THE IMPACTS OF TWO SCHOOL OUTDOOR CLASSROOMS ON 6TH AND 7TH GRADE STUDENT MOTIVATION LEVELS IN SCIENCE

By

HANNAH R. HARDER

Bachelor of Arts in Biology

Bachelor of Arts English Writing

Westmont College

Santa Barbara, California

2004

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
July, 2010

THE IMPACTS OF TWO SCHOOL OUTDOOR

CLASSROOMS ON 6TH AND 7TH GRADE

STUDENT MOTIVATION LEVELS IN SCIENCE

Thesis Approved:

Dr. Lowell Caneday

Thesis Adviser

Dr. Debra Jordan

Dr. Kathryn Castle

Dr. Mark E. Payton

Dean of the Graduate College

ACKNOWLEDGEMENTS

All of these people are tremendous and inspirational and have shaped not only my thesis, but also my life in very powerful ways. I do not have words to properly explain what I owe them.

To the members of my committee, who are both great teachers and great learners who have dedicated their lives to improving education: Dr. Caneday, I feel so blessed to have had you as my committee chair. Thank you for your great guidance, patience, and encouragement throughout this whole process. This would have fallen apart long ago without you. To Dr. Castle, you have reminded me to always look at what children themselves want and how they create meaning. Your reviews and your insights about working with schools and making the language more accessible to the students were very valuable. Dr. Jordan, thank you for your astute editing and support. This paper is so much better for it. You have taught me a lot about writing, drafting, and software. Also to Dr. Richard Bryant, thank you for welcoming me into the program and helping in the initial stages. Talya Henderson, I think most of us feel that you are the unseen committee member. You have been so encouraging throughout. Thank you for the long-term use of your laptop, so I could utilize SPSS at any hour from my own home.

To Cris Kirby, Jerry Newhouse, and Bruce Edwards whose inspired work, at the Regional Food Bank of Oklahoma and beyond, introduced me to gardening with and for kids—you planted this seed.

To Joy Hayes, thank you for helping me to find a study site, twice.

I am very appreciative to the principals, teachers, and students at Briarwood Elementary and Central Junior High for their willingness to allow me to observe in their classrooms and collect data on their great outdoor classrooms. I hope I have done justice to your great programs.

Thank you to Sandra Rodriguez, Christina Stallings, and Jerel and Sunshine Cowen for your passion, friendship, listening ears, and shared rides.

Most importantly, thank you to my family. Dad, thanks for the help with the figures, tech support, and editing. Special thanks to mom, Carrie, and Mary for your babysitting services. To Cris and Connor, thanks for lots of time away from your mom, even though this was not on your priority list. Hopefully I'm a better mom for it. I'm done now and eager to play in our garden. Finally, to my husband, Evan, thanks for everything and for being one of few people who may actually read this! I love you all very much.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

> Beauty has its moral effect on a child. It is useless to expect untarnished morality from children whose parents provide ramshackle outbuildings and schools uninteresting and repellent outside and in, where no playgrounds exist and where no provision is made to keep investigating minds safely busy when not occupied with lessons. Clothe your outbuildings with vines, screen them with groups of trees, plant your grounds with things that invite the children to note their growth or to enjoy their welcome shade. Make school a delightful place in which to linger because it has so many charming interests. (King, 1912, p. 137)

"It is through what we do in and with the world that we read its meaning and measure its value" (Dewey, 1900, p.33).

Over the last several decades, the relationship of children with the outside world has changed dramatically (Tandy, 1999). Shifts from mostly rural agricultural societies to those that are mostly urban and dominated by technology have led to a severe disconnect between children and the natural world. Within "the space of a century, the American experience of nature has gone from direct utilitarianism to romantic attachment to electronic detachment" (Louv, 2006a, p.16). This detachment affects children's perceptions of nature and ecological processes and has consequences for their mental and physical health (Ginsburg, The Committee on Communications, & The Committee on the Psychosocial Aspects of Child and Family Health, 2007; Louv, 2006a, 2006b).

Children are now spending much less time in natural settings than previous generations before them because of urbanization, changing laws, and technical advances—especially technical games and ubiquitous access to the Internet. Many children are fundamentally at risk for forgetting, or never discovering, the most elemental aspects, interactions, and education of their natural surroundings. This is a critical issue. Having intimate knowledge of the environment is essential to the behavior and attitude changes that are now deemed necessary for environmental education to succeed (Athman & Monroe, 2001).

Despite the many positive benefits green spaces and interacting with nature have on children, spaces like outdoor classrooms and gardens are sparse in schoolyards and neighborhoods (Tandy, 1999). Many schools have minimal access to natural exterior spaces and the interiors are uninteresting and disengaging, particularly to middle school students (Cothran & Ennis, 2000; J. S. Eccles & C. Midgley, 1989a, 1989b; Maehr, 1989; Schmidt, Shernoff, & Csikszentmihalyi, 2007; Shernoff & Csikszentmihalyi, 2009). In light of such information, the challenge is to create innovative spaces that maximize motivation, expose students to their natural surroundings, and enable students to develop sustainable behaviors and find solutions for many ecological crises of today.

Purpose of the Study

The purpose of this study was to examine, document, and compare the influences of two school outdoor classrooms on 6th and 7th grade students' motivation levels in science. The study examined whether motivation levels in outdoor classrooms are affected by school or sex. Many studies about students participating in different types of environmental education programs demonstrate higher performance and motivation than their peers not involved in such programs (Cline, Cronin-Jones, Johnson, Hakverdi, & Penwell, 2002; Lieberman & Hoody, 1998; Thorp, 2001; Volk & Cheak, 2003). By continuing to examine students' motivation levels and experiences in outdoor learning programs educators can gain a better understanding of how these spaces best suit the needs and desires of the students.

Hypothesis

The following three hypotheses were tested:

1) School effect:

H_0: There is no significant difference in science motivation levels over time between 6^{th} and 7^{th} grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between 6^{th} and 7^{th} grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

2) Sex effect:

H_0: There is no significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

3) Factor interaction:

H_0: There is no interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is significant interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

Limitations

- The study was based upon existing outdoor classrooms; the researcher had no input into design of either the outdoor classroom or the wetland area.
- The study was designed around existing curricula without modification.

- The two outdoor classrooms were different sizes.
- Time span between the pre- and post-tests was governed by class availability and teachers recommendations that surveys not occur during the winter months

Delimitations

- Only 6th grade students from Briarwood Elementary and 7th grade students from Central Junior High who were at their school for the entire school year were participants in this study.
- Only data from students who were present on both survey dates were utilized.
- Only students who gave assent and had parental consent participated.
- Due to time constraints, the school calendar, and limited outdoor classroom and wetland usage during the winter months, the study examined differences in motivation levels over two and a half months of the school year.

Assumptions

- The revised Achievement Motivation Inventory instrument measured motivation similarly for both 6th and 7th grade students.
- The revised instrument maintained similar validity and reliability with the original instrument.

- Factors outside of participation in the outdoor classroom facilities did not interfere with the motivation of the students in their science studies during the study period.
- Students understood questions asked on the surveys and made their best attempts to honestly answer each question without being purposefully misleading.
- Any data excluded did not affect how representative the data were of the population examined.
- Students in 6th and 7th grades have comparable mental abilities, developmental, and motivational needs (Meece, Anderman, & Anderman, 2006).
- Students at both sites spent comparable amounts of time in their outdoor classrooms and received similar quality levels of instruction.
- Middle school students are capable of accurately self-reporting their motivation levels (Assor & Connell, 1992; Ryan, Connell, & Deci, 1985).

Definitions of Terms

- Achievement goal theory—The theory that perceives "behavior as purposeful, intentional, and directed toward the attainment of certain goals" (Meece et al., 2006 p.90).
- Conservation education—Education that specifically focuses on the preservation and management of natural resources through changing negligent philosophies and behaviors (Marsden, 1997).

- Conservative education—Education philosophies where the teacher dominates and the learning is expected to occur through rote memorization, recitation, and traditional assessments (Kohn, 1999).

- Constructivism—The continuous process of building on pre-existing knowledge to encourage students to look at the whole picture and create synthesis of facts and disciplines rather than just memorizing isolated facts (Athman & Monroe, 2001; Yager, 1991).

- Environmental education—Education in and for the environment with a goal "to develop a world population that is aware of, and concerned about, the total environment and its associated problems, and which has the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones" (UNESCO-UNEP, 1975, p.3). This education often focuses on higher order thinking skills, discovery, and cooperative learning (Nava-Whitehead, 2002).
- Extrinsic motivation—The "motivation to engage in an activity as a means to an end" (Linnenbrink & Pintrich, 2002).
- Flow—The optimum state of performance where an individual is so engaged that they cannot do anything else and may be so absorbed that they may even disregard social norms or comparisons (Csikszentmihalyi & Nakamura, 1989).

- Garden based learning—Any number of learning experiences that occur in a garden that and include any academic subject, which enhances mental or physical development, ecological knowledge, and subsistence or life skills (Desmond, Grieshop, & Subramaniam, 2002).
- Intelligence—”A biological and psychological potential (for learning)— a capacity that resides in each person” (Krechevsky & Seidel, 1998, p.22).
- Intrinsic motivation—The “motivation to engage in an activity for its own sake” (Linnenbrink & Pintrich, 2002, p. 319).
- Kinesthetic learners—Those who learn through physically moving and doing (Dunn, Beaudry, & Klavas, 1989; Gregory & Chapman, 2007).
- Learning style—A different approach or preference that is used by an individual across different content area (Sternberg & Grigorenko, 2001).
- Learner-centered principles—A framework for learning where learning is a process initiated by the student and emphasis is placed on developing relevancy and connections to prior experiences (McCombs & Whisler, 1997; Meece, 2003).
- Nature study—An examination in the outdoors of the natural history of the physical, chemical, or biological aspects of the environment and of the wild or cultivated species that may be contained in a community that is primarily based on information rather than conservation or action (Athman & Monroe, 2001).
- Origin experience—An occurrence where one originates or creates his or her own outcome and is not manipulated and pushed around by the desires of others (deCharms, 1984).

- Pawn experience—An occurrence where one is manipulated or motivated by the desires of others (deCharms, 1984).
- Progressive education—The movement started in the 1890s that emphasizes that the child should be the initiator of his or her learning experience and that they should learn by doing, investigating, and problem solving (Athman & Monroe, 2001; J. Disinger & Monroe, 1994; Kohn, 1999).
- Tactile learners—Individuals who learn best through physically manipulating materials and having concrete experiences (Dunn et al., 1989; Gregory & Chapman, 2007).
- Tactile/kinesthetic learners—Individuals who learn best through whole body movement (Dunn et al., 1989; Gregory & Chapman, 2007).

CHAPTER II

REVIEW OF LITERATURE

Evolution of Nature Study, School Gardens, and Environmental Education

Around the globe as countries became industrialized people flocked to cities to compete for jobs in factories. Farms were abandoned and awareness of the natural world diminished (Ibrahim & Cordes, 2002). The rapid urbanization and influx of people necessitated schools that were stark models of efficiency without regard to the aesthetic and natural space needs of children. Since natural areas of any size were unavailable to most children at home, schools needed to include areas to teach the values and benefits of the natural world. The introduction of nature studies and gardening as part of school curriculums paralleled the development of progressive education ideologies in Europe and in the United States (Desmond et al., 2002; Dewey, 1925, 1929; Fröebel & Hailmann, 1887; Jackman, 1891; Montessori, 1912).

Nature study, the precursor to modern environmental education, has waxed and waned throughout modern educational history (Desmond et al., 2002; Marsden, 1997). Nature studies have been embraced by many of the most prominent progressive education experts of the last three centuries both in Europe and in the United States as an ideal mechanism that allows students to learn by doing, experimenting, and cultivating their whole person through appreciation for morals and beauty (Dewey & Dewey, 1915). In spite of the well documented benefits and historical foundation for outdoor learning experiences and nature studies, many social, pedagogical, technological, and educational disconnects may prevent students from having these experiences today.

The concept that outdoor areas can enhance learning and motivation is not a new one. A Czech philosopher, Johann Comenius (1592-1670) thought that education should have strong social components and advocated that every school should be adjacent to a school garden (Braund & Reiss, 2004; Subramaniam, 2002). Jean Jacques Rousseau (1712-1788), the famous French philosopher who is known for his perceptions of humanity and society, wrote about the power of the outdoors for education in his novel *Émile* (Braund & Reiss, 2004; Subramaniam, 2002). In the early 1800s, Johann Heinrich Pestalozzi (1746-1827) a Swiss educator, advocated for students to have access to gardens with individual plots. He was influenced by the theories of Locke and Plato, who advocated that the mind receives and processes information based upon impressions from the outside world and that exposure to noble sights and experiences would raise the moral standing of children. The children in his studies used physical models to convey their interactions with the outdoors (Pestalozzi World, n.d.).

Pestalozzi was the originator of what has come to be known as the "pedagogy of intuition" where children were encouraged to explore the outdoors and natural world with very little adult assistance (Thorp, 2001, p. 14). To him, intuition gained from natural experiences and interpreted by the senses should be central, not peripheral, to an education philosophy. He envisioned "schools in which children were invited to make use of their senses, discarding books and didactic lessons...[where] students [were] encouraged to make use of their senses, exercise their consciousness and through this active exploration of the world find intellectual and moral development" (Thorp, 2001, p. 14). In his philosophy, children should begin their studies of the natural world in their immediate surroundings. Only after discovering what was near at hand would they be able to successfully navigate and interpret their community and the greater world (Thorp, 2001).

Friedrich Fröebel (1782-1852), the German founder of Kindergarten, felt that it was necessary for children to be in nature in order for them to develop a unity between themselves and the natural world, to develop their own individualities, and to reach their full potential (Thorp, 2001). Fröebel believed that only by studying things in their natural environment could a student truly understand the essence of a thing and that students should begin their education by first studying what was near to them and proceeding to the larger community from there (Desmond et al., 2002). Gardens, in particular, provided both places and materials for children to practice basic utilitarian skills such as cultivation of plants, wood chopping, and mat and basket weaving. In Fröebel's schools, nature inspired art and provided a place to look at simple machines such as boats, windmills, and waterwheels. With a garden as their outdoor classroom children were able to play out in miniature the dramas and duties of adult life (Fröebel & Hailmann, 1887).

Fröebel and Pestalozzi and their practices of educating the whole child through common objects in their everyday world contributed to the rise of European progressive movements (Kohn, 1999; Loss & Loss, n.d.). Previously, more conservative practices had been based around lessons dominated by teacher as expert, memorization, and recitation. In contrast, progressive philosophies focused on the children initiating the doing, investigating, and problem solving (Loss & Loss, n.d.). The philosophies of progressive education and accompanying social reform movements that swept through Europe and the Americas between in the late 19th and early 20th centuries encouraged school gardening and nature studies to become more prominent globally and spread rapidly between the 1900s and 1930s (Desmond et al., 2002). Gardening became so prevalent that as of 1905 over 100,000 school gardens were thought to exist in Europe (Desmond et al., 2002).

School gardening programs developed in Europe much earlier than in the United States. Prussia developed one of the first required gardening programs in schools as early as 1811 (Desmond et al., 2002). In 1869, the Austrian Imperial School of Law issued a decree that a garden and a place for agriculture experiments be established at every school. The French followed suit and in 1882 passed a law that defined a course of study for all middle grades to be involved in gardening. This was followed by an 1887 decree that all state-supported schools had to be attached to a garden (Miller, 1904).

By the late 1800s, Sweden also required school gardens and around the same time in Belgium all public elementary schools had gardens and teachers were required to have training to learn how to use them. School gardens gained popularity throughout Germany and many gardens of various sizes could be found. In Frankfort a garden was formed in 1896 where students studied natural history; in Breslau in 1900 there was a garden of 11,738 acres; Dresden boasted of areas to cultivate fruit trees and forest trees as well as vegetables. In 1888, Leipzig students were learning to transplant and graft trees (New York Times, 1900).

For Maria Montessori (1870-1952), Italian founder of the Montessori method, school gardens were a critical part of her child development curriculum. Like Fröebel, she perceived individual plots as having optimum value for the child and felt that contact with nature was essential for nurturing a child's spiritual and religious self (Fröebel & Hailmann, 1887; Kilpatrick, 1916; Montessori, 1912). Montessori demonstrated specifically that nature and the outdoors were good places for children to get basic exercise, to develop independence, and to learn. In a garden, children could learn about good eating habits and how to prepare food for the table. When the garden began to bloom, Montessori documented that even the youngest children were drawn to spontaneously write about their experiences to describe what was occurring (Montessori, 1912).

The United States school gardening movement is thought to have initiated in Roxbury, Massachusetts in 1891 when Henry Lincoln Clapp returned from surveying many of the school gardens in Europe (Desmond et al., 2002). From here school gardening quickly spread to Boston in an attempt to make life less dreary for common people. By 1902 a school farm was established in New York City (Miller, 1904). Despite the many opportunities natural study areas offered for children, inaccessibility to natural spaces, sparse financial support, and demands to justify the educational and social value of outdoor nature studies was a continuous battle American educators had to overcome (Dewey & Dewey, 1915; King, 1912). Ironically, these obstacles continue to predominate environmental education discussions to this day (Athman & Monroe, 2001; Braund & Reiss, 2004; Carrier, 2009; Desmond et al., 2002; Gruenewald & Manteaw, 2007).

In an attempt to educate urbanites who had lost their awareness for the natural world, comprehensive instructive books like Wilbur Jackman's *Nature Studies for the Common Schools* (1891) began to emerge (Athman & Monroe, 2001; J. Disinger & Monroe, 1994). It was recognized that smaller scale spaces for nature studies offered practical applications for learning about food generation and cultivation and provided access to the natural world. The school garden or children's garden (green spaces designed specifically for, and often by, children) were increasingly seen by progressive educators as a widespread solution to connecting children to nature and the origins of their food sources. In such spaces children could witness and engage in nature's principles, education, and aesthetics at least partially, rather than not at all (Miller, 1904).

Because of their versatility and functionality gardens were recognized to have many benefits to children. King, in his 1912 book, *The School Garden, Its Educational and Social Value,* stated that outdoor study areas,

> while teaching the life history of the plants and of their friends and enemies, instill in the children a love of outdoor work and such knowledge of natural forces and their laws as shall develop character and efficiency. (p. 129)

Likewise, John Dewey (1859-1952), perhaps the most famous and prolific of American progressive educators, believed that outdoor learning developed moral character. He thought that in order to provide learning that was meaningful and relevant to student experiences good education should provide students with interactions with the natural world (Llewellyn, 2002). Dewey repeatedly displayed concern that the traditional school room was a place of passivity and absorption that impeded the natural flow of how students work and process information. He felt that it was critical that children learn by investigation, experimentation, and observation, not just by acquiring facts (Dewey, 1900, 1925, 1929; Dewey & Dewey, 1915). Dewey also felt that reading, writing, and a desire to synthesize and acquire knowledge would be the natural progression when students were given authentic learning experiences where they had some direction over their own learning. Dewey felt that nature study would bring “strong, healthy, and independent young people with well developed characters and a true sense of the beauty of nature” (Dewey & Dewey, 1915, p.91) and provide the perfect access to investigations and experiments. In his writings on nature study, Dewey thought it essential that nature study follow the seasons and take place throughout the year. He recommended a vegetable garden as an excellent starting place for urban children to observe local and seasonal changes.

