long have you been teaching at this grade level? _______ years

Please mark how many Forever Earth field trip curriculums you have done? (place the number next to the curriculum)

_____ The Water Cycle
_____ Finicky Fish Finish Last
_____ Alien Invaders
_____ Geo Scene Investigation

List and briefly describe previous science related field trips you have taken over the past 5 years (you can use the back side if needed).
APPENDIX F

Teacher Interview Protocol

To gather data for a more in-depth understanding of teachers’ perspectives, a semi-structured interview strategy was used. Although potential questions were identified, the protocol allowed for changes such as using prompts and asking additional questions (Merriam, 1998). Standard questions could be asked at any point during the interview (Rubin & Rubin, 2005).

How did you find out about Forever Earth?

What did you like best about the Forever Earth field trip? And the students?

How could the Forever Earth field trip be improved?

Did you use any of the information from Forever Earth in your classroom instruction? Was it helpful?

Does Forever Earth tie into the curriculum?

Do you notice a change in student attitudes towards science?

Have the kids used any of the knowledge they gained on Forever Earth in the class?

Did you tell anyone about the Forever Earth field trip? If yes, what did you tell them?

Did you do the classroom preparatory activities as directed/suggested?

Would you do another Forever Earth field trip?

Was the teacher previsit beneficial? Suggestions for improvement

Was the classroom previsit beneficial? Suggestions for improvement

What are your past experiences with Environmental Education programs?

Do you find Environmental Education possible to integrate into your classroom instruction?
  Science area?

How do you integrate Environmental Education concepts into your existing science curriculum?
APPENDIX G

IRB Approval Notice for Research Protocol (one page)

Social/Behavioral IRB – Expedited Review Approval Notice

NOTICE TO ALL RESEARCHERS:
Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: March 10, 2008
TO: Dr. Lori Olafson, Educational Psychology
FROM: Office for the Protection of Research Subjects
RE: Notification of IRB Action by Dr. J. Michael Stitt, Chair
Protocol Title: Measuring Teachers' Attitudes and Stages of Concern Towards an Environmental Education Field Trip
Protocol #: 0802-2623

This memorandum is notification that the project referenced above has been reviewed by the UNLV Social/Behavioral Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45 CFR 46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is March 3, 2009. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the official Informed Consent/Assent (IC/IA) Form for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be any change to the protocol, it will be necessary to submit a Modification Form through OPR. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond March 3, 2009, it would be necessary to submit a Continuing Review Request Form 60 days before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRS-HumanSubjects@unlv.edu or call 895-2794.

Office for the Protection of Research Subjects
4505 Maryland Parkway • Box 451047 • Las Vegas, Nevada 89151-1047
APPENDIX H

IRB Approved Informed Consent (three pages)

TITLE OF STUDY: Measuring Teachers' Attitudes and Stages of Concern Towards an Environmental Education Field Trip

INVESTIGATOR(S): Lori Olafson and Michelle Weibel

CONTACT PHONE NUMBER: 895-5734 Michelle Weibel

Purpose of the Study
You are invited to participate in a research study. The purpose of this study is to examine teachers' environmental attitudes and stages of concern regarding participation in the Forever Earth, environmental education field trip.

Participants
You are being asked to participate in the study because you are a teacher taking your students on the Forever Earth field trip in 2008.

Procedures
If you volunteer to participate in this study, you will be asked to do the following: 1) complete a 35 item likert-scale stages of concern questionnaire with demographics page, a 30-item likert-scale Environmental Attitudes scale, and one Open Ended Statement of Concern prior to the Forever Earth field trip taking approximately 20-30 minutes. You will then be asked to complete another likert-style Stages of Concern Questionnaire and Environmental Attitudes Scale at the end of your field trip taking approximately 20-30 minutes. Finally you will be interviewed about your Forever Earth field trip experience following your trip at a time convenient to you. The interview will take 30 minutes.

Benefits of Participation
There may not be direct benefits to you as a participant in this study. However, we hope to examine teachers' environmental attitudes and stages of concern before and after participating in a Forever Earth field trip. We hope to add to the knowledge of how environmental attitudes are related to participation in environmental education.