Irving King wrote a social commentary about school gardens and their educational and social values around the same time that John Dewey was gaining notoriety. Interestingly, King reached many of the same conclusions as Dewey. King professed that participating in gardening gave children responsibilities, helped them to develop judgment, gave them contact with their environments, and relieved them from their classroom restrictions (King, 1912). Gardening allowed students to have real world experiences and to be introduced to the study of geography. King felt that many of the same purposes of school gardens, such as experience and moral development, could be accomplished regardless of type or size because “in a school garden the educational, economic, aesthetic, utilitarian, or sociological value may be the most prominent according to circumstances” (King, 1912, p.131). To King, the cultivation of individual plots and larger areas held greater developmental benefits to children than communal plots.

Throughout World War I and later in World War II, gardens were used to augment the United States' food supply. In the 1930s in the United States following the dustbowl the focus of nature studies in schools shifted from being predominantly about natural processes and ecology to being largely related to conservation education. Education aimed to preserve and manage natural resources through changing negligent philosophies and behaviors (Marsden, 1997). Conservation efforts remained throughout the next two decades sometimes being augmented by outdoor education, which sought to provide survival skills, challenge, and a feeling of personal accomplishment to students (Athman & Monroe, 2001). As technology propelled scientific advancements, social, cold war, and nuclear concerns caused environmental and nature studies to sometimes gain reputations as being informal or juvenile sciences (Marsden, 1997). Nature studies as part of the curriculum were further overshadowed by expansion of student athletic fields of the 1940s (Desmond et al., 2002).

However, increasing awareness and concern over pollution during the counter-culture revolution and responses to Rachel Carson's 1962 *Silent Spring* led education for the environment to gain international recognition. The focus of nature study during this era was to encourage action and preservation (Athman & Monroe, 2001; Desmond et al., 2002; J. F. Disinger & Roth, 1992). To many educators, however, environmental education as a defined entity is not thought to have specifically begun until the 1972 United Nations conference (Athman & Monroe, 2001). Following this conference, the UN approved the Belgrade Charter in 1975 which states explicitly that

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the total environment and its associated problems, and which has the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones. (UNESCO-UNEP, 1975, p.3)

This was followed by the Tbilisi declaration of 1976 in which the goals of environmental education were expanded to encourage activities to cease or reverse environmental degradation. Because of these two UN declarations, the goals of environmental education remain very action oriented, focusing on human impacts and discovering and implementing solutions to global environmental problems (Athman & Monroe, 2001; Mckeown, 2003). At the height of the environmental movement, school gardens and outdoor classrooms remained mechanisms for teaching students life skills related to resource management and sustainability (Desmond et al., 2002). To remain effective vehicles for environmental education all types of outdoor classrooms and gardening areas will need to continue to enable students to think globally (Adkins & Simmons, 2002; Hungerford, Peyton, & Wilke, 1980).

The United Nations conference in 1992 on environment and development, *The Earth Summit,* in Rio de Janeiro attempted to further expand the focus of environmental education. It was in Rio de Janeiro that *Agenda 21* was adopted. *Agenda 21* sought to provide environmental protection, integrating the needs of society with the economy, and alleviate human suffering and poverty. The first step in achieving these goals is for a society to develop understanding of the basic ecological—understanding that is recognized as severely lacking throughout many schools in the United States today

(Mckeown, 2003). Despite widespread consensus in the environmental education community that education ought to produce sustainable changes, outdoor study (if available at all) frequently focuses on the study of local nature or ecology without advocating for changed actions (Mckeown, 2003).

A reorientation of education practices that develop “strategies to teach awareness, skills, perspectives, and values that will guide and motivate people to pursue sustainable livelihoods, participate in a democratic society, and live in a sustainable manner” (Mckeown, 2003, p.120) will be necessary to achieve the goals set forth in the international environmental education agreements such as Belgrade, Tbilisi, and *Agenda 21*. This transition between localized nature studies and creating environmentally responsible behaviors should be a natural one: the diverse experiences of outdoor classrooms provide easily accessible tools to understand the natural world and to act sustainably (Desmond et al., 2002; Duderstadtt, 1996).

Learning Development Theories, Models, and Movements

Much of modern environmental education can trace its roots to the developmental theories of Jean Piaget. Piaget believed that all stages of development are directly influenced by the organization of one’s environment. At each stage of development the child must assimilate, or interpret, new information based on previous knowledge and then make accommodations to utilize newly acquired information (Hart, 1979; Hoyt, 1991). This continuous process of acquiring knowledge and then using this knowledge to construct new knowledge came to be known as constructivism (Athman & Monroe, 2001; Knapp, 1996; Yager, 1991).

Constructivism encourages students to look at the whole picture and to synthesize facts and different disciplines rather than merely participate in rote memorization (Clifford Knapp, 1992). Environmental education fits the models for constructivist theories because it is something students do, not something that is done to them (Athman & Monroe, 2001). In this way students actively generate knowledge and construct meanings through their own questions, planned investigations, and problem solving (Association for Experiential Education, 2007-2008; Athman & Monroe, 2001).

In constructive and progressive models of education learning occurs through the integration of cognitive processes across time. In 1956, Benjamin Bloom and colleagues derived from constructivist ideals the three domains of educational activity. Referred to as Bloom's Taxonomy, these are among the most widely accepted models for designing and assessing educational activities because of their ability to quantify and rank types of thinking and educational activities. These domains include cognitive or mental skills, affective or attitudinal skills, and psychomotor or physical skills (Clark, 1999). Within each domain, subdivisions of how learning occurs are outlined from simplest to most complex. For example, in the cognitive domain the simplest way of learning is to recite facts. The deepest level of learning occurs when one pulls together multiple pieces of knowledge to synthesize and evaluate. In the affective domain, the first step is for the learner to demonstrate willingness to listen and to pay attention. Next, the learner responds by taking action, attributing value to a related object, phenomenon, or person in light of new knowledge and evidence, and finally incorporates the experience into their own value system (Bloom, 1956; Clark, updated 2009). Environmental-based programs are often commended for the ways in which they enable students to function and synthesize information higher up within the domains (Lieberman & Hoody, 1998b), thus performing better and retaining information longer than occurs in learning situations where lessons remain lower on the domain (Braund & Reiss, 2004; Lieberman & Hoody, 1998b).

As with Bloom's taxonomy, Barriault (1999) believes that a hierarchy of behaviors can be used to convey depth of behaviors. As students work through an exhibit or learning experience they should progress from initiation to transition to breakthrough behaviors. Acting out a behavior is the initiation stage. Here students gather information while simultaneously assessing and establishing their feelings of safety. Once a student feels comfortable, is engaged, and has made a positive association he or she moves to transitioning behaviors and will be likely to repeat an activity. After this point the student reaches breakthrough behaviors that allow the student to refer to past experiences, identify relevance, and seek and share information, thereby restarting the scientific process and engaging in meaningful learning experiences. When routinely working in the higher domains, students perform better and retain knowledge longer than in learning situations where lessons remain lower on the domain (Braund & Reiss, 2004; Lieberman & Hoody, 1998b).

Another model that diagrams a theory for how learning engagement might be maximized outside of a traditional classroom setting is Braund and Reiss' *Contextual Model of Learning in Informal, Out-of-School Contexts* (a modification of the Falk and Dierking model). In the original publication Falk & Dierking (2000) examined hundreds of studies reflecting the ways learning occurs specifically within the context of museum settings. They identify the three contexts as being the personal, social, and physical; they list eight factors as sub-headings under these that collectively contribute to a museum or out of classroom interpretive learning experience.

Table 1 Summary of Falk and Dierking Model for Best Practices in Museum Learning

Learning Context	Factors that Influence Museum Learning	Comments
Personal Context	1. Motivation & Expectations	If the individual is motivated and their expectations are met learning will occur.
	2. Prior Knowledge, Interests, & Beliefs	These three are highly personal at a museum influencing which museum and what exhibits an individual attends.
	3. Choice & Control	Learning peaks when an individual has both of these while learning. May be present more frequently in museum settings than other learning environments.

Sociocultural Context	4. Within-group Sociocultural Mediation	The peers or family group that come to the museum with an individual who will influence their experience.
	5. Facilitated Mediation by Others	The experience will be influenced by others outside of ones own group, e.g. by staff members.
Physical Context	6. Advance Organizers & Orientation	The pre-trip preparation, advance orientations, or documents a facility provides will impact learning.
	7. Design	How form and materials of space and exhibit influence multiple senses will affect learning.

8. Reinforcing Events & Experiences	Effective education pulls from prior knowledge by appealing to pop culture or current events and situates the exhibit in larger context.

The Braund and Reiss model it is the overlap of personal, physical, and socio-cultural learning contexts that causes increased motivation in educational settings (Braund & Reiss, 2004; Falk & Dierking, 2000; see Figure 1).

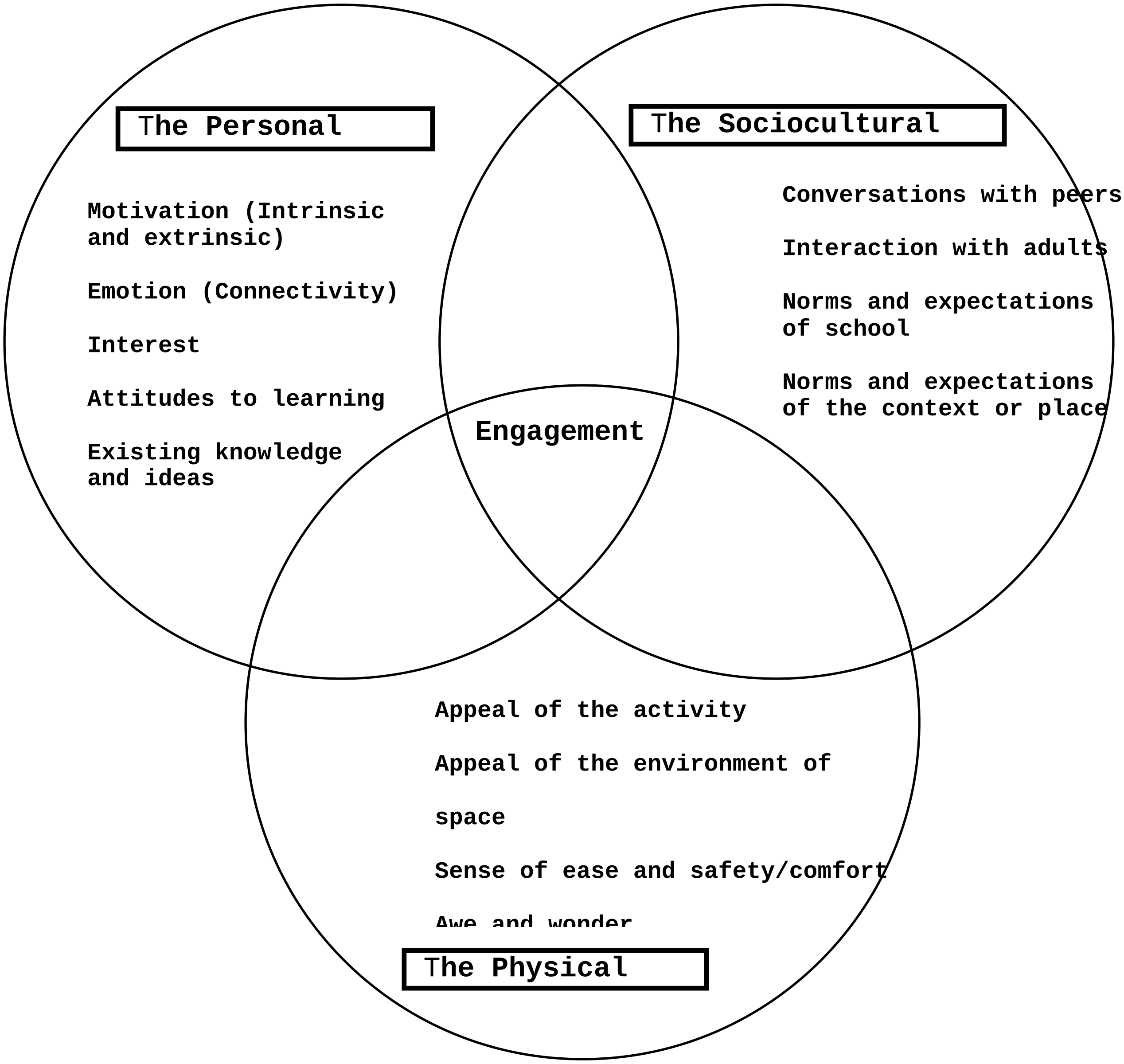

Figure 1. The Braund & Reiss contextual model of learning in informal, out-of school contexts

Braund and Reiss kept these three contexts as central to their model for optimal motivation and learning experiences and broaden the model to include twelve factors that influence learning and motivation. These factors are shared across interpretive centers such as museums, outdoor classrooms, freshwater habitats, field centers, botanical gardens, zoos, farms, industrial sites, and field trips aimed at teaching physical sciences through interactive and hands on experiences. Shared characteristics of these interpretive centers are that they offer novel experiences, physical manipulation of objects, concrete examples, application of scientific process and inquiry skills, sensory stimulation, contextualization of concepts within learner experiences, and identification of relationships between objects or sequences. In essence, interpretive centers, including outdoor classrooms, provide a context for constructivist learning to occur (Braund & Reiss, 2004).

In the personal context, students may demonstrate increased motivation, interest, and attitude simply because they are engaged in a new learning situation outside of the traditional classroom environment. In the socio-cultural context, students are permitted to have additional conversations with their peers and teachers that might be suppressed inside the classroom while becoming more engaged in the greater community as a whole. In the physical context, they may experience awe and wonder at increased sensory stimulation throughout their new activities. The combination of these three domains is what leads to a maximally motivating learning situation (Braund & Reiss, 2004; Falk & Dierking, 2000).

Motivation, Interest, and Intrinsic Motivation in Education

Notions that students learn through active and constructivist processes are commonly accepted today, but prior to the 1950s behaviorist theories initiated by psychologists like B.F. Skinner, assumed students' responses to be mindless conditioning. Motivation and educational behavior theories that began to evolve after that time period focused on the individual or student as the one who made the decisions, actively processed information, and engaged in activities at his or her own will (Maehr & Meyer, 1997; Pintrich, Cross, Kozma, & McKeachie, 1986; Schunk, 1992; Weinstein & Mayer, 1986). Motivation was recognized as being highly contextual and domain specific (Linnenbrink & Pintrich, 2002; Maehr, 1974, 1984) and the meaning or motivation behind a certain task was a process of individual constructions (Cobb, Gravemeijer, Yackel, McClain, & Whitenack, 1996; Middleton & Toluk, 1999). Motivation is fluid, varying depending upon the situation and context (Linnenbrink & Pintrich, 2002; Middleton & Toluk, 1999). It may be enhanced by attention grabbing "catch techniques" such as new instruction methods or "hold techniques" (Linnenbrink & Pintrich, 2002, p. 319), which make the content useful and purposeful to the learner (Mitchell, 1993).

The motivation behind why someone chooses to do something is often divided into two types: intrinsic and extrinsic motivation. Intrinsic motivation is the "motivation to engage in an activity for its own sake, whereas extrinsic motivation refers to motivation to engage in an activity as a means to an end" (Linnenbrink & Pintrich, 2002, p. 319). Many researchers agree that intrinsic motivation is a more interesting, positive, and enduring way to motivate individuals because it gives the individual the optimum sense of challenge and responsibility for the outcome. In effect, intrinsically motivating activities enhance interest (Csikszentmihalyi, 1978; Csikszentmihalyi & Nakamura, 1989; Maehr, 1974, 1984). Metaphors to describe intrinsic and extrinsic sources of motivation generally display intrinsic motivators as positive and extrinsic motivators as negative. Theories or practices that stress external motivators are termed "push theories" and, according to Kelly, are represented by a pitchfork prodding an animal to do something.

Intrinsic motivators are deemed “pull theories” and offer the student a proverbial carrot (Kelly, 1958; Middleton & Toluk, 1999).

Kohn (1999) explains that extrinsic motivators can be divided into two categories: punishments and rewards. He contends that rewards, in the form of grades, incentives, or scores can be equally damaging as punishments for the ways in which they undermine intrinsic motivation: “the more you reward people for doing something, the more they tend to lose interest in whatever they had to do to get the reward” (Kohn, 1999, p. 98). In environments driven by the external, individuals may do the bare minimum that allows them to escape punishment and may cut corners or even cheat to deliver the expected performance. When scores or test performances are upheld as the educational ultimatum creativity, curiosity, enjoyment, and true learning diminishes. According to Kohn, allowing schools to focus on adding substantive and engaging student activities, rather than on how students or schools are performing will an create atmosphere in which students are interested and feel comfortable and confident to take risks and engage in true inquiry (Kohn, 1999).

The presence of an internal motivator is referred to by de Charms as an “origin experience” where one originates his or her own outcome, versus an external motivator as being a “pawn experience” where one is manipulated and pushed around by the desires of others. His concern is that in the traditional classroom students are obligated to spend more time as pawns and less time as originators and that this severely hampers their motivation, interest, and performance. de Charms describes the paradigm between the two types of motivation this way:

> Originating one’s own actions implies choice; choice is experienced as freedom; choice imposes responsibility for choice-related actions and enhances the feeling that the action is ‘mine’ (ownership of action). Put in the negative, having actions imposed from without (pawn behaviors) abrogates choice; lack of choice is experienced as bondage, releases one from responsibility, and allows, even encourages, the feeling that the action is ‘not mine.’ (de Charms, 1984, p. 279)

Throughout de Charm’s research in the 1960s and 1970s with the Carnegie Corporation, he and his associates conducted studies on whether teachers who treated their students as initiators would see differences in the students’ personal causation and academic gains. Over four years they measured the students’ motivation and academic achievements on the Iowa Annual Test of Basic Skills. Each year the students who received the training on being originators of their realities were closer to performing at their grade level than their peers who did not receive the training. To de Charms, classroom motivation levels can best be described as having a curvilinear relationship that is governed by teacher dominance combined with number of student choices and pupil motivation. On one end of the spectrum if the classroom structure is too rigidly structured or on the other end if it is completely unstructured there will be an overall decrease in student motivation. The optimum motivation occurs in a classroom that has a medium level of teacher enforced structure combined with student choices (de Charms, 1984).

According to Lepper and Hodell (Lepper & Hodell, 1989), the four components essential to intrinsic motivation include 1) challenge, 2) curiosity 3) control, and 4) fantasy. Having challenge provides variety and a situation that encourages curiosity, “provide[ing] students with information or ideas that are surprising, incongruous, or discrepant to existing beliefs and ideas" (p. 91). Having control over a situation makes students feel empowered, and indulging in fantasy allows them to expand horizons to have experiences that may otherwise be unattainable (Lepper & Hodell, 1989). Additionally, it is generally recognized that intrinsically motivating activities result in increased interest, engagement, and ultimately, gains in academic achievement (Kohn, 1993, 1999; Meece et al., 2006; Schmidt et al., 2007; Shernoff & Csikszentmihalyi, 2009).

Csikszentmihalyi and Nakamura found in their studies that rats and humans would seek optimal arousal whenever possible and concluded that it was intrinsic motivation that led their subjects to seek curiosity and novelty. In 1970, they termed the optimum state of performance "flow" and used this to describe a state when individuals are so engaged that they cannot do anything else, possibly disregarding social norms or conventions. Many of their subjects did not reach flow until both mind and body were engaged (Csikszentmihalyi & Nakamura, 1989). Motivated individuals in numerous contexts demonstrate the same patterns by continually choosing their selected activity over others and by demonstrating persistence, improved performance, and continued motivation in the absence of external prompts (Maehr, 1984).

To summarize their findings combined with research of other educational psychologists on motivation needs in education, Shernoff and Csikszentmihalyi (2009) devised a *Conceptual Model of Student Engagement and Optimal Learning Environment* in which it is intensity combined with positive emotional response that are the overarching aspects necessary for optimum motivation. Academic intensity is driven by both challenge and relevance, and positive emotional responses are directly influenced by students' abilities to demonstrate skills, feel in control of their learning, and participate in high activity levels. Both enjoyment and interest appear to drive long-term performance and motivation. Other factors that are recognized as contributing to motivation in educational experiences are cooperative or social learning, and lessons that are learner-centered (Kohn, 1993, 1999). While often utilized in elementary school classrooms, the benefits of such experiences extend throughout the middle school years (Meece, 2003).

Beginning in the 1980s other educational psychologists began formally associating motivation with the need to achieve goals (Meece et al., 2006). Achievement goal theorists, "view behavior as purposeful, intentional, and directed toward the attainment of certain goals" (Meece et al., 2006, p. 490). The theorists examine why students choose and persist at certain learning activities as well as how much effort and engagement is necessary for learning to occur. Achievement goal theorists believe that two types of goals exist: 1) mastery or learning goal orientation and 2) performance goals. In mastery goals, there is a marked desire to improve knowledge and skills and to understand concepts. In this type of goal, the focus is on success and motivation by and for the self. Mastery goals are associated with learning strategies that result in deeper comprehension, enduring motivation, and increased performance. In contrast, performance goals are more focused on competition and comparisons with others and may rely heavily on superficial learning strategies (Graham & Golan, 1991; Meece, Blumenfield, & Hoyle, 1998; Meece, 2003).

Learning environments centered around performance goals may, in some situations, lead to negative student behaviors like procrastination and cheating (Anderman, Griesinger, & Westerfield, 1998; Urdan, Midgley, & Anderman, 1998). Ironically, other sources document that motivation strategies in the classroom environment may switch from mastery to performance goals during middle school years. When compared to elementary school teachers, middle school teachers frequently use teaching practices that emphasize rote memorization over student conceptualization (Meece, 2003; Midgley, Anderman, & Hicks, 1995).

Are Middle Schools Failing to Meet Students' Motivational Needs?

Many educators feel that naturally children do not need to be motivated (Berliner, 1989; deCharms, 1984; Kohn, 1999). Kohn states, "from the beginning [children] are hungry to make sense of their world. Given an environment in which they don't feel controlled and in which they are encouraged to think about what they are doing (rather than how well they are doing it), students of any age will generally exhibit an abundance of motivation and a healthy appetite for challenge" (Kohn, 1993, p. 198, parenthesis his). However, in many schools, particularly American public schools, boredom, disengagement, and frustration abound. The least engaging work of lectures, individual work, and taking notes are the dominating tasks (Cothran & Ennis, 2000; Shernoff & Csikszentmihalyi, 2009). Referring to his 2001 dissertation, Shernoff declares "high school students were less engaged in their classrooms than anywhere else. Their concentration was higher than outside of classrooms, but their interest was lower and their enjoyment was especially low. Students were found to be thinking about topics entirely unrelated to academics a full 40% of time in classrooms" (Shernoff & Csikszentmihalyi, 2009, p. 134).

Beginning in the 1980s some educators and organizations began to articulate concerns that the practices of many American middle schools were not in alignment with the developmental stages of adolescents (Carnegie Council on Adolescent Development, 1989; Eccles & Midgley, 1989b; Stipek, 1984). Around this same time the American Psychological Association published guidelines prompting for learner-centered principles to be directed toward middle school education (Meece, 2003). These principles stressed a framework for learning where learning is a constructivist process initiated by the student and emphasis is placed on developing relevancy and connections to prior experiences (McCombs & Whisler, 1997; Meece, 2003). These suggestions mirror those adopted by the National Research Council and were eventually incorporated into the 1999 National Science Standards, which place emphasis on inquiry and student-directed problem solving (National Research Council, 1999).

Older students should be expected to perform frequently at higher cognitive levels, to take more ownership for their learning projects, and to be challenged to work on more real world inter-disciplinary problems than elementary students. However, many middle schools fail to offer tasks that involve intrinsic motivation, freedom of choice, active constructions, mind plus body engagement, and novelty, and are often failing to meet middle school students' needs (Anderman, Maehr, & Midgley, 1999; Carnegie Council on Adolescent Development, 1989; Eccles & Midgley, 1989a, 1989b; Meece, 2003; Middleton & Toluk, 1999; Wigfield, Lutz, & Wagner, 2005). Maehr addressed these failings succinctly: "at a time when the adolescent is seeking to explore his/her individuality, the school environment is likely to stress external control, reduced freedom and choice, more structured learning experiences, and less openness to individualization of learning" (Maehr & Meyer, 1997, p. 21).

Sex Issues in Science and Motivation

Motivational needs may be unique to each sex and research continues to unveil ways in which males and females experience learning environments differently. Research has been done examining differences between males and females within classroom environments and is growing about differences in non-traditional learning environments. Familiarity with natural settings appears to enhance learning in both sexes. Fears, perceptions, engagement, and modes of learning may differ by sex, and affect motivation and optimal performance (Bixler & Others, 1994) and the roles sex plays within different learning environments is a prevalent research topic.

Interestingly, within classroom environments, females have demonstrated higher flow than males (Shernoff & Csikszentmihalyi, 2009) and in some studies they outperform their male peers (Buzhigeeva, 2004; Gurian & Stevens, 2005). Some attribute boys' lesser engagement in classrooms to many of them being kinesthetic and impulsive learners (Buzhigeeva, 2004; Gurian & Stevens, 2005) who may benefit from more action-oriented activities (Taylor & Lorimer, 2003). Less research exists documenting how sex influences outdoor learning experiences. Benefits in some form, however, are frequently seen in both sexes in outdoor learning (Metro, 1981). In a 2007 study that examined outdoor treatments combined with environmental education curricula that looked at variables of knowledge of environment, attitudes, behaviors, and comfort, boys in the outdoor classroom treatment environment had score gains across all domains. Girls had gains in knowledge levels, but did not show statistical changes in attitudes (Carrier, 2009). During such authentic learning experiences, brain-based studies demonstrate increased engagement for boys and girls over that seen with more traditional learning environments (Kaufeldt, 1999; Konecki & Schiller, 2003).

Boys and girls also differ in their perceptions of the environment. Girls look at their environment more relationally, and boys tend to objectify it (Loughland, Reid, & Petocz, 2002). For the majority of both sexes, environment is perceived as separate from them, rather than something they are integrated with. These trends appear to have effects on students' propensity toward environmental actions (Loughland, Reid, & Petocz, 2002; Loughland, Reid, Walker, & Petocz, 2003). In a study of 5th grade students' forest experiences, sex did not play a role in overall enjoyment and more than 90% of students displayed enjoyment. When asked how they spent their time, 'explore' was the most frequently cited behavior for both sexes, with girls listing it more times than boys. Boys more frequently listed 'sports' and 'play'. Camping and observing plants and animals were listed in nearly equal amounts for both sexes (Metro, 1981).

Some researchers have sought to address how previous outdoor experiences influence fears and ease of learning in outdoor settings. In one study, the fears of boys were formulated from direct experiences, whereas origins of girls' fears could be traced to third party sources and the media rather than direct experience (Bixler & Others, 1994; Ollendick & King, 1991; Ollendick, Matson, & Helsel, 1985). Girls also communicated more fears verbally and in overt behaviors than boys of the same age (Bixler & Others, 1994, Ollendick & King, 1991).

Researchers have concluded that these discrepancies may be a result of fewer opportunities given girls to engage and explore the outdoors away from home (Bixler &

Others, 1994; Ollendick & King, 1991). Across the world, boys are permitted to explore the natural world more frequently and sooner than their female peers (Bixler & Others, 1994; Hart, 1977; Webley, 1981). Boys are more likely to have participated in outdoor programs or to have visited parks or wilderness settings, giving them more knowledge and familiarity with nature before coming to an outdoor learning experience than their female peers (Falk, Martin, & Balling, 1978; Hart, 1977; Watson, Williams, Roggenbuck, & Diagle, 1992). This may be important if female students come to an outdoor learning experience with fewer previous exposures, because studies show that unfamiliarity may lead to less interest and less learning (Falk et al., 1978). Additional studies have documented that a lack of familiarity with the outdoors may create initial discomforts in both sexes that must be addressed to maximize learning outcomes (particularly among urban students) (Bixler & Others, 1994; Falk et al., 978). Educators should strive to meet the comfort needs of both genders because students who are overly fearful in an outdoor learning experience may learn less as new and foreign stimulations cause cognitive chaos to occur (R. Kaplan & Kaplan, 1989; S. Kaplan & Kaplan, 1982).

Labs and Traditional Classrooms versus Natural Learning Spaces

Students learning in the lab or in a traditional classroom who do not have access to real data or purposeful inquiry, may not see the connections or relevance of pre-determined experiments to their everyday lives (Meece et al., 2006). Experiments conducted in a lab or traditional classroom can seem stagnant, abstract, or without context with little data being drawn from the real world (Lepper & Hodell, 1989). Students may not perceive that science and inquiry are a way of life or understand how to go through the scientific method without teacher assistance (Rahm, 1999). Such prevailing educational dilemmas are identified by Volk and Cheak:

> Traditional learning contexts are typically textbook driven and discrete content areas are taught in isolation with little integration of the curriculum. Teachers typically dominate the instruction and make the bulk of the instructional decisions. Many students find such contexts boring and irrelevant. Students from diverse backgrounds are even more at risk to be disconnected and even confused by the mismatch with their cultural bonds. Contexts such as these impoverish any chance for motivation or critical thought. (2003, p. 23)

In contrast to contrived and artificial learning environments, environmental education is often experiential, learner-centered, and place-based. In environmental education student directed learning through inquiry dominates over teacher led inquiry (Doyle & Krasny, 2003). If students are learning about science within their own backyard or schoolyard through projects such as a garden, they have been shown to take more initiative and ownership over their learning (Rahm, 1999, 2002). Other documented benefits of environmental education are that it promotes greater civic engagement and may lend itself to more multidisciplinary and interdisciplinary opportunities than more traditional approaches to education (Lieberman & Hoody, 1998b; Volk & Cheak, 2003). Because the environment includes everything around, outdoor learning situations do not have the same artificiality as a laboratory and students may see more unaltered interactions of the natural and physical sciences. Through environmental education the social sciences can be incorporated to demonstrate how resources have been utilized within societies across time. In discussing the research of David and Weinstein, Hoyt concludes that, "Nature fosters a sense of place... supports exploration behavior, and develops social cooperation" (David & Weinstein, 1987; Hoyt, 1991, p. 25).

Education that occurs in the outdoors also has the added benefit of contributing to students' psychological well being. The outdoors has always provided engaging activities for students and is one of the most stimulating and preferred places for people to think and philosophize (Francis, 1988). Measurements of adult mental health, relaxation, and mood are enhanced by exposure to natural settings and exposure to photographs of natural settings (Hoyt, 1991; Ulrich, 1981). Psychological testing has demonstrated a preference for natural environments over built environments in both adults and children (Hoyt, 1991). Natural spaces are often self-selected safe havens for many children between the ages of 7 to 14 (Thorp, 2001). This drive to be around nature and wild things appears to be deeply embedded within us and is what Edward Wilson describes as "biophilia" (1984, 2000). Appealing to this affinity appears to make education more engaging (Cline et al., 2002; Desmond et al., 2002; Lieberman & Hoody, 1998a; Volk & Cheak, 2003).

Intelligences and Learning Styles

Environmental education is accessible to students because it engages the senses and appeals to more styles of learning and multiple intelligences more than classroom learning (Lieberman & Hoody, 1998b; North American Association for Environmental Education, 1999; Rahm, 1999). Learning styles represent an individual's preference or tendency for how to best learn information (Sternberg & Grigorenko, 2001). One of the more well known, valid, and reliable classification systems for learning styles is from

Dunn, who identified five basic learning styles: auditory, visual, tactile, kinesthetic, and kinesthetic/tactile (Dunn, Dunn, & Price, 1987; Gregory & Chapman, 2007). Environmental education offers enhanced learning opportunities through utilizing multiple learning styles and is particularly beneficial to tactile, kinesthetic, and tactile-kinesthetic learners. This is because tactile learners learn best through physically manipulating materials and having concrete experiences, kinesthetic learners need to move and do, and tactile/kinesthetic learn best through whole body movement (Dunn et al., 1989; Gregory & Chapman, 2007).

Inquiry based environmental education is thought to be helpful to kinesthetic learners because it allows them to be doing active things, which often include their whole bodies. In contrast, traditional classrooms and tests only cater to a few learning styles (Braund & Reiss, 2004). In the classroom, auditory learners who excel in lecture-based environments are often favored. Students in the outdoors are given the opportunity and encouraged to utilize various learning styles through the use of hands on activities and opportunities for integrating multiple subjects (Bainer, Cantrell, & Barron, 1996; Cline et al., 2002). Additional testing methods, such as self- and peer-evaluations, journals, and portfolios, enable outdoor environmental educators to have a broader scope of assessment than exist in the traditional classroom (Hogan, 1994).

In contrast to learning styles, “intelligences” are considered to be the tendency or learning type of an individual. In 1983 Howard Gardner first proposed a theory of multiple intelligences in which he described seven distinct tendencies of how individuals best learn and organize knowledge. These intelligences were 1)Musical intelligence, 2) Bodily-Kinesthetic Intelligence, 3)Logical-Mathematical Intelligence, 4) Linguistic

Intelligence, 5)Spatial Intelligence, 6)Interpersonal Intelligence, and 7)Intrapersonal Intelligence. Those with musical intelligence seem to show innate sensibilities for learning and performing music. Bodily-Kinesthetic intelligence enables one to excel at sports or physical activities. Logical-Mathematical propensities create quick problem solving skills, ability to draw conclusions from a sequence of events, and logically deduct answers. Linguistic intelligence governs the ability to string words or communications together. Spatial intelligence enables one to understand navigation and maps as well as visualize objects from all sides or imagine a dimension that is not visible. Interpersonal intelligence allows people to identify with motivations, intentions, and moods of others. Those with intrapersonal intelligence have strong intuitive and emotional sensibilities. They are highly aware of their own feelings and emotions. Gardner's definition of intelligence involved propensities with biological and psychological origins unique to the individual (Gardner, 1999, 2006; Krechevsky & Seidel, 1998, p. 22). While a learning style is a different approach or preference that is used by an individual across different content areas (Sternberg & Grigorenko, 2001), every individual possesses all of the intelligences to some degree, but it is the capacity to develop some over others that determines in which areas the individual is dominant or gifted (Gardner, 1999; Krechevsky & Seidel, 1998). For each of the described intelligences, Gardner identified talents and strengths that an individual might possess at the start of their formal education experience.

In 1999, he expanded his original seven by adding an eighth that he dubbed, "Naturalist Intelligence." A person who exemplifies this intelligence has strong observatory, classifying, pattern recognizing, and sorting tendencies. Naturalists excel in life sciences and nature studies and may have heightened interactions with other species. Gardner argued that by giving children frequent exposure to as many intelligences as possible their career options, abilities to sort and classify, and the development of their language skills may be enhanced (Gardner, 1999). Using projects to allow students to utilize multiple intelligences may also help them to develop more respect for how others learn (Krechevsky & Seidel, 1998).

By integrating multiple ways of knowing and learning in the everyday classroom, educators may finally allow what Gardner has dubbed “real learning” to occur. George Nelson, reflecting on Gardner’s *The Unschooled Mind* (Gardner, 2004), and what constituted real learning, concludes that real learning is action oriented and changes perceptions and thoughts. Beyond facts and figures, real learning gives ability to function in real world situations and to continue applying knowledge outside of the classroom (Nelson, 2006). Real learning gives explanations, meaning, and extensions to experiences (Beard, 1998; Newmann, Marks, & Gamoran, 1995). Student interest is best elicited through hands-on, sensory and inquiry driven constructivist learning where the affective and cognitive domains are merged (Nava-Whitehead, 2002). Through participating in environment-based activities students are given the opportunity to learn about and internalize their own surrounding environments, and extend their discoveries and excitement to their classroom, the school, parents, and the community (Twiss et al., 2003; Volk & Cheak, 2003).

Politics and Accessibility of Environmental Education

Beginning in the 1980s increasing mandates for conservative education practices led to a back-to-the basics approach that thwarted existing progressive models for education (Kohn, 1999). Many of these mandates were in response to *A Nation at Risk: The Imperative for Educational Reform,* published in 1983 (The National Commission on Excellence in Education, 1983). This report documented that schools in the United States were not keeping up with schools globally and that test scores in most of the subjects, including science, were declining. This report, combined with others throughout the 1980s, called for a return to textbook-based learning, decreases in extracurricular activities, and increases in standards and accountability. During this time the development of garden-based learning programs and other outdoor classrooms suffered (Desmond et al., 2002; Gruenewald & Manteaw, 2007). The practices of isolating schools from the community, fragmenting curriculum, and increasing standardization were prevalent (Kohn, 1999), creating conflicts with the goals of environmental education (Gruenewald & Manteaw, 2007).

Progressive educators, however, continued to advocate for experiential and project-based learning over standardized, textbook directed studies. The debate between progressive and conservative education practices became prominent once again during the early 1990s as progressive educators spearheaded these efforts (Kohn, 1999). This led to reforms such as the National Science Education standards which recommended reforms throughout K-12 programs including multi-disciplinary programs that emphasized hands-on inquiry and curricula that included natural processes related to everyday life (National Research Council, 1999). The inquiry standards within these programs asked students to make observations, pose questions, plan investigations, and use tools and technology to solve problems. Teachers served as the facilitators and directed student inquiry. As part of these standards, by grades 5-8 students were to recognize linkages between environments and human health and well-being (National Research Council, 1999).

In 2001 Congress passed the No Child Left Behind Act (Boehner, 2001), which created an education culture dominated by accountability through standardized tests. Developing math and reading skills usurped other subjects (Gruenewald & Manteaw, 2007). Contemporary environmental education experts were concerned how such legislation would affect environmental education and feared that if standards did not specifically address environmental literacy, that environmental curricula would be further and further marginalized (Elder, 2003). Many environmental educators responded by either adapting their curricula to demonstrate “measurable student learning in the tested content areas” (Gruenewald & Manteaw, 2007, p. 176) or by resisting the accommodation rules which redefined student or school accountability . Gruenewald argued that reducing environmental education to what could be demonstrated on standardized tests severely narrows the scope of what could be taught and undermines the aims of creating a society interested in sustainability (Gruenewald & Manteaw, 2007).

As the debate over the No Child Left Behind Act of 2001 continues, some are asking to what degree the current science standards can be accomplished using traditional and conservative education practices driven by national textbooks with little relevance to a student’s local environmental setting and where teachers may not have access, time, or funds to make extensive use of off-campus interpretive centers (Elder, 2003; Harvey, 1990; Simmons, 1993). Instead, creating spaces where accountability is measured not only by individual student, teacher, or school performance, but by the development of community, institutions, and relevancy will create a more transformative and enjoyable educational system for students and their communities (Gruenewald & Manteaw, 2007). Localized outdoor environmental studies have historically created a way for students to develop relationships with the environment and can also help schools to meet the objectives laid out in local and national science standards. Learning about the environment locally creates an intimate knowledge of a place, which elicits ownership and knowledge gained from discovering and rediscovering the same place (Braund & Reiss, 2004; Duderstadtt, 1996).