Risks of Participation
There are risks involved in all research studies. This study may include only minimal risks. You may feel uncomfortable answering some of the questions in the surveys and interview.
TITLE OF STUDY: Measuring Teachers’ Attitudes and Stages of Concern Towards an Environmental Education Field Trip

INVESTIGATOR(S): Lori Olafson and Michelle Weibel

CONTACT PHONE NUMBER: 895-5734 Michelle Weibel

Cost/Compensation
There will not be financial cost to you to participate in this study. The study will take approximately 1½ of your of your time at three different intervals (Pre-trip, Field trip, Post-trip). You will not be compensated for your time.

Contact Information
If you have any questions or concerns about the study, you may contact Michelle Weibel or Lori Olafson at 895-5734 or 895-1313 respectively. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for the Protection of Research Subjects at 702-895-2794.

Voluntary Participation
Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be shred.
INFORMED CONSENT
Department of Educational Psychology

TITLE OF STUDY: Measuring Teachers’ Attitudes and Stages of Concern Towards an Environmental Education Field Trip
INVESTIGATOR(S): Lori Olafson and Michelle Weibel
CONTACT PHONE NUMBER: 895-5734 Michelle Weibel

Participant Consent:
I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

__________________________  __________________________
Signature of Participant     Date

Participant Name (Please Print)

Audio Taping:
I agree to the interview being audio taped.

__________________________  __________________________
Signature of Participant     Date

Participant Name (Please Print)

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.
Activity learning students
Affect
   Affect: learning
   Affect: teacher: story
Anything else?
Class instruction POST
   Class instruction: helpful
Concerns
   Concerns: alleviated
   Concerns: chaperones
   Concerns: FE curriculum
      Concerns: facilitators
      Concerns: student involvement
      Concerns: time
   Concerns: financial
      Concerns: financial: buses
      Concerns: financial: fuel
      Concerns: financial: substitutes
   Concerns: NONE
   Concerns: weather
Safety
   Concerns: safety: boat
   Concerns: safety: release form
   Concerns: student behavior
   Concerns: student numbers
Connection to Nature
Curriculum
Do another FE?

EE
   EE: classroom
      Science: pushed back
   EE: Integration
      IEE: throughout curriculum
         EE: Integration: interdisciplinary
      IEE: solo subject
         EE: Integration: arts
         EE: Integration: english
         EE: Integration: math
         EE: Integration: reading
         EE: Integration: science
         EE: Integration: social studies
   EE: Integration: writing
      EE: Integration: field trips
      EE: outdoors env
      EE: teacher
         EE: Past experience
      EE: teacher resources
      EE: teacher training
Facilitator style
   Fe codes
   Fe: program
      Class instruction POST
         Class instruction: helpful
      Connection to Nature
      Curriculum
      Facilitator style
      FE: improvement
      Positive Feedback
         Anything else?
         Like: Student
         Like: Teacher
         Student Positive FE
      Student-directed learning
         Activity learning students
         FE: interactive students
         Hands-on
      Student outcomes
         Affect: learning
         SA
            SA FE
            SK
            Stewardship: student
Preclassroom
Preclassroomv: expectations
Preclassroom: student excitement
Preclassroom: suggestions
Preclassroomv: content
Preclassroomv: management
Preclassroomv: assessments
Preclassroomv: beneficial
Preteacherv: beneficial
ATLAS.ti Codes Hierarchy (...continued)

<table>
<thead>
<tr>
<th>FE:improvement</th>
<th>Spring08</th>
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</thead>
<tbody>
<tr>
<td>FE:interactive students</td>
<td>Springs Preserve</td>
</tr>
<tr>
<td>Floyd Lamb</td>
<td>Stewardship:student</td>
</tr>
<tr>
<td>Hands-on</td>
<td>Student-directed learning</td>
</tr>
<tr>
<td>Like:Student</td>
<td>Activity learning students</td>
</tr>
<tr>
<td>Like:Teacher</td>
<td>FE:interactive students</td>
</tr>
<tr>
<td>Mirage Dolphins</td>
<td>Hands-on</td>
</tr>
<tr>
<td>Natural History Museum</td>
<td>OnlyFEPastExp</td>
</tr>
<tr>
<td>NoPastExp</td>
<td>Referred</td>
</tr>
<tr>
<td>NPS</td>
<td>Do another FE?</td>
</tr>
<tr>
<td>OnlyFEPastExp</td>
<td>WHAT tell about FE?</td>
</tr>
<tr>
<td>Referred</td>
<td>WHO tell about FE</td>
</tr>
<tr>
<td>Teacher</td>
<td>Affect:teacher:story</td>
</tr>
<tr>
<td>Teacher:personal</td>
<td>Teacher:projects</td>
</tr>
<tr>
<td>Teacher:projects</td>
<td>Teacher:personal</td>
</tr>
</tbody>
</table>
REFERENCES


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www.news.cornell.edu/stories/March06/wild.nature.play.ssl.html


www.whitehutchinson.com/children/articles/nature.shtml


CURRICULUM VITAE

Michelle L. Weibel

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Public Lands Institute
University of Nevada, Las Vegas
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Education
2011 Ph.D. Educational Psychology: Assessment and Evaluation
University of Nevada, Las Vegas
Dissertation title: Being Outside Learning About Science is Amazing: A Mixed Methods Study

2001 M.Ed. Health Promotion: Interdisciplinary, University of Nevada, Las Vegas

1998 B.A. Psychology, University of Nevada, Las Vegas

Honors and Awards
2009 Golden Key International Honor Society
2005 Accepted for AERA Graduate Student Seminar
Awarded scholarship for seminar in Montreal, Canada
2005 Service Above Self Scholarship awarded by The Grant Institute
2005/2006 The Chancellor’s List
2004/2005 The Chancellor’s List
2003/2004 The National Deans List
2001-present Member Phi Kappa Phi Honors Society
2001 Graduate Highest Academic Honors (4.0 GPA)
Lifetime Member, Who’s Who

Professional History
2009-current Program Assistant; Public Lands Institute, University of Nevada, Las Vegas. Assist with Discover Mojave Outdoor World and Forever Earth projects. Responsibilities include 1) facilitate field trips 2) collect and analyze data, 3) prepare and revise curriculum-based activities, 4) train staff, 5) develop technical reports, 6) assist in hiring process of PT facilitators, 7) schedule and staff all events 8) serve as communication liaison between community programs and school district.

2006-2009 Research Assistant; Public Lands Institute, University of Nevada, Las Vegas. Assist with Discover Mojave Outdoor World and Forever Earth projects. Responsibilities include 1) facilitate field trips 2) collect and analyze data, 3) prepare and revise curriculum-based activities, 4) program evaluation, and 5) reports.
2003-2005 Graduate Assistant; Educational Psychology Department, University of Nevada, Las Vegas. Assist professors with research studies (using qualitative, quantitative, and mixed method approaches) and teaching. Current research areas include 1) assessment training for pre-service teachers, 2) teacher beliefs and uses in elementary level math assessments, 3) student and teacher measures of school climate and connectedness, 4) program evaluation, and 5) technology integration in classroom instruction.
Responsibilities include 1) program/research implementation, 2) collection and analysis of research data, 3) literature reviews, 4) journal publications, 5) measurement tool construction, and 6) teaching assistance including preparation, instruction, and record keeping.

2002-2003 Project Coordinator and Research Assistant; Laboratory for Developmental Studies and Prevention Methodology at UNLV. Assisted Dr. Lawrence Scheier with funded research projects, grant proposal submissions (federal, state, and local level), and analysis in areas of prevention methodology, competency enhancement, grade retention, and international technology collaboration (Russia). Also assisted with university and community contracts for research, analysis and evaluation, and consulting.

2001 Research Assistant; Assisted Stephanie Holland, Psy.D., at Child Focus, Inc. gathering and scoring career assessment data, establishing field opportunities, and analyzing the of at-risk adolescent girls including minor intervention feedback session. Research and database done of private foundations and federal funding opportunities

1999-2001 Graduate Assistant; Educational Psychology, University of Nevada, Las Vegas. Assisted with 1)on-line counseling research 2) alcohol and drug prevention research and 3) served as liaison between interns and Clark County School district.

Professional Memberships
American Educational Research Association (AERA)
North American Association of Environmental Educators (NAAEE)

Scholarly Publications and Activities

Book Chapter

Technical Reports


Scholarly Paper Presentations:


presented at the annual meeting of the Hawaiian International Conference on Education. Honolulu, HI.


Spataru, Weibel, Olafson, & Bendixen (2004, March). *Use of Technological Tools in a Classroom Assessment Course*. Poster presentation at the Society for Information Technology and Teacher Education Annual conference, Atlanta, GA.