Related Studies in Environmental Education

The existing literature displays positive results after the implementation of environmental education programs in a various settings. Students in grades K-12 have repeatedly been shown to be more engaged, motivated, and willing to actively participate in their classrooms and communities when engaged in learning in natural settings where they are actively using their own questions to construct meanings (Desmond et al., 2002; Lieberman & Hoody, 1998; Thorp, 2001; Volk & Cheak, 2003). This type of education often leads to improved academic performance and test scores that are superior to their peers engaged only in traditional classrooms (Glenn, 2000; Lieberman & Hoody, 1998; Nava-Whitehead, 2002; Rahm, 2002; Thorp, 2001; Volk & Cheak, 2003).

The Florida Schoolyard Wildlife Project

Cline, Cronin-Jones, et al. (2002) collaborated with the Florida Schoolyard Wildlife Project to study the extent that community involvement contributes to the successes of schoolyard ecosystem restoration projects implemented in the 1990s. The study used quantitative methods based on Bennett's model (1989) to evaluate the wildness of environmental education sites and then used qualitative methods, including interviews, videos, and surveys of schoolyard facilitators, teachers, students, administrators, groundskeepers and community members to assess program efficacy. The researchers examined programs at ten schools. Program successes were independent of the amount of financial contributions. Programs that were considered most successful relied on the work of committees and local experts to become established, and were rich in material and time donations from community members. These programs were frequently utilized by an entire school, were used to reinforce traditional classroom concepts, and were administered by teachers using available existing environmental education curricula such as Project WILD. According to the researchers, all successful schools had abundant community involvement (Cline et al., 2002). Weaknesses perceived in established facilities included minimal use, maintenance problems, and trying to obtain continual funding to maintain the facilities.

Teachers contributed to program weaknesses when they did not work together as a team to develop habitat facilities, did not coordinate with other teachers, and failed to provide introductions or training to new teachers (Cline et al., 2002). Additionally, teachers limited program successes when they had attitudes of discomfort about being in the outdoors. Science was the subject area that was taught most in the restored outdoor habitat areas. Throughout all of the outdoor areas gardening and animal activities were done frequently and were the most favored use of outdoor areas by students. Despite some minor hesitations and fears about spiders, snakes, and bee stings, "virtually all students said that they did not get to spend as much time as they would like to in their schoolyard sites" (Cline et al., 2002, p. 15).

Environmental Education and Community

Volk and Cheak (2003) studied the effects of an environmental education program on students, parents, and community. This five-year longitudinal study examined 5th and 6th grade students in an environmental education program in Molokai, Hawaii using qualitative and quantitative methods. The study was based on the curriculum, *Investigating and Evaluating Environmental Issues and Action (IEEIA),* which was designed in 1996 (Hungerford, Litherland, Peyton, Ramsey, & Volk, 1996). This "skill development program [is] designed to help learners take an in-depth look at environmental issues in their community, to make data based decisions about those issues, and to participate in issue resolution" (Volk & Cheak, 2003, p. 12). In this study, the *IEEIA* curriculum was used as an umbrella for different content areas. Students had choices and influences over their learning experiences because they could select issues, research, investigate, and make recommendations based on findings. Half of the 5th and 6th grade students participated in the *IEEIA* curriculum while the remaining students provided a control for comparison.

Quantitative surveys were used to assess student environmental literacy, reading and writing literacy, and critical thinking skills (Volk & Cheak, 2003). The Critical Thinking Test of Environmental Education, (CTTEE) was the Middle School Environmental Literacy Instrument (MSELI) (Bluhm, Hungerford, McBeth, & Volk, 1995) to examine students' environmental literacy. Students in the IEEIA program demonstrated significant differences between the two groups of IEEIA or non-IEEIA groups. "*T* test comparison between the two groups indicated that the IEEIA students significantly outscored the non-IEEIA students on the critical thinking skills measured on this test" (Volk & Cheak, 2003, p. 15). The IEEIA students outscored non-IEEIA students on five of the eight subtests of the MSELI. Subtest results that demonstrated statistical significance included areas such as Knowledge of Issues, Ecological Foundations, and Issue Analysis. Higher percentages of IEEIA students considered themselves knowledgeable about the environment, believed they could make a difference for the environment, and reported higher levels of environmentally responsible actions.

Qualitative data included interviews with all stakeholders and newspaper clippings from the period within the study (Volk & Cheak, 2003). Qualitative findings demonstrated that students who participated in the program demonstrated awareness of environmental issues and felt empowered to become citizens who could resolve conflict and work toward environmental changes within their community. The program also encouraged community receptivity to changes and solutions offered by the students. Students showed eagerness to read from a variety of texts challenging for their age levels, including scientific and technical writings, expert opinions, and public records and adapted their reading strategies by working together in groups to decipher difficult reading material. Students conveyed feelings of accomplishment when they completed difficult tasks and studied texts conceptually rather than as isolated facts. They began to author a regular column in their local community paper on environmental topics. Parents noticed that writing improved when the students had an authentic purpose and were writing to solve real world problems.

Oral communication skills improved as students presented their findings at a public symposium and later went on to give presentations off the island to legislators (Volk & Cheak, 2003). Participating in the project enabled the students to have exposure to technology as they worked together to create presentations for the public of their findings. Special needs students also felt successes through IEEIA and some were able to exit the special needs program. Developing so many types of skills made students, regardless of academic standing or home life, feel empowered to succeed. Teachers found that by sequencing the lessons and instruction time flowed more easily when an environmental program was used as an integrating program for everything else.

Environment as an Integrated Context for Learning

In one of the largest and most comprehensive studies on environmental education ever completed, Lieberman and Hoody (1998a) compared programs in 40 schools across the nation, and conducted interviews with 400 students and 250 administrators who had participated in schools that were utilizing the Environment as an Integrating Context for Learning (EIC) program. Lieberman and Hoody examined standardized test scores, grade point averages, and attitudinal scales. Participating schools included elementary, middle, and high schools that were representative of all economic levels. The degree of natural areas that were available to the students varied widely from large rivers to asphalt playgrounds with small container gardens. At all study sites, the environment was used as the integrating context for different disciplines and students used experience-based education to develop their own project-based activities and problem solving skills. Nearly all classes participating in EIC programs demonstrated, "better performance on standardized measures of academic achievement in reading, writing, math, science, and social studies; reduced discipline and classroom management problems; increased engagement and enthusiasm for learning; and, greater pride and ownership in accomplishments" than schools not participating in such programs (Lieberman & Hoody, 1998b, p. 22).

Similar to the Volk and Cheak study, 100% of the sub-sample of 17 schools that were evaluated for language arts programs demonstrated that students in EIC outperformed their peers in language arts (Lieberman & Hoody, 1998; Volk & Cheak, 2003). Teachers observed improvements in their students' reading, writing, oral skills, and strategy implementation. Scores improved for 71% of the schools and teachers stated that their students demonstrated a deeper understanding of mathematical concepts, while finding math more engaging, and more applicable to daily life than they had previously experienced. In the sciences, students also improved in comprehension of concepts, processes, principles, and abilities to apply these to real world problems than they had displayed before their schools participated in the EIC program. Students also demonstrated understanding of social studies concepts and integration of knowledge of socio-cultural systems with civic, political, and economic processes.

Garden Based Learning

Desmond, Grieshop, & Subramaniam (2002) used qualitative methods to gather information from school gardening practitioners around the world. The researchers sent questionnaires to over 50 experts connected with school gardening programs in central and Latin America, Asia, Africa, Australia, North America, and Europe. They found that school gardens have been used for many of the same purposes across the globe. Gardens were used to support core academic subjects, to enhance mental and physical development, and to foster sustainable development as well as ecological literacy. Gardens were used to teach subsistence and life skills through agriculture education. Garden-based learning had many societal benefits and often fostered community development. Additionally, gardens taught about food security, hunger, and sustainability issues related to both the individual and the global community. Gardens also provided a mechanism to improve school aesthetics and eliminate dullness.

The most successful programs had long-term visionary planning from the beginning and were truly community efforts. It was also important that programs were designed with enough flexibility that they were not dependent on teachers having an extensive knowledge of gardening and horticulture practices. The researchers commented that while even minimal exposure to gardening had intrinsic value, “in the ideal world the garden space would also include a complete horticulture environment including native plants, fruit trees, vegetables, traditional medicine and/or ceremonial plants and fiber plants” (Desmond et al., 2002, p. 30). In Cuba, school gardens were part of the cultural identity, and to be considered fully educated one must have knowledge of the food cycle. In Cuba and in India, gardens were used to teach vocational skills to those with physical and mental challenges. Gardens also provide a means for children in rapidly developing areas to maintain some connections to natural spaces.

An Elementary School Garden

Thorp (2001) examined the impacts of a school garden in partnership with a garden-based curriculum on students and teachers in a mid-western school. Previously this school had not been meeting standards. Teachers were extremely frustrated, had feelings of being trapped, and felt that the current state of affairs of how their school was assessed was dehumanizing. In this situation, the garden brought newfound purpose, wonder, and creativity to teachers and students and provided a mechanism for interdisciplinary curriculum (Thorp, 2001). Data were collected using observations, interviews, and interpretations of student photos and work. Data were collected from five teachers and 40 students. Some of the author's findings included the following: the garden was useful for reshaping school culture, providing students with a place for enriching experiences, creativity, self-expression, and allowing food to be perceived as more than just a commodity. Thorp concludes that, "a living garden is a potent force in reshaping school culture.... As teachers and children continue to experience loss of time, loss of control, and loss of place in their lives.... the garden has provided a venue for healing these wounds of modernity" (Thorp, 2001, p. 138). Additionally this garden provided students with richer educational experiences and transformed their perceptions of food.

Summary

After assessing the literature and related studies, it is evident that learning in multiple types of outdoor environments has been the focal point of many education models throughout history (Desmond et al., 2002; Dewey, 1925, 1929; Fröebel & Hailmann, 1887; Montessori, 1912). Areas with a multitude of available materials and access to natural materials are considered highly motivating and ideal fits for constructivist learning models (Huitt & Hummel, 2003; Yager, 1991). Additionally, areas that provide a context for higher order thinking and may be motivating because they may offer students choices, challenges, and control while appealing to multiple methods of learning (Csikszentmihalyi & Nakamura, 1989; deCharms, 1984; J. S. Eccles & C. Midgley, 1989a, 1989b; J. S. Eccles & C. M. Midgley, 1989; Hart, 1979; Lepper & Hodell, 1989).

While studies continue to document outdoor classrooms as having highly motivating and successful outcomes (Cline et al., 2002; Desmond et al., 2002; Lieberman & Hoody, 1998; Thorp, 2001; Volk & Cheak, 2003), few studies have examined how students perspectives are motivating factors in outdoor environmental education environments (Athman & Monroe, 2004). Environmental educators are also leery how the availability of outdoor learning experiences will be jeopardized by the encroachment of standards-based education (Gruenewald & Manteaw, 2007).

An important consideration is whether the outdoor learning environments are equally motivating to males and females. Within classrooms females in some studies demonstrate greater motivation and outperform males (Buzhigeeva, 2004; Gurian & Stevens, 2005; Shernoff & Csikszentmihalyi, 2009), but in outdoor environments results have been inconclusive (Carrier, 2009). Also, previous exposure to the natural world may temper an outdoor learning experience (Bixler & Others, 1994; Ollendick & King, 1991). This is disconcerting as studies often show that females have less exposure to the natural world which may negatively influence their outdoor learning experiences (Bixler & Others, 1994; Hart, 1977; Webley, 1981).

CHAPTER III

RESEARCH METHODS AND PROCEDURES

Instrument Rationale

This study was modeled largely after Athman and Monroe's 2004 study, *The Effects of Environment-Based Education on Students' Achievement Motivation.* In the original study, over 400 ninth through twelfth grade students in Florida Public schools were examined in a variety of environment-based education programs. The students were assessed using an instrument designed for 9^{th} graders. The 9^{th} graders who participated in the environment-based learning program were compared with a control group of peers from the same school who did not participate and were assessed using a pre-test post-test nonequivalent comparison group design. Pre-tests were not possible for 12^{th} grade students who had already had exposure to the environment-based programs, so a post-test only nonequivalent comparison group design was used for the 12^{th} graders. The study assessed the students' overall motivation levels in school before and after participating in environmental education programs. The researchers used qualitative analysis of student and teacher interviews to further support their findings (Athman & Monroe, 2004).

The Athman and Monroe study was an appropriate one on which to model the current research because it provided an easily duplicated and modifiable study, it was specifically designed to assess motivation in an environmental education program, and it was based

on the well documented student motivation instrument: The Achievement Motivation Inventory (AMI). Additionally, the AMI language was easily modifiable for use with middle school students and could be made specific to outdoor classroom or wetland experiences. Both the Athman and Monroe study and the AMI measure

> overall motivation toward academic achievement through a 20-item inventory that takes approximately 15 minutes to complete. Each item has five response categories: ‘strongly agree,’ ‘agree,’ ‘not certain,’ ‘disagree’, and ‘strongly disagree.’ Items on the instrument are scored as follows: Each of the 20 terms was worth a maximum of five points with a possible total score of 100. For the items stated as positive to achievement motivation, the response ‘strongly agree’ is worth five points, and the responses ‘agree,’ ‘not certain,’ ‘disagree,’ and ‘strongly disagree,’ are worth four, three, two, and one points respectively. For the items stated where achievement motivation is stated negatively, the response ‘strongly agree,’ is worth 1 point and the response ‘strongly disagree’ is worth 5 points. Higher total scores indicate higher levels of achievement motivation. (Athman & Monroe, 2004, p. 14).

The original questions from Athman and Monroe are in Appendix A of this document.

In the Athman and Monroe study the 20 questions from the AMI were subdivided into four domain categories with five questions each. The domain categories were self-efficacy, control, goal orientation, and task value. Pretests were administered to students at a nearby school. The results of the pretests indicated that "the reliability coefficient (internal consistency) of the pilot data (*n* = 81) was .84, as measured using Cronbach's alpha. A factor analysis of the pilot data revealed that a one-factor model accounted for 25% of the variance; 19 of the 20 items loaded onto this factor" (2004, p. 14). At the conclusion of the study, "the reliability coefficient (internal consistency) of the posttest data collected from 9th grade students in this study *n* = 172 was .79 and .78 (*n* =228) for the 12th grade data as measured using Cronbach's alpha" (2004, p. 15).

Athman and Monroe used multiple linear regressions to compare the treatment group with the control and factorial ANCOVA to examine treatment influences. The treatment was seen as statistically significant for 9th grade students. For 12th grade students the treatment was also seen as being statistically significant, however, this finding was tempered by ethnicity. The treatment effect did not make a difference for non- white students, but "white students in the environment-based programs scored 8.56 points higher on the 100 point inventory than white students in the control group" (2004, p. 17).

The current study was modeled after the Athman and Monroe study in that it consisted of a quantitative survey administered twice, with two open-ended questions added on the second survey date. This study was distinguishable from the Athman and Monroe study in several key areas. First, while the original study compared 9th and 12th grade students, this study compared motivation levels between 6th and 7th grade students at two different schools. Next, this study was narrower in focus and examined how participating in two outdoor classroom learning environments affects achievement motivation toward science, rather than motivation more broadly. The number of questions on the survey was reduced from 20 to 12 to make it more accessible to younger grades. An equal number of questions were taken from the original four domains, so the survey would remain balanced. Questions were not analyzed by individual domain because it was thought that this would be a threat to validity. Finally, this study did not have a control group and statistically controlled only for sex and school. (Since 6th and 7th grade students were assumed to be developmentally similar (Meece, Anderman, & Anderman, 2006), the bigger question was how motivation levels in science compared at two different outdoor classroom learning environments). Student ethnicity was not a variable examined in this study.

Sample for Study

In the original Athman and Monroe study, the study sample was selected by selecting regional high schools that had "environment-based programs…. through operational construct sampling (finding manifestations of the theoretical construct of interest) and maximum variation sampling (purposefully picking a wide range of cases for external validity) as described by Patton" (Athman & Monroe, 2004) p. 12, parenthesis theirs; (Patton, 1990).

This sample was a convenience sample based on two established outdoor classrooms in the Oklahoma City metro area. The actual names of the teachers, administrators, and schools are used with permission. From the beginning, challenges in finding and obtaining data from schools with active and established outdoor classrooms or gardening programs in Oklahoma existed. The programs were particularly sparse within the state at the time of the initial study design. Jerry Newhouser had worked with garden programs for kids through the Regional Foodbank of Oklahoma and the Young Women's Community Association, and was familiar with school programs in the Oklahoma City metro area. He suggested a single school in Northeast Oklahoma City, Millwood Elementary School, which fit the criteria of an established program using gardening in the science curriculum with upper elementary students. Joy Hayes was the science teacher at this school and was eager to participate in the study, but within a few weeks had taken a new position as a science curriculum coordinator with a different district. No other teachers or administrators at Millwood had a vision for their courtyard garden and within the summer, all the vegetation in the former outdoor classroom area was mowed down and the program discontinued.

The new district to which Mrs. Hayes transferred, Moore Public Schools, is located in a suburb just south of Oklahoma City and is the third largest school district in the state of Oklahoma. This district had five existing outdoor classroom or garden programs among their schools. Mrs. Hayes contacted the principals at all of these schools by email and asked them to distribute information to their teachers by email that a graduate student was looking for a sample of teachers currently using their outdoor classrooms for science education for a thesis study. Only two schools responded. These schools were similar in that their outdoor study areas both consisted of natural areas with an emphasis on native species and minimal cultivation. The researcher went in person to meet with the school principals and the willing teachers. At Central Junior High, Mr. O'Halloran, the 7th grade science teacher, established and maintains the outdoor classroom. He is the primary and almost solitary user of this outdoor classroom. At Briarwood Elementary, Mrs. Wilhelm was identified by the principal and the librarian as one of the teachers who utilizes the outdoor classroom area most frequently.

Central Junior High School

Central Junior High serves grades seven and eight and is one of five junior high schools in the city of Moore. The student population is just above 500 students and each student has a six period day (Moore Public Schools, n.d.). Dan O'Halloran, a teacher at the school, established the outdoor classroom in 1997 to "give kids opportunities for discovery and life changing experiences" (D. O'Halloran, personal communication, September 9, 2008). This outdoor classroom is enclosed in an open-air courtyard and is 13 x 33 meters in size; it can be seen from the main school hallway. One assignment that the students do is to construct a map of the area. This helps them develop a sense of scale and practice map skills. Below is a reconstructed sample of a student diagram of the area. Originally this diagram was in color, but was changed to be in black and white for inclusion in this paper. The word "skulls" in the diagram refers to Mr. O' Halloran's collection of miscellaneous animal skulls.

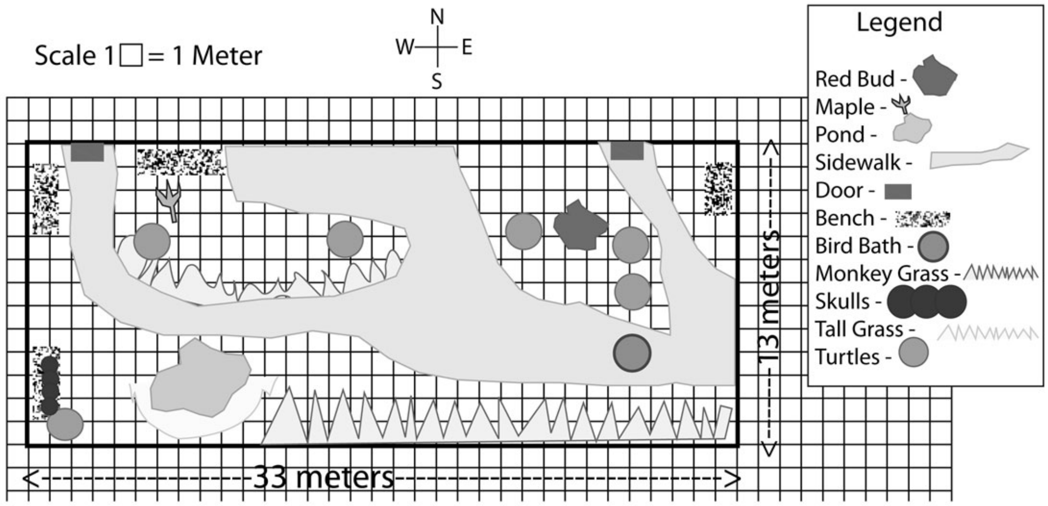

Figure 2. Recreation of student diagram of Central Junior High outdoor classroom

The Central Junior High outdoor classroom is composed primarily of Oklahoma native plant species and some habituated wild-caught animals including box turtles, snakes, and fish. It is primarily vegetated and has several winding cement pathways and benches. The area is not irrigated and received water and care about once a week throughout the summertime. Reptiles were routinely fed and allowed free roam in the area. The pond is approximately three meters in diameter and has native fish as well as water plants. Bird feeders were provided and wild birds were free to come and go.

Much of the emphasis at the Central Junior High outdoor classroom is on biodiversity, adaptations, respect for all life forms, and teaching scientific skills related to observations, recordings, and measurements. The site is funded primarily by O'Halloran's own donations, with some student store and parent organization contributions to bird food expenses. The site is primarily (and almost exclusively) used by O'Halloran's 7th grade life sciences students, although other teachers were permitted and encouraged to use the area, as well. The lessons were aligned with the Oklahoma

Priority Academic Student Skills (PASS), Oklahoma's state mandated education standards, and were primarily O'Halloran's own creations with little input from specific environmental education curricula. Programs at the site have been occasionally used to enhance other disciplines. Examples include a language arts teacher who uses the area as a staging ground for readings on Thoreau and a band teacher who has used the water area as a way to examine musical pitches. Special education classes also occasionally utilize the facilities. According to O'Halloran, the area has had a tremendously calming influence on some of the most severely violent or emotionally disturbed students at the school (personal communication, September 9, 2008).

Two ways that O'Halloran feels that the Central Junior High outdoor classroom was beneficial to students were "the ways that it helps all students develop a better respect for all life forms and the ways it creates intergenerational bonds between students and people like their parents and grandparents who were much more in touch with nature than the current generation" (personal communication, September 9, 2008). As David Peak, principal of the school, says about the outdoor classroom, "It is the best of what teaching and education is supposed to be. It touches [students] at a personal level" (personal communication, September 9, 2008).

Briarwood Elementary School

Briarwood Elementary is one of 21 elementary schools in the Moore public school district. It has over 600 students in pre-K through 6th grades. The 6^{th} grade students have a five period day and switch between classes for different subjects. In 1996, their outdoor classroom (hereafter, called the wetland to avoid confusion with the outdoor classroom at Central Junior High) was constructed and funded in collaboration with the Briarwood

Parent Teacher Association, the Oklahoma Department of Wildlife, and the Oklahoma Conservation Commission. The current media specialist and principal were involved with the development and construction of the wetland. All of the other school staff who were involved with the initial development have since moved on to other positions. The outdoor classroom area is approximately 157.28 m by 60.96 m.

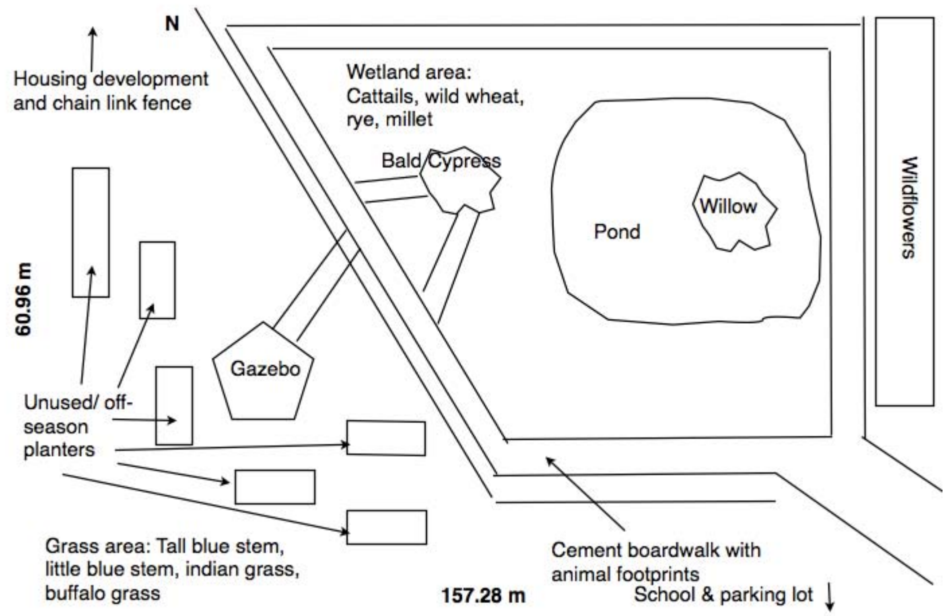

Figure 3. Briarwood Elementary wetland outdoor classroom

The area includes a geographically isolated wetland that has seasonal influxes of water and does not connect directly to any larger body of water. This wetland area is surrounded by a cement boardwalk; installed six years ago. The boardwalk was installed because when the area was mulched, overgrowth affected teachers' desires to use the area. At the time the boardwalk was laid, animal tracks and leaf prints were installed in the sidewalk to enhance the educational experience. The grass area outside of the boardwalk is mowed but the interior portion is rarely tended.

In the center of the wetland an island about fifteen feet across is a small wildlife sanctuary where students cannot access or cause direct disturbances. The dominant plant is cattails and there is an abundant resident population of redwing blackbirds. A small gazebo with benches can be found at the west end of the facility. The area is partially fenced with a chain link fence. Originally the fence was kept locked, but now the area is open to allow for community use. The north side of the wetland runs into the backyard property lines of a housing development that was built after the wetland was created.

The degree of use varies depending on grade level, teacher preferences, and the state PASS skills that must be covered in each grade level. The school has had some continuous struggles with residents who have developed adjacent properties and have at times been displeased with the aesthetics of the area. Likewise, ongoing complaints have come from some parents and community members who feel that the area could be better utilized as a parking lot.

Program Design

Early in the spring semester all students in Mrs. Wilhelm's and Mr. O'Halloran's classes (78 sixth grade students, and 121 seventh grade students) were given letters explaining the purpose of the study and inviting participation in two brief 15 minute surveys. Surveys were Likert scale and based on a modified version of the Athman and Monroe Achievement Motivation Index (AMI). Each survey had 12 questions, each with a possible five point value for a maximum score of 60 points, with higher points equaling higher motivation. The twelve questions were taken almost verbatim from the AMI with minor modifications made to be place specific and to look at motivation specifically toward science. As in the original study, the language for questions three, four, eight, eleven, and twelve was reverse coded. Surveys were given 11 weeks apart, at the request of the teachers based on their classroom uses of the area and availability to meet and were intended to document student motivation in relationship to their outdoor classroom or wetland use both during the winter months and at the end of the semester when students had been participating in these environments for a full school year. Only students who gave their assent and provided signed parental permission were able to participate. Permission slips and Oklahoma State University Institutional Review Board

(IRB) approval are included in the appendices. Individual student identities were kept confidential from the researcher. Students were assured that their participation was optional, their results would stay anonymous, and that their grades would not be affected.

During the third week of February 2009, students were given the first survey in their classrooms by the researcher. Students who did not choose to participate were given options to either work on other homework or read quietly at their desk by their teachers. The researcher read all twelve questions aloud and asked students to circle either 'strongly agree, agree, not certain, disagree, or strongly disagree' in response to each statement. Permissions forms from students, parents, teachers, and administrators can be found in Appendix B. Instructions for the study, including the coding system for how the study was to be kept anonymous can be found in Appendix C. The survey was administered a second time after eleven weeks, during the first full week of May 2009 at both schools. Also during this visit students were asked to complete written responses to two brief questions about their experiences in their school outdoor classroom or wetland program. For each student, two surveys and matching written responses were examined together since each respective response material had the same code. Any samples that did not have both a matching first and second test were excluded from the analysis. The surveys were meant to assess a deepening in experience and shared factors affecting motivation in two different outdoor learning environments. Having the written responses close to the end of the year allowed students to have had almost a complete academic year of observing changes and doing science studies in their outdoor classrooms.

The quantitative instrument was intended to assess non-equivalent groups without a control. Modifications were made to the original instrument to make the study appropriate for younger ages and to assess the impacts of participating in an outdoor classroom on students' motivation to engage in their science studies. The modified study was examined using a Lexile score to assess reading level. Lexile is a tool designed to score and assign an average grade level to the readability of a text (MetaMetrics Inc., 2010). Using this tool, the modified instrument was determined to be between a 3rd and 4th grade reading level.

Because modifications were made to the *AMI,* it was necessary to have a panel of experts review the changes. This panel consisted of three professors from Oklahoma State University in the College of Education, one teacher from the study site, and the science curriculum director from the school district. The professors have expertise in outdoor recreation, elementary curriculum, and literacy. This panel was asked to review the study to ensure that it aligned with the original intentions, spirit, and scoring protocol of the original instrument. They also offered opinions on the age appropriateness and comprehensibility of the study. At the recommendations of the committee, the number of questions on the survey was reduced to 12 items and open-ended items were reduced to two questions. One expert recommended that the term "outdoor classroom" be used because this is the term used by the students and teachers themselves. All other changes were intended to simplify the language for a younger audience and to make the survey more specific to science motivation, rather than just motivation generally. The quantitative pre- and post-survey given to the students can be found in Appendix D.

Statistical Analysis

A two-way Analysis of Variance (ANOVA) with *F* statistic was used to determine if, after eleven weeks of continuous participation in the outdoor classroom during spring semester of 2009, there were differences in changes in motivation levels by school or sex between students utilizing outdoor classrooms. The Type 1 error for analysis was set at alpha = .05.

The following three hypotheses were tested:

1) School effect:

H_0: There is no significant difference in science motivation levels over time between 6th and 7th grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between 6th and 7th grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

2) Sex effect:

H_0: There is no significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

3) Factor interaction:

H_0: There is no interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is significant interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

Analysis of Open Ended Items

The purpose of the open ended questions was to describe how the outdoor classrooms were being used within the curricula and to discover what aspects of these environments was important or interesting to students and teachers (Best & Kahn, 1986). In his book, *The Enlightened Eye*, Elliot Eisner (Eisner) provides lenses through which the qualitative researcher can adequately assess and reflect learning within classroom environments. Referred to as “the ecology of schooling” (Eisner, 1991, p. 72), this framing of the school environment encourages researchers to look to how 1) intentional, 2) structural, 3) curricular, 4) pedagogical, and 5) evaluative dimensions are occurring and the implications these interactions create for both learners and teachers. He concedes that a researcher may use one or all of these lenses to varying qualitative degrees depending upon the specific research questions that they are trying to assess. The intentional dimension encompasses the "goals or aims that are formulated for the school or classroom...explicitly advocated and publically announced as well as those that are actually employed in the classroom" (Eisner, 1991, p. 73). Questions about this dimension assess whether what is actually intended (educational aims or goals) is what is occurring and to what degree expectations are met. Additionally it assesses whether expectations are worthwhile and add value to the educational experience. For example, if expectations are too low, educational experiences may be less valuable, and may even be prohibitive to maximum learning.

The second dimension that Eisner examines is the structural dimension. This includes how the school time and place are divided. The curricular dimension asks questions about the content: is it up to date, relevant, eliciting higher order thinking, promoting an external orientation that extends learning beyond the subject, and does it enhance and allow practice of skills? The fourth dimension is the pedagogical dimension. This assesses how teaching is done through available materials. An important point, which may differ from other educational approaches, is that the purpose is not to assess the teacher based on an abstract ideal, but rather to assess teachers within the context and limitations of their current teaching situation and how well they are accomplishing their own individual aims and displaying their strengths. The final dimension, evaluative, looks at how the evaluation mechanisms that are in place within the school influence students' perspectives and performance. Through these five lenses the researcher is able to provide description, interpretation, evaluation, and articulate the thematic "recurring messages" which, when woven together, create a story.

As this study was not looking at assessment, evaluation, teaching methods, or objectives, the fourth and fifth dimensions were the least relevant. However, the lenses provided by the three other dimensions allowed the researcher to obtain an enhanced view of the impacts and motivating influences of these two outdoor classroom programs. Primarily this study assessed whether the outdoor classrooms were succeeding as intended to provide a motivating and stimulating science learning environment while also promoting meaningful learning experiences.

Open-ended questions allowed the researcher to examine sources of student motivation more closely. Written open-ended responses from the students were the most time efficient, least disruptive of class time, and least invasive method for obtaining data from the students. The open ended questions were administered by the researcher in the students' own classrooms with their teachers present. Students who did not participate were able to work on previously assigned work or homework for other classes. As in the Athman and Monroe study, the open-ended questions were "used to determine what students and teachers identify as factors influencing motivation" (Athman & Monroe, 2004, p. 15). There were two sections of open-ended questions:

Part I: Students who were involved in the outdoor learning experiences of the outdoor classrooms at Central Junior High or Briarwood Elementary answered two open-ended questions about their experiences at the end of the post-test survey. These questions were based on questions asked in the original Athman and Monroe study. Originally there were three questions in the Athman and Monroe study for students:

> 1) What do you do in this program? 2) What parts of the program do you like best, and 3) Has this program changed the way you feel about school or the way that you feel about learning? If the response is yes: What about this program has changed the way you feel about school? What about this program motivates you? (Athman & Monroe, 2004, p. 15 - 16)

At the recommendation of the committee, these questions were shortened to be more age appropriate. The questions were revised to: 1) What do you do in the outdoor classroom? and 2) What parts of the outdoor classroom do you like the best? It was intended that these questions would assess what learning objectives or actions were occurring in the outdoor classroom as well as what students found motivating. The implication being that engaging in what one likes best is also what is maximally motivating (Howse, Lange, Farran, & Boyles, 2003; Meece et al., 2006; Nolen, 2003; Shernoff & Csikszentmihalyi, 2009; Wigfield, Lutz, & Wagner, 2005).

Part II. Teachers and administrators who were involved in the program also completed brief open-ended responses (N= 4) (Appendix E). The two principals were asked four open-ended questions (Appendix F) about successes, impacts, obstacles, and effects of their respective outdoor classrooms on how they perform their administrative duties. The two teachers were asked about frequency of use, how outdoor classrooms were used for lessons, engaging moments, and special events, for a total of nine open-ended questions.

Themes and emotional reactions in the students' responses were examined. Responses that were illegible were omitted. Both positive and negative themes that emerged were discussed. Teacher and administrator responses were used to supplement information about the survey conditions and student responses (Bixler & Others, 1994; Hart, 1977; Webley, 1981).

CHAPTER IV

FINDINGS

At Central Junior High, out of 121 7th grade students enrolled in O'Halloran's classes for the school year, 61 students (50%) participated in the outdoor classroom in the fall and in the spring and completed both the first and second surveys. Of these 61 students, 27 (44%) were males and 34 (56%) were females. A study mortality rate of 6 individuals occurred between the first and second sample dates with one male and four females being absent from school or from the classroom and one female student declining to participate in the second date. Mr. O'Halloran's classes utilized their outdoor classroom approximately 15 times before the first data collection and 15 times between the first and second data collections.

Mr. O'Halloran is a board certified teacher who has been teaching for 17 years, with 11 of those years in his current position. His classes utilized their outdoor classroom to write observations about ecology, biodiversity, and how organisms adapt or respond to stimuli. Students compared and contrasted vertebrates and invertebrates, and examined plants and insects regularly. They also recorded signs of the changing seasons by observing migrations, hibernation, responses to decreasing or increasing daylight, nesting, and dormancy and reemergence. Students recorded air temperatures in Celsius and Fahrenheit as well as sunrise and sunset daily, information that students then used to graph changes across time. Students also took measurements of the equinox and winter solstice to compare shade lines from a consistent point. At the end of the school year, students reflected on their year in the outdoor classroom. For one former student, his outdoor classroom experiences were so impactful that he is returning to complete a butterfly garden as part of his Eagle Scout project.

At Briarwood Elementary 35 students (45%) of Mrs. Wilhelm's 6th grade science students were participants in the fall and spring in the wetland and completed both the first and second surveys. Of the students, 18 (51%) were male and 17 (49%) were female. A study mortality rate of four individuals occurred between the first and second sampling dates as one male student was killed by a car and three female students were absent. All students were reminded at the second date that participation was optional. Mrs. Wilhelm's classes utilized their classroom three times before the first collection and three times between the first and second collections.

Mrs. Wilhelm is a board certified teacher who has been teaching thirty years, with two of those years being 6th grade science. The major objectives taught in the wetland this year included lessons about biotic and abiotic factors as well as biomes, ecosystems, labeling and identifying similar and different characteristics, and diagramming the wetland area. Mrs. Wilhelm felt that the most successful features of the wetland was "the flexibility of being able to use the wetland for so many different topics across a variety of content areas, [and] the support of our staff and administration for the wetlands." For her, one of the biggest obstacles was that since it was only her second year teaching 6th grade science area, she was still building the curriculum to correlate wetland activities with district guidelines. Other obstacles came from the wetlands:

> For a good chunk of the school year it is not so wet! It actually dries up completely and so having a continuous water supply has been an ongoing problem. We have tried having raised beds and different types of gardens, but water has always been an issue. One summer we even had fishing times for kids and parents, but we could not keep it up because the pond dried up (A. Wilhelm personal communication, May 6, 2009)!

Statistical Analysis Findings

A two-way between groups analysis of variance was conducted to examine the influences of school or grade and sex on changes in motivation levels in science across time at two outdoor classroom sites. The following three hypotheses were tested:

1) School effect:

H_0: There is no significant difference in science motivation levels over time between 6th and 7th grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between 6th and 7th grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

2) Sex effect:

H_0: There is no significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is a significant difference in science motivation levels over time between male and female students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

3) Factor interaction:

H_0: There is no interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

H_1: There is significant interaction between school and sex on the effects of science motivation levels over time between students participating in two outdoor classroom programs as measured by the twice administered modified Achievement Motivation Inventory.

Verification of Assumptions

Sampling and Independence of Observations

Students were not selected at random, but were volunteers based upon their assent and parental approval. The schools and classrooms were selected based on availability and teacher willingness, yielding a sample of convenience. A total of 44.9% of the 6^{th} grade students from Briarwood Elementary and 50.4% of the 7^{th} grade students at Central Junior High chose to participate in the study and were present at both sampling events.

Students were asked to answer the surveys without collaborating with their peers on each of the two sampling dates. The study examined students' perceptions of their own internal motivation toward science in the outdoor classroom and not things that were done to them or how their teachers performed in such settings. Students may have experienced some unavoidable influences within their classroom on any given sampling date.

Normal Distribution and Internal Reliability

Looking at all students from both schools demonstrated a normal type data distribution. Additionally, because the sample sizes were greater than 30 at each school, any divergences from normality were assumed to not affect the robustness of the analysis (Cone & Foster, 1993). Thus, the hypotheses are safe from violations of this assumption.

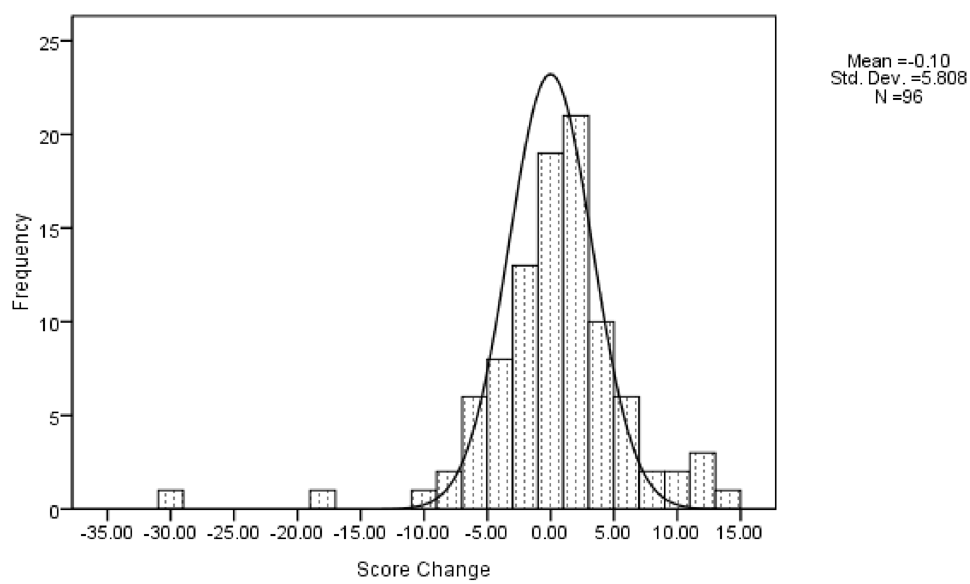

Figure 4. Distribution of mean score changes of all groups with normality curve

For this modified achievement motivation inventory, the Cronbach's alpha of the overall measure at observation one and observation two is .626. This further exemplifies a normal distribution, as this alpha value indicates that almost 63% of responses were within two standard deviations of the mean. The instrument in this instance demonstrated effective internal reliability.

Homogeneity of Variance and Levene's Test of Equality

After conducting the two-way ANOVA test the Levene's test had a significance value of .023, which being less than .05 means that the variances of the two groups are not equal and the assumption is violated. This violation would be buffered if the groups were of approximately equal sample size with a ratio between them of largest to smallest group being less than 1.5. These two groups were not within this range and contained group sizes that vary by a factor of 1.7. The homogeneity of variance cannot be met. This can be seen in box plots of the spread of scores of each group.

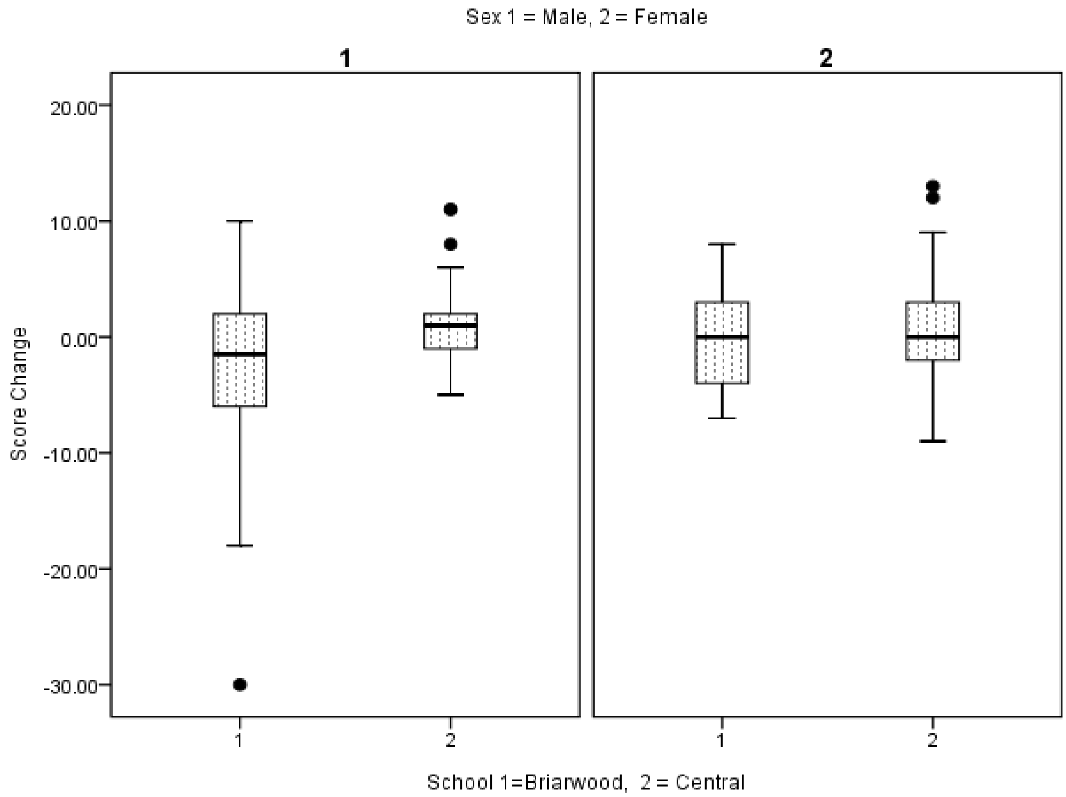

Figure 5. Box plots of mean changes in score across all groups

When examining the data for outliers, the researcher found one 6th grade male outlier with a standard deviation lower than three times the average score change for all students. The teacher noted that some of the male students in the class period with the largest deviations were close friends of a student who died between data collection periods, probably influencing their motivational scores. It was suspected, but not known, that this student may have been a close friend of the student who died. Because the identity of the outlier student was not known, it was decided he should be included in the analysis. However, when data were re-grouped by box plots of individual conditions rather than combined, no extreme outliers were present in any group. When examined within his own group, the extreme male was within one-and-a-half times the average for 6th grade males. Two female students from Briarwood and two female students from Central were outliers with scores one-and-a-half times above the average score change of all students.

The discrepancies of homogeneity of variance in this specific research situation are tempered by the male to female ratio of participants at both schools being near to 50 percent, the fact that it is a between ANOVA analysis, and the fact that the biggest and smallest variances are within four times of each other (Theissen, 2009; Zar, 1996). However, because the homogeneity of variance assumption is violated, the power is compromised making it difficult to generalize these findings beyond this sample. Type I error is a particular concern with the possibility that a null hypothesis of no significant difference could be rejected when it was in fact true and significant difference was present.

Descriptive Statistics

The descriptive statistics reveal a decrease in motivation scores among male, female, and overall totals for students at Briarwood Elementary between the two data collection periods. Sixth grade males demonstrated the widest standard deviation of any group (9.22); more than twice as large as any of their peer groups. Having such a large variance is a threat to homogeneity of variance. There was an increase in the change in motivation scores for both male and female students at Central Junior High after two measurements of motivation levels. Scores also increased at Central Junior High independent of sex. Looking at the results by sex, but not school, it is possible to see that there was a decrease in overall male motivation and an increase in overall female motivation. Overall, scores decreased by -0.1.

Table 2 Descriptive Statistics for a Two-Way ANOVA Change in Scores

Source	N	M Δ in Score	SD
Briarwood 6th grade students			
Male	18	-3.44	9.22
Female	17	-0.47	4.16
Total	35	-2	7.28
Central 7th grade students			
Male	27	1.33	4.04
Female	34	0.71	4.85
Total	61	0.98	4.49
Total students from both schools			
Male	45	-0.58	6.94
Female	51	0.31	4.62
Total	96	-0.1	5.81

Two-way ANOVA results

The interaction effect, computed by SPSS vs. 17, between school and sex was not statistically significant, $F(1,92) = 2.26$ allowing the researcher to examine the main effects of the other factors. The main effect of school, $F(1,92) = 6.17$, $p = .015$ was found to be significant at alpha of 0.05. Sex $F(1,92) = .96$ was not found to be significant.

Table 3 Two-Way ANOVA Table of Change in Motivation Scores at Two Outdoor Classrooms

Source	SS	*df*	MS	F
Intercept	19.46	1	19.46	0.612
School	196.06	1	196.06	6.17*
Sex	30.45	1	30.45	0.96
Sex x School	71.72	1	71.72	2.26
Error	2923.74	92	31.78	

Note. *$p < .05$.

Equal variance was assumed and a Tukey Least Significant Difference test with alpha of .05 was conducted as the follow up statistic to discover whether the differences in school were present at observation one, observation two, or within the score change. The Tukey Least Significant Difference test was a conservative measure that is standardly used in situations with different sample sizes. From this statistical calculation, it is possible to see that there was no significant difference during the first observation, but that there was a significant difference related to change in score and at observation two. This is an expected finding because it was near observation two that a student died after being struck by a car in front of Briarwood Elementary and by this observation quantity of use varied substantially by school.

Table 4 ANOVA Tukey LSD Test Looking For Causes of Significance Affecting Schools

		df	Mean Square	F	Sig
Observation 1	Between groups	1	95.02	3.45	0.07
	Within groups	94	27.52		
	Total	95			
Observation 2	Between groups	1	567.3	20.18	<.001*
	Within groups	94	28.11		
	Total	95			
Score change	Between groups	1	197.98	6.19	0.02*
	Within groups	94	31.99		
	Total	95			

*p<.05

Estimated Marginal Means

Since the data were not transformed to accommodate for the outliers and the different group sizes at the two schools, estimated marginal means were examined using SPSS vs. 17.0. In this examination the extreme outliers are less prominent and are tempered by more reasonable and consistent averages of surrounding scores. For example, Briarwood males still demonstrate a large decrease in score change and the largest standard error, but it is much closer to the error experienced by other groups. Here it is possible to see that overall the groups had a slight decrease in motivation scores after 11 weeks of participation in their outdoor classrooms. The marginal mean statistics reveal a decrease in motivation scores for both male and female students at Briarwood Elementary. Independent of sex, for 6th grade students overall there was a decrease in total science motivation levels with a grand mean of -0.47. There was an increase in motivation scores for both male and female students at Central Junior High after two measurements of motivation levels, with the 7th grade males having the highest increase in scores. Looking at the results by sex, but not school it is possible to see that there was a decrease in overall male motivation and an increase in overall female motivation, while overall scores decreased.

Table 5 Estimated Marginal Means for Change in Motivation Scores Across Time

			95% confidence interval	
Group	*M*	*SE*	Lower bound	Upper bound
Grand Mean	-0.47	0.6	-1.66	0.72
Sex				
Male	-1.06	0.86	-2.76	0.65
Female	0.12	0.84	-1.55	1.78
School				
Briarwood 6th grade	-1.96	0.95	-3.85	-0.06
Central 7th grade	1.02	0.73	-0.42	2.46
School*Sex				
Briarwood				
Male	-3.44	1.33	-6.08	-0.81
Female	-0.47	1.37	-3.19	2.25
Central				
Male	1.33	1.09	-0.82	3.49
Female	0.71	0.97	-1.21	2.63

Dependent variable: Change in motivation scores across time

When examining the marginal means, a large variance between Briarwood boys and the grand mean is prominent. Central 7th grade boys and girls had a more positive skew and were clustered closely to each other and to the grand mean. Additionally the Central males showed the highest gain in motivation scores over eleven weeks. Central 7th grade males were closest to the grand mean.

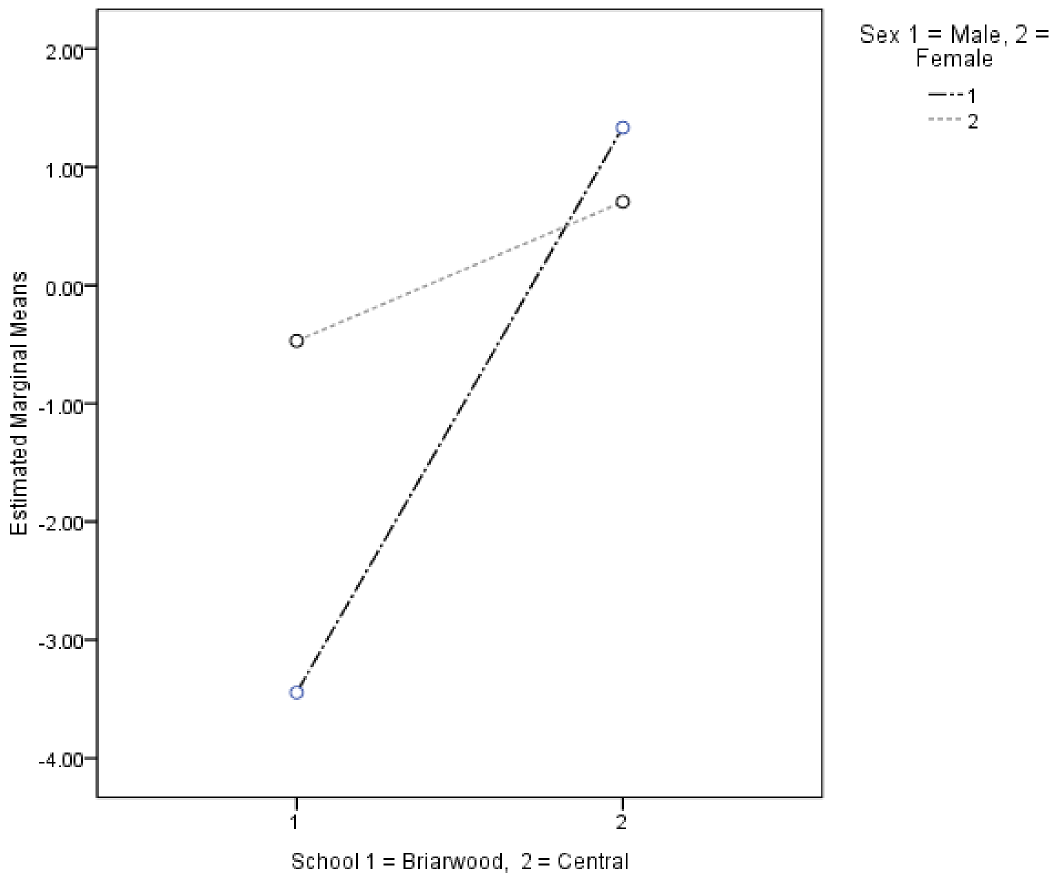

Figure 6. Estimated marginal means across all groups

In spite of the decreases in motivation scores at Briarwood Elementary, the majority of summed scores for students at both schools remained clustered on the high end of the motivation scales at both observation one and observation two. The maximum motivation score possible on the scale was 60 points, and scores below 36 points would indicate that a student's response was negative or neutral. Scores above 36 points indicated positive and highly motivated responses; thus it is possible to see from the average summed scores that average scores across all groups were in ranges that lean towards high and positive motivation. Briarwood students had average scores that went from 47.34 to 45.34 and Central students had scores that went from an average of 49.41 to 50.39.

Table 6 Descriptive Statistics for Summed Scores at Two Observations

Group	*N*	*M* Observation 1	*M* Observation 2	*SD* Observation 1	*SD* Observation 2
Briarwood 6th grade students					
Male	18	47.61	44.17	7.32	8.48
Female	17	47.06	46.59	5.84	4.46
Total	35	47.34	45.34	6.55	6.84
Central 7th grade students					
Male	27	49.37	50.7	4.68	4.61
Female	34	49.44	50.15	4.11	3.86
Total	61	49.41	50.39	4.34	4.18
Total students from both schools					

Male	45	48.67	48.09	5.87	7.13
Female	51	48.65	48.96	4.83	4.37

Additionally, looking at the averages of individual questions it is possible to see trends in how 6th and 7th grade students answered the surveys. In the original survey questions were broken out into four categories: self-efficacy, control, goal orientation, and task value. In this modified survey, the questions were drawn equally from each category with the intention of keeping the survey questions balanced along these themes.

Table 7 Categories of Questions in Quantitative Survey as Seen in Athman and Monroe

Question category	Item numbers in category
Self-efficacy	1, 5, 9
Control	2, 6, 10
Goal orientation	3, 7, 11
Task value	4, 8, 12

From the individual question averages it is possible to see that question ten (At school, I have many questions about how things work in the outdoor classroom that I don't get to ask) was the lowest score for all groups and that 6th grade students had the lowest scores on all measures of feeling in control of their learning environments. Both classes gained confidence in their ability to do science by the second testing date. By the second survey date, the value of activities done in the outdoor classroom, as displayed by question number four, had decreased for sixth grade students. But conversely, reverse coded questions number 8 and 12 were some of the highest scores across all groups demonstrating that students did not feel bored or like their outdoor classrooms were a waste of time.

Table 8 Average Score of Each Question

Question	6th grade pre-test average	7th grade pre-test average	6th grade post-test average	7th grade post-test average
1. I'm doing a good job of learning in the outdoor classroom.	4.29	4.52	4.09	4.57
2. I sometimes get to make choices about what and how to do things in the outdoor classroom.	3.43	3.59	2.94	3.72
** 3. The only reason I care about participating in the outdoor classroom is to please my teachers or my parents.*	*4.09*	*4.26*	*4.40*	*4.49*
** 4. I often worry that I am not very good at science.*	*3.23*	*4.08*	*3.54*	*4.05*
5. Most of what I'm learning about how things work in the outdoor classroom is important to me.	3.91	4.20	3.69	4.31
6. When I come to the outdoor classroom, science makes more sense to me.	4.11	4.26	3.83	4.36

7. I try to learn as much about science from the outdoor classroom as I can.	4.40	4.38	4.11	4.43
** 8. The outdoor classroom is usually boring.*	*4.54*	*4.52*	*4.17*	*4.66*
9. I feel good about my ability to do science.	3.91	4.16	3.74	4.23
10. At school I have many questions about how things work in the outdoor classroom I don't get to ask.	2.63	2.23	2.57	2.10
** 11. I help in the outdoor classroom so my teachers and parents don't get mad at me.*	*4.14*	*4.26*	*3.97*	*4.38*
** 12. The outdoor classroom is a waste of time.*	*4.66*	*4.93*	*4.29*	*4.95*

Note. * = questions that were reverse coded.

Hypothesis Conclusions

To summarize, the researcher rejects the null hypothesis for school effect by finding that there were significant difference levels in science motivation levels over time between Briarwood 6th grade and Central 7th grade students participating in two outdoor classroom programs as measured by the twice administered modified Achievement

Motivation Inventory. For the 6th grade students at Briarwood Elementary there was a significant decrease in motivation levels across time. For the other two factors of sex effect and interaction effect, the null hypotheses are not rejected indicating that there were no significant differences or interaction effects between sex and school at the study sites. As seen in Metro (1981), sex was not a significant statistical factor contributing to enjoyment or motivational levels in this study. Because of the violations of homogeneity of variance this research is not expandable to larger populations.

Open-Ended Questions

The day of the second survey, students were directed to answer two questions with three or four complete sentences: 1) What do you do in the outdoor classroom? and 2) What parts of the outdoor classroom do you like best? Student responses to the open-ended questions were overwhelmingly positive and can be found in Appendix G. Two students had negative things to say; one male student felt that he liked nothing about the outdoor classroom and another felt that it was only “okay”. In contrast, many students wrote in large letters, underlined, added exclamation points, or smile faces to add emphasis to the parts of their outdoor classroom they liked the best with many stating, “everything,” and “all of it.” After compiling the data, it became apparent that the outdoor classrooms were valued and desirable learning environments. Responses were evaluated based on themes, positive and negative reactions, and language indicating Eisner’s lenses of whether value was added to the educational experience, how physical space impacted students, and if the outdoor classrooms allowed for critical learning and skill development to occur (Eisner, 1991).

The most prominent of the emergent themes at both schools were affinities for plants, animals, and the ponds. These findings were parallel to other environmental education studies (Athman & Monroe, 2001; Francis, 1988; Hart, 1979; Hoyt, 1991; Jordan-Knight, Mclellan, Tai, & Taylor-Haque, 2006). An unanticipated and unique finding in this study was widespread contempt from both sexes and classes for in-class learning, sitting down, and using textbooks. Many students demonstrated an ease or enjoyment of learning in their outdoor classroom or wetland area as well as a perception that they worked harder there than anywhere else.

The totality of the student responses can be summarized under the categories of relationships students had with people, places, or things or actions that were done or not done in the outdoor classrooms. These are summarized in the following charts, which highlights all responses that were given by two or more students within a categorical group.

Table 9 Relationships Demonstrated by Students in Open-Ended Responses

Relationships to/ with	Central boys	Central girls	Briarwood boys	Briarwood girls
People				
Teacher	☒	☒	☐	☐
Peers	☒	☒	☒	☐
Place				
Outdoors/nature	☒	☒	☒	☒

Wild/ wilderness	☐	☒	☒	☒
Pond	☒	☒	☒	☒
Biota				
Plants	☒	☒	☐	☒
Animals	☒	☒	☒	☒
Physical World				
Soil /land	☒	☒	☒	☒
Water	☒	☒	☒	☒

Students discussed having interactions with the people, places, objects, biota, and aspects of the physical world. For the 7th grade students socializing and relationships with others was mentioned multiple times by many students. Students appreciated and loved "Mr. O" and enjoyed their discussions as well as getting to talk with their friends. Emphasis on human relationships was mostly absent from the 6th grade student responses.

Students at both schools loved being outdoors and in nature. As seen in some of the other literature, even these small spaces had high impact on these young adolescents (Nava-Whitehead, 2002; Owens, 1988; Rahm, 2002). A few students perceived their outdoor classroom and wetland as being truly natural or wild. One student compared it to feeling like being in a forest. And another 7th grade student stated a preference for the more natural areas of his outdoor classroom over the human-made areas. (All quotes are verbatim, thus, errors made by students, teachers, or principals are intact).

> “I learn about nature. The outdoor classroom is about as natural as places get now a days” (Female, 7th grade).

> “We walk around and look at the plants + animals. We get to see them like we would in the wild. It is more like what a sintest [scientist] would do in real life…” (Male, 7th grade).

> “The pond is very important, it is the only patch of wildlife in Briarwood Elmentary” *(*Female, 6th grade*).*

Overwhelmingly, the most commonly cited non-living thing that students liked, and even loved, were the ponds. This is in alignment with the conclusions of the book for elementary students, *Designing Outdoor Spaces for Children*, which indicates that water is one of the most desired and least provided elements in a child’s play world (Jordan-Knight et al., 2006), and was an interesting expression from older students. To students at both schools, the ponds were an area of biodiversity and they enjoyed looking into it and hearing water sounds. Some students used poetic adjectives to describe their pond: “calm,” “relaxing,” “pretty,” “iridesent”. Other objects that were noteworthy were the bridge and gazebo structures at Briarwood.

The presence of plants and animals were mentioned by almost every student and was what almost everyone loved best. The physical experiences of planting and feeding or holding animals were especially meaningful to the students. Observing turtles mating was a memorable experience for students at Central Junior High. Also, several of the female students revealed an empathetic response toward the animals when they mentioned that they liked seeing them in a more free state of being rather than in a cage.

> ...We whatch the animals eat. And we see little baby turtles. And there’s a lot of plants we write about and lean about. everything is great (Male, 7th grade)

> ... I like seeing the animals the best. I like being able to go outside in the middle of class. I like how the plants seem to get bigger every time I go out there. (Male, 7th grade)

> I like the turtles all the animals I love the trees. The plant life. The Verity of fish in the pond. (Male, 7th grade)

> I like the heavly vegateded parts of the O.C. The forms of life that live in the grasses, trees, ect. are facinating . (Male, 7th grade)

> [What do you like best?] Deffinatly when Mr. O Feeds the turddles or takes Bull [class bull snake] out with us and lets him cral around Because that isnt something everyone gets to see. I really do enjoy the O.C. (Male, 7th grade)

> I like the animals the best. Because they are not trained and they are not caged up . They are just free to roam anywhere they want to go. (Female, 7th grade)

I like hearing the animals. I don’t really know why, it just has a peaceful affect on me. It’s kinda like being in a little bitty zoo but more natural, more peaceful. ☺ (Female, 7th grade)

...I love the life in there and the peace. I like the turtles + the birds + snakes + every single living thing out there (Female, 7th grade)

...I like looking at the pond and we get to flip over lilly pads to see if there are baby snails or any new fish. We also get to feed the fish sometimes. I like the turtles too, we get to hold them sometimes. ☺ [Star drawn] (Female 7th grade)

...We also, well, we mainly observe all kinds of things, that are interesting to me. I like the fish pond and the trees + flowers + the plants + the animals -(especially the birds + butterflys), well I can’t choose a favorite, but I love the O.C. and everything in it. (Female, 7th grade)

[I like best].That there are living things in it. I like that the wet lands have ducks and fish. (Female, 6th grade

Student responses could be divided into two categories: things students were doing and things they were not doing.

Table 10 Student Responses to Activities Done in Outdoor Classroom

	Central boys	Central girls	Briarwood boys	Briarwood girls
Activities				
Science schoolwork	☒	☒	☒	☒
Notes/ journal/survey	☒	☒	☐	☒
Draw	☐	☐	☒	☒
Talk	☒	☒	☒	☐
Hang (with friends)	☐	☐	☒	☐
Walk or run	☒	☒	☒	☒
Plant	☐	☒	☒	☐
Pick up trash	☒	☐	☐	☐
Feed/hold animals	☒	☒	☐	☐
Special events				
Student memorial	☐	☐	☒	☒
Earth day	☒	☒	☐	☐
Sensory things				
Look	☒	☒	☒	☒
Listen	☒	☒	☐	☒
Smell	☒	☐	☐	☐
Feel/touch	☐	☒	☐	☐
Taste	☒	☐	☐	☐

I am not…				
Indoors/in a classroom	☒	☒	☒	☒
Sitting still/in a chair	☒	☒	☒	☒
Using textbooks	☒	☒	☐	☐

Students discussed liking and doing active things in their outdoor classrooms.

> We walk around and look at the plants + animals...(Male 7th grade)

> Feed animals, plant plants, listen to birds, and pick up trash. (Male 7th grade)

> ...And I like to walk around and see all the living things and how the turtules eat and things like that. (Female, 7th grade)

> [I like]...going <u>outside!!</u> I like running around the pond. I like hanging. (Male, 6th grade)

> We obsurve the nature, wright on the sidwalk with chalk and we walk around. [I like] that we learn about nature and things around there. (Female, 6th grade)

Appropriately, many students spoke of doing some form of written work while outdoors including taking notes, measurements, or observations, making journals, doing projects, and conducting surveys and experiments. Students also studied biomes, ecology, and biodiversity. However, unlike inside the classroom where written tasks may be seen as less desirable (Shernoff & Csikszentmihalyi, 2009), in the outdoor classroom and wetland these tasks were viewed as enjoyable. Additionally, students felt like their learning was more real and more challenging than that done inside the classroom.

> ...The O.C. is a different atmosphere. We like actually doing work out there. (Female, 7th grade)

> We work harder than is possible indoors. We do many outdoor activities…(Male, 6th grade)

> I like when we take notes. I also like describing what I see. (Female, 6th grade).

> We always have fun, but learn at the same time. I get to do things myself, and learn. (Female, 6th grade)

> We do like to study there. It helps a lot. I really love just everything about it because its easier to learn. We get to study science upclose. (Female, 6th grade)

Students at both schools mentioned special events when describing what they did in their outdoor classrooms. At Briarwood, the week of the second collection a male 6th grade student was hit by a car in front of the school and died a few days later. On the day that the students found out that he was declared brain dead, the students spent their science period creating a memorial for him and drawing with sidewalk chalk on the boardwalk in the wetland. Many students mentioned this event. Mrs. Wilhelm summarized the event as follows

> [This] was an excellent opportunity for the kids to be as together or alone as they needed to be and to express their grief and loss. It also allowed the community around our school to see that we had lost someone we loved and how much he was cared for. Also just being able to be outside with a specific task was much more constructive than trying to conduct an actual class at that time. (A. Wilhelm, 6th grade teacher)

At Central Junior High, Earth Day is the biggest event in the outdoor classroom. On this day each student was encouraged to bring a plant and plant it within the outdoor classroom which “allows them to touch mother earth and gives them some ownership of the O.C.”, according to Mr. O’Halloran.

One theme that seemed very strong because of the number of times it appeared in discussion, regardless of school or sex, were statements that students liked being outdoors and not in chairs inside the classroom. Others declared that they liked learning that was not centered around textbooks. Students used entrapping language like “stuck” or “cramped” and expressed needing a break when describing how they felt about indoor classrooms.

> [I like best] that we don’t have to sit in a chair and read out of the text book. It helps me bc [because] I learn better with hands on. I hate to read out of the text book!! (Female, 7th grade)

> [I like]...not having to sit around. (Male, 6th grade

> ...I like being outside instead of sitting down and being stuck indoors all day. Also I like to see all of the animals outside. (Female, 6th grade)

> I like to go outside so we don't have to sit in chairs all day. (Female, 6th grade)

In contrast to language about classrooms and textbooks, adjectives students used to describe experiences in the outdoor classroom were overwhelmingly positive: "everything" or "all (of it) is"…"great", "fascinating", "interesting", "cool", "peaceful", "awesome", "beautiful", "neat", "special", "fun", "amazing", "comfortable", "calm", and "pretty". Some students recognized their participation in an outdoor classroom as a privilege and not something that very many other students have the opportunity to do. A few students at Briarwood declared that they did not use their wetland area often enough.

For the teachers and administrators the two outdoor classroom environments provided positive learning environments. Mrs. Wilhelm felt that the aspects of discovery, open discussions, and having the freedom to choose how to find and record information were the most beneficial to students. For her the wetland provided "less discipline issues, less grading, and more enthusiasm from the kids!" She felt that the changing of the seasons brought new interest in wildlife, as ducks and geese came to nest there.

At Central Junior High the principal felt that the program was successful because

> ...nearly everyday we have students in an area of the school where they are really doing science. They have the chance to collect data, graph it, explore trends, create hypotheses, observe observe and observe. Routinely the teacher uses this area to provide instruction at the teachable moment (butterfly garden and monarch migration, spiders and predation in the webs, reproduction (turtles mostly), water biology in our pond ecosystem.)

He felt that student motivation was impacted most by the relevancy of the outdoor classroom to seeing and connecting concepts with their environment.

The 7th grade teacher also felt that the ways the outdoor classroom made science relevant to his students was the biggest success of this area. Mr. O'Halloran thought that the outdoor classroom was something that both motivated his students and gave him tremendous teaching opportunities:

> Visits to the O.C. are something my students look forward to and they know they have to earn the right to experience it. Poor behavior and performance prevents them from going to the O.C. I've had my most meaningful experiences as a teacher in the O.C. I've been able to reach kids who don't perform well in the square walls of a classroom. When I hear the kids comment on the O.C. and the excitement in their voices, I feel better about my day at school.

CHAPTER V

CONCLUSIONS

Context of study

The results from this study are similar to other studies in environmental education that have been conducted throughout the last thirty years. Outdoor classrooms were cherished by nearly all of the participating students from both schools. The written responses reflect almost unanimous positive feelings, even in instances where individual scores may have decreased or remained the same. Some students stated that they felt they did not utilize their outdoor classrooms often enough. To the students, the outdoor classrooms were stimulating, beautiful, interesting, and intriguing. In the opinions of the students, teachers, and administrators, these areas were highly desirable and motivating places to learn at both schools.

Challenges to the Study

A preliminary unpublished survey conducted in 2006 by the Oklahoma Environmental Education Coordinating Committee, a state-wide discussion group of educators from state agencies (of which the author was a former member), identified many management issues and vulnerabilities of existing outdoor classroom programs in Oklahoma. The committee had sought to identify all existing outdoor classrooms in the state and had mailed questionnaires to all the district science coordinators throughout the state seeking information about where outdoor classrooms were located, how they were being used and managed, whether they were functioning or failing, and how this committee could better provide environmental education resources to enhance education opportunities provided by these areas.

The return rate was very low and replies bleak. It appeared that many existing programs were failing or in jeopardy of being discontinued. Teacher turnover, maintenance failures, destruction by ill-informed landscaping staff, inadequate budgets, lack of time, and non-continuation after the first year were some of the most common obstacles articulated by school respondents. Interestingly, the first proposed study site in Northwest Oklahoma city had experienced all of these obstacles, yet this site lasted for three years before the garden there was discontinued.

The teacher from the northwest Oklahoma City school who was originally going to participate in the study took a position as a science coordinator in a different school district before the study began, but remained instrumental in identifying several schools that had existing gardening or outdoor classroom programs in her new district. She sent inquiries out by email, but only two teachers responded to requests to participate. Inviting both of these classes to participate provided a larger sample size than would have occurred with only one of the classrooms, thereby increasing statistical significance and power. It also allowed the researcher to examine potential motivators in two separate learning environments. The students were developmentally at similar ages, were from the same school district, and had teachers who were both nationally board certified teachers with similar number of years of teaching experience. Both areas had native species with a water observation area. Both areas were used primarily for science instruction.

Teachers were asked to record how often and how they utilized their outdoor classroom environments. It was projected at the beginning of the study that use would be similar in both areas, however, teaching demands and circumstances prevented areas from being utilized to their full potentials. Frequency of use turned out to be more different at the two schools then originally projected when the study began. This may have caused the Central seventh grade students to have a more familiarity and comfort with their outdoor classroom.

The teacher at Central Junior High was more familiar with his outdoor classroom and had more ownership over the program. As the designer, primary user, and manager of the area he had power over use and management that few other teachers who use outdoor classrooms may have. Having a contained area may help with student concentration and allow them to develop an enhanced knowledge of the surroundings and inhabitants--connections necessary to developing a sense of place. Central students may also have experienced heightened motivation due to a novelty effect because participating in an outdoor classroom was a new thing to them.

Another distinguishing feature not considered at the time of the study design, was that in Oklahoma subject area teachers in the middle grades have an advanced degree in their subject area. Mr. O’Halloran’s pre-existing and more in-depth knowledge of biology and science may make him more innately comfortable within the outdoor classroom and aware of the biota and care needs than a teacher who was untrained in a science profession. He had been utilizing this outdoor classroom for more than thirteen years. He felt that since the enactment of the *No Child Left Behind Act* that teaching was not as fun, that he had less autonomy over his lessons, and that holding students accountable for superficial facts rather than teaching them how to learn had high costs to depth of knowledge, creativity, and utilizing critical thinking skills.

The teacher at Briarwood, while a seasoned teacher, had only been teaching 6th grade science for two years. At Briarwood one possible advantage to the student's knowledge of their local environment was that students who had completed the entirety of their elementary school years there may have been exposed to their outdoor classroom over several years. However, despite being around for 17 years, the wetland area at Briarwood was not frequently used. One teacher compared it to being like an old car where the newness had worn off and it had become lackluster. Even though the wetland was accessible to all teachers at the school, some teachers did not use it at all.

Teachers at Briarwood felt overwhelmed by new school guidelines that required teachers to be accountable for and document literally every minute of their day. Such heightened pressure constantly made them feel like even taking the time to walk to the outdoor classroom (which was adjacent to the school) could be seen as time wasted, superfluous to learning, and even "fluff." Teachers were permitted to have limited discipline quotas of how many times a day or week students could be sent to the office and so they were forced to deal with more discipline themselves, which was disruptive to class time. Additionally, teachers felt that the increased pressure of more state and national testing meant that they were constantly "teaching to the test" and were not able to do as many creative activities. Increased testing demands had caused teachers to lose some of their former enthusiasm and caused students to be less interested in learning than they had been prior to the most recent testing mandates.

Teachers at both schools felt that the physical environment placed some limitations on the use of their outdoor classrooms. One limitation on the outdoor classrooms was that the biggest part of the growing season occurs when the students are not in school. Weather also was a concern. The comfort needs of the students were high and Mr. O'Halloran said that he felt uncomfortable taking his students out on any day where the weather was below 50 degrees because many did not have the money to be dressed warmly enough. Other obstacles he encountered were social barriers related to a missing familiarity this generation had with nature, with their local land and resources, and with their culture and heritage. Because his students did not possess much pre-existing knowledge of the outdoors he felt that much of the initial time spent in the outdoor classroom was remedial, occupied with making them feel more comfortable, and teaching them about basic natural processes that would have been known to someone who grew up spending time outdoors. Because of their constant access and connection to electronic media, he felt that his students had lost contact with the land and, in so doing, had also lost connections with older generations of parents and grandparents who may have been ranchers, farmers, or even gardeners.

The programs were largely unsupported financially at both schools. While the on-site administrators at both schools were supportive of the outdoor classrooms, the support and feelings of the higher administrators, district, or school board about these facilities were not examined. At both schools teachers and administrators revealed that parents seemed sometimes unsupportive, unaware, or unconcerned about the programs and their successes and were overly concerned about maintaining more traditional looking landscape aesthetics. Some community members questioned whether the outdoor classroom spaces could be better utilized, perhaps as something more functional—a parking lot.

For Briarwood students the second test date scores were overshadowed by the tragic death of a student earlier in the week. Students were having a difficult time coping with the loss of their classmate and friend and were still very much grief stricken. The teacher said that some of the male respondents were some of his closest friends and all of the students were according to Mrs. Wilhelm “struggling to find a new normal (without him)”. The outdoor classroom was a place that the students went to express some of their grief and to make a memorial for the student who died.

Representativeness of the sample must be considered as only 44.9 % of 6^{th} and 50.4% of 7^{th} grade students from the sample schools participated. It is possible that the students who were disinterested in outdoor classrooms chose not to participate in the study. Additionally, responding to a survey is considered an undesirable activity (Lepper & Hodell, 1989; Maehr & Meyer, 1997) for students because interrupting learning to complete a survey may pull them from their optimal flow environments (Csikszentmihalyi & Nakamura, 1989; Shernoff & Csikszentmihalyi, 2009). The second survey dates occurred one week after students had taken their mandated state and national tests, which may also have created reduced motivation in complete another test.

Reliability

The Athman and Monroe instrument was tested for reliability using a test-retest method. The original AMI instrument, (upon which this modified Achievement Motivation Inventory survey was based), when administered in a test run had a Cronbach's alpha when n=81 of 0.84. The AMI results during the original motivation tests revealed alpha values of 0.79 (n=172) for 9th grade students and 0.76 (n=228) for 12th grade students. Factor analysis was also conducted on the original Athman and Monroe survey to further confirm the reliability of the instrument. For this modified achievement motivation inventory, it was not possible to conduct a pilot test, but across the two observations the Cronbach's alpha value across all groups was .626.

Validity

At the end of this research, as is common in many classroom observations, the validity of the score results are justifiably examined only within the context of this specific study. While the construct and content validity of the instrument were justified based on existing research, previous usage (and findings) of the unmodified original Achievement Motivation Index and approval of modifications by a committee of experts, flaws in study design, the inaugural use of this modified instrument, and circumstantial interferences beyond the researcher's control compromised the criterion validity. The concurrent validity is affected by the fact that one school used their outdoor classroom five times as often as the other school. Also, at the date of the second observation, the 6th grade students were probably in a drastically different frame of mind than their 7th grade peers due to the recent and untimely death of their classmate. These events certainly affected the internal validity of the instrument by creating very different study histories, maturation, and experimental mortality between the two observation time periods and the two schools. Differences in quantity of use and curricula may have also created unanticipated interaction effects. Because of the aforementioned effects to internal validity, it is unnecessary to consider external validity. Additionally, it is possible that interaction effects between the two observation dates swayed students or made them disenchanted at taking the same survey.

Effects of Briarwood Elementary and Central Junior High Outdoor Classrooms on Motivation

Adverse study circumstances overshadowed and may have contributed to the lack of statistical significance for sex or to the declines in male 6th grade student scores. However, the open-ended responses add an intriguing additional dimension to the study. In the written responses it was apparent that the outdoor classrooms were very meaningful to the majority of the students. Students responses referred to all three contexts mentioned within the Braund and Reiss contextual model of learning in informal, out of school contexts (Braund & Reiss, 2004). The specifics they mentioned within the personal contexts seemed specifically to point toward the ways in which they felt that their outdoor classrooms helped them to demonstrate skills. They felt that they were able to utilize real life scientific skills, which made the lessons relevant to them. At both outdoor classroom environments students perceived their learning as purposeful.

In the socio-cultural context the students were excited that their outdoor classrooms were places where school was about active engagement instead of their usual passive listening.

Students appreciated the cooperative learning atmosphere and perceived themselves to be valued collaborators in real research projects. They enjoyed the interactions with their teachers and peers, and recognized their participation within these places as a privilege. Within the physical context, the aspects of these outdoor classrooms that seemed most important to the students were not sitting down, encountering plants and animals, and having water and structural elements. The two outdoor classroom areas also displayed the four components of intrinsic motivation: 1) challenge, 2) curiosity, 3) control, and 4) fantasy (Lepper & Hodell, 1989). Additionally, to students, the work they do in the outdoor classroom was challenging, but did not feel like work—a characteristic of being in a state of flow (Schmidt et al., 2007; Shernoff & Csikszentmihalyi, 2009).

Returning to the lenses provided by Eisner, it appears that these two outdoor classrooms succeed in the intentions of providing a stimulating and motivating learning environment, and did so within statewide and national curriculum objectives. According to Linnenbrink (2002) such an environment is essential to promoting academic performance. It was apparent from their open-ended responses that students felt like they were not only doing a wide-variety of scientific and inquiry behaviors as defined and advocated by national science educators (Center for Science, 2000; Llewellyn, 2002), but doing so with eagerness and enjoyment.

> We take field notes, we study life, we make journals, and we listen, watch, & learn as much as we can... (Male, 7th grade)

> We study the plants and animals. The turtles are all different. We study indications of spring. We record all of our observations in our notebooks. [I like] everything, because when we're in the outdoor classroom we get to be close to nature... (Female, 7th grade)

> In the O.C. we learn about science! We learn about real, live, interesting science. We record p.t. [pond temperature] + study the animals, (such as turtles, fish, + birds.) I especially love the O.C. because we get a break from the class room. [Q2:] I love being able to be outside. It's awsome (sic) to be able to look at nature, for real, not in a book! ☺ (Female, 7th grade)

> I just really learn about the animals and soil. We do like to study there. It helps alot. I really love just about everything about it because its easier to learn. We get to study science upclose. (Female, 6th grade)

The efficacy of their science knowledge and performance were not evaluated but quantitative responses reiterated feelings of doing science with confidence. In the structural dimension, the students expressed feeling that the outdoor classrooms were unique in comparison to other learning situations that they had encountered. Having a school situation where time is meticulously partitioned and focus interrupted as students switch between class and subject is not considered ideal for this learning age and can be disorienting (Anderman, Maehr, & Midgley, 1999; Eccles & Midgley, 1989b). It could be that the outdoor classrooms provided some reprieve from the rest of their busy lives and allowed students to follow motivating phenomena.

Perhaps some of the greatest strengths of these outdoor classrooms are what they contribute to the curricular dimension. Students found studying science highly engaging and relevant. It appeared from some of their responses that students were participating in higher order thinking by “describing”, “surveying”, “study(ing)”, “expirement(ing) (sic)”, “investigat(ing)”, making “qualitative observations”, and journaling. By doing these behaviors students practiced their inquiry skills, repeatedly, and in a way that was purposeful. Additionally, the outdoor classrooms created an external orientation by making students more aware of their native biodiversity and orienting some towards environmental action. Influences

Potential Common Motivators Among Outdoor Classrooms

Outdoor classroom environments, regardless of scale or type, repeatedly are shown to lend themselves to acute mental engagement and intense enjoyment (Athman & Monroe, 2001; Athman & Monroe, 2004; Glenn, 2000; Nava-Whitehead, 2002; North American Association for Environmental Education, 1999; Twiss et al., 2003; Volk & Cheak, 2003). What are the common denominators contributing to student motivation in these areas? Perhaps it is experiencing the unfolding of dynamic and living systems that creates perceived challenge. Because organisms and their surroundings are in constant flux, things are changing daily, or even by the minute or second. In prefabricated experiments there is predictability and expectation, but nature is laden with surprise. The mind eagerly anticipates what comes next. Students must try to find and explain sources of the unexpected thus fueling their curiosity. In the natural environment the brain is constantly stimulated and processing varied sensory information (Lehrer, 2009).

One could make the argument that classrooms are very stimulating places and that increasing access to electronic media will stimulate student performance and interest, and in extreme instances, should even replace student access to natural spaces. However, many environmental educators remain cautious and outspoken against such an approach (Louv, 2006a, 2006b). Scientists continue to confirm that access to natural spaces may be an evolutionary need and that when in such spaces children and adults have different biological, psychological, and physiological responses than when confined to human made spaces.

For example, it is not only quantity of stimuli that correlates to engagement; the source of the stimulation makes a big difference in brain function. In natural environments more biological diversity equals heightened performance, but, interestingly, exactly the opposite effect is seen in urban spaces with minimal access to nature (Kahn & Kellert, 2002). In cities, crowdedness, mechanical stimuli, and constant distractions lead to absentmindedness, loss of self-control, and loss of emotional control in adults and children (Kahn & Kellert, 2002; Lehrer, 2009). It appears that the constant influx of impersonal and irrelevant stimuli can cause the brain to feel overloaded and constantly needing to refocus to locate and filter the relevant (Lehrer, 2009).

In an outdoor classroom, however, the main sources of stimulation are natural. Edward O. Wilson attributes the affinities that our species has toward plants and animals to our evolutionary heritage and dubs this phenomenon “biophilia” (Wilson, 1984, 2000). The brain and the body subconsciously return to their evolutionary roots through sights and sounds that would have previously indicated the presence or absence of food, danger, companionship—all things that demand any organism’s highest alertness. Being in a natural environment appears to play more critical roles in balancing circadian rhythms and the endocrine system, which both play more largely into overall physical and emotional health than previously understood (Stevens & Rea, 2001).

Being outdoors provides students with the first hand experiences and choices they need to be able to best internalize and learn from the world around them. This type of environment also seems to lend itself to a situation where students have more control and ownership over their learning. And, central to the tenets of constructivism, students are able to formulate direct experiences, create meaning, and discover the world for themselves (Huitt & Hummel, 2003). Instruction can be tailored to a variety of learning styles (Gregory & Chapman, 2007) and students may be given increases opportunities for less structured play than in a traditional classroom, which is considered essential for learning (Ginsburg et al., 2007; Jones & Cooper, 2006; Pelligrini & Bohn, 2005), because through these opportunities students can act and build on pre-existing knowledge.

These two outdoor classrooms were thoroughly enjoyed by nearly all responding students of both sexes from both schools. However, more specific research could be conducted on what the two sexes appreciate about or need, want, expect, or learn in different aspects of outdoor learning environments. Within the two outdoor classrooms students were presented with choices that, judging by their open-ended responses, seem to be largely absent from the rest of their school days. In some instances they expressed being able to present on or further study a topic of their choice, investigate, or lead discussions. This type of learning environment facilitates the opportunity for continuing and sustaining inquiry. Being able to make choices was shown to be important to students on Earth Day and when sorting through their grief after the classmate’s death.

These two outdoor classrooms appealed to a sense of fantasy by providing the illusion of having access to wilder, grander, or untamed places. It was interesting, and perhaps indicative of limited access to more or larger naturalized spaces, that to the students these spaces felt wild. Mr. O'Halloran commented that throughout his teaching career he has felt like students have spent less and less time in nature and, therefore, even his small outdoor classroom is very impactful. The outdoor classrooms offered tranquility and a place to rest which may contribute to a feeling of security, something that many middle school students are longing to have (Berliner, 1989; de Charms, 1984). The outdoor classrooms provided escape, places to be away from or not in school. They provided a purposeful learning environment where students perceived that they were real scientists doing real science, whose actions and investigations were useful and part of a bigger purpose. Students, teachers, and administrators alike felt that the greatest benefits of the outdoor classrooms were the relevancy and connectivity they provide to the student's everyday lives. Repeatedly, students (and teachers) had positive responses to these learning environments. Having positive experiences should contribute to more motivation and willingness to seek out new information within learning experiences (Shernoff & Csikszentmihalyi, 2009).

Recommendations for Instrument and Revising the Study

It appears, based on repeated discrepancies in comparison to the rest of an individual's responses, that the double negatives embedded within some of the questions or reverse coded questions were unnecessarily confusing to students. (See *Table 8 Average Score of Each Question*). These statements were intended to make the reliability stronger by asking the same question in multiple ways. Having five out of twelve questions reverse coded, however, may have created some barriers to student understanding of the questions. These questions were reverse coded because questions were selected which seemed to best summarize the original subcategories. The number of reverse coded questions was not considered in the original design of this revised Achievement Motivation Inventory.

The wording on question ten on the quantitative portion of the surveys, in particular, seemed a common irregularity in comparison to the rest of student responses. Many students who scored consistently high on most or all the other questions on their surveys answered this question with a lower point value. Average scores for this question were as follows: 1) 6^{th} grade pre-test: 2.63, 2) 7^{th} grade pre-test 2.23, 3) 6^{th} grade post test 2.57, and 4) 7^{th} grade post 2.10. This question read, “At school, I have many questions about how things work in the outdoor classroom that I don’t get to ask.” This question may also be an obscure measurement of the amount of control students have over their learning environment. This question was reverse coded because it was assumed that having more unanswered questions implied a positive relationship with desire to continue learning. Many students had lower scores on this question in comparison to all their other questions. Perhaps the unpredicted lower scores indicate that the teachers are doing a good job answering and allowing students to find answers to questions. Or, perhaps students feel disruptive by asking too many questions, or are uninterested in the subject matter. Regardless of inferences, this question adversely affected the scores and may need to be reconsidered in future use of this instrument.

Additionally, this study would have benefited from having a control group of similar aged students who were not participating in outdoor classroom areas. In these schools all of the 6th and 7th grade students were participants in outdoor classroom areas. However incorporating a third school would allow for a comparison within the school district of levels of motivation in science for those not participating in any outdoor classroom program. This would enhance the validity. Adding a pilot study or replicating the study would enhance the reliability.

Recommendations for Improvement of Outdoor Classroom Areas

At Briarwood Elementary

After talking with multiple teachers at this school about their hesitations to use the environment, it was apparent that if they were given increased training with available environmental education curriculums they might gain reassurance of how this area can be better utilized and better meet teaching objectives across the disciplines. Investigations of how newer state standards might be adversely affecting teachers' use of these areas would also be useful. The positive benefits from the wetland area, such as students' reactions, high levels of motivation, and the quality of work that they do in their wetland area need to be further demonstrated to the greater community to justify the area to parents, fellow teachers, and administrators at the school, district, and even state levels. If teachers, administrators, and parents involved understand the positive reactions of students to this learning environment, (revealed in orientation of motivation scores and the qualitative responses), and how these areas may affect motivation then it would be easier to increase access to and use of these areas. Particularly as highly motivated students can be a factor in improving performance in schools (Beard, 1998; de Charms, 1984; Shernoff & Csikszentmihalyi, 2009). Other possibilities to increase the value and visibility of the area to the community that have been widely successful in other outdoor classrooms (Braund & Reiss, 2004) are to find ways to make the wetland a focal point for school festivals or community events such as holiday events, or student art or poetry exhibitions.

Teachers could think more broadly in designing their lesson plans. For example, sometimes absence is just as valuable an instructor as presence. If there is no visible water, the students can investigate why, how water recharges, water consumption patterns around the world, organisms found in dry areas, or physical properties of water. It might be beneficial for students to collect data over multiple years and compare the findings from peer groups across time. Likewise, if there are not many animals present for observation students can assess how their behaviors may repel wildlife, whether habitat needs are being met, or whether animal presence varies seasonally.

As residential development is negatively impacting this wetland area, the school could consider having additional professional consultation as to how to maximize wildlife viewing opportunities. Possibilities to increase habitat might include expanding the wetland, installing a butterfly garden, extending an interpretive nature trail through the neighborhood, re-directing runoff water through this area, or encouraging adjacent neighbors to participate by including plants to encourage butterflies or birds to stop over and linger. In order to increase visits by desired species their specific shelter, water, and food needs must be met.

At Central Junior High

The outdoor classroom at Central Junior High might benefit most from establishing a committee of teachers to oversee its use and betterment or even to concede to developing (or reverting) some additional space on the outside of the school to a more natural state. The outdoor classroom at this school has been built and endured because of the steadfast determination of one teacher. Long term, however, this will likely be an unsustainable management strategy and others should be included in the management of any future natural areas. The area deserves to be spotlighted for the effects it is having on the students and learning. Parents and administrators should be encouraged to see the learning that is going on within this environment. It would be interesting to assess systematically the long term impacts on students, as many return frequently and speak of how their outdoor classroom experiences influenced everything from their confidence in science, to career choices, to their relationship with nature.

Recommendations for Future Studies

The sparseness of available outdoor classrooms throughout Oklahoma seems incongruous with an area that historically has strong agricultural interests and incompatible with goals of developing environmentally literate citizens. Further research should be done as to why such voids in environmental discourse exist in the mid-west and how race, urban versus rural areas, or education levels may affect the availability of first hand environmental studies in this region. Follow-up studies that might be of interest might include topics such as how do outdoor classrooms affect awareness of natural world, environmental choices, or even future career choices of participants? How do outdoor classrooms enhance instruction or teaching objectives? What features and lessons are most impactful long-term? Does the knowledge gained in outdoor classroom experiences outlast similar knowledge learned in more traditional classroom settings?

The initial site for the study where the garden was discontinued included a demographic that was approximately 95% African-American students. As many parts of Oklahoma City still have an acute sense of segregation and remain poorly integrated socially and economically, this region would make an ideal site to examine questions relating to the availability of and continuation of outdoor classroom programs for minority groups. Do the strategies for developing, utilizing, and maintaining outdoor classrooms need to vary by demographic?

More research needs to be done on what inhibitions teachers have toward utilizing these areas, how the areas can maintain appeal, and how to properly prepare pre-service teachers to maximize such spaces. Teachers must feel comfortable with the outdoors, with their own knowledge of science and environmental processes, and with curricula that are pertinent to outdoor classroom environments for these areas to be successfully utilized. More emphasis must be placed on giving Oklahoma’s pre-service teachers more first hand experiences with outdoor classrooms and possibly creating a network of environmental educator mentors to lead them along the way. Oklahoma teachers and pre-service teachers must be given opportunities and time to connect with networks of existing outdoor classrooms and interpretive centers. It would be interesting to discover how sex or subject area emphasis of a teacher might affect their comfort levels within an outdoor classroom.

Likewise, programs that make outdoor classroom areas multidisciplinary (not just about science) are successful at providing meaningful contexts for learning and raising student scores across a broad spectrum of subjects (Hoody, 1995; Lieberman & Hoody, 1998). In light of this information, school districts should attempt to adopt highly localized lessons that encourage students to pursue their own inquiries while developing a sense of place, revolving around local geography, history, biota, and conditions. It will continue to be imperative to ask how standards driven curricula affects use of outdoor classrooms and vice-versa.

In this study many students displayed positive emotional reactions toward their outdoor classrooms and that, when given the choice, these areas were preferred over more traditional in-classroom based methods of learning. It would be beneficial to research how these areas affect psychological well-being of upper elementary or middle school students and how such effects may help students to deal with the stresses of their personal or school lives. Of particular interest would be how outdoor areas help students to deal with tragedy.

Creating Outdoor Classrooms in a Post *No Child Left Behind* Era

This study reiterates many of the positive benefits of outdoor classrooms that have been documented for many years. During the duration of this research concern was mounting about the consequences of the 2001 *H.R. 1990 The Leave No Child Behind Act* and the 2001 *S. 940 Leave No Child Behind Act and* their impacts on outdoor learning experiences (Gruenewald & Manteaw, 2007) largely because of the ways in which these acts pushed test performance, isolated fact memorization, and narrowly measured curricula and definitions of success over attributes and skills like curiosity or the ability to design an experiment which yield deeper learning (Gruenewald & Manteaw, 2007).

It is possible that no other single event or legislation has placed the future of children in the United States and their interactions with nature in peril (Gruenewald & Manteaw, 2007; Louv, 2007). thankfully, there appears to be a powerful and growing counterinsurgency to this Act that is reclaiming play and learning through nature as a defining aspect, and even right, of childhood. From the vegetable gardens on Mrs. Obama's lawn to the H.R.2054: *No Child Left Inside Act of 2009* and the related S. 866: *No Child Left Inside Act of 2009* currently in legislative committee review, societal shifts seem to be pushing educators, parents, developers, planners, and landscapers toward a future that incorporates the developmental and motivational needs of children and how to best reconnect them with nature. The *No Child Left Inside Act* was introduced to both Houses of Congress in 2007 and was passed in the House, but did not progress in the Senate. It was re-introduced in 2009 and currently both Houses of Congress have sent the bill to committees focused on education. The proposed bill in the current form is a direct response to the concerns that *No Child Left Behind* is forcing schools to reduce time in school that is spent outdoors. If passed, the bills would require states to develop environmental literacy plans and environmental education standards with the necessary training for teachers to implement these. These would also allow schools and interpretive centers or government entities that are doing environmental education to have access to education funds and to fund research projects in the environmental education field.

According to Richard Louv, the leave-no-child-inside movement could become one of the best ways to challenge entrenched conceptions—for example, the current, test-centric definition of education reform…."[because] when we challenge schools to incorporate place-based learning in the natural world, we will help students realize that school isn't supposed to be a polite form of incarceration, but a portal to the wider world" (Louv, 2007).

Louv believes that much of the undercurrent that has pushed students inside has been adult fear of the outside world. Could the extreme push toward indoor classroom use and constant standards driven testing be a response to national fears that our schools are inadequate to prepare students for competing in a global world and fears by schools of issues of liability? Louv concludes:

> Yes, there are risks outside of our homes [and schools]. But there are also risks in raising children under virtual protective house [or school] arrest: threats to their independent judgment, and value of place, to their ability to feel awe and wonder, to their sense of stewardship of the Earth—and, most immediately, threats to their psychological and physical health (Louv, 2007)

Creative environmental educators are finding ways to reconnect students with the natural world (Braund & Reiss, 2004), but much of the focus in recent years has been on creating outdoor opportunities for preschool or elementary students (Child Educational Center, n.d.; Jordan-knight et al., 2006; Louv, 2006a; Twiss et al., 2003) However, as this study reiterates through the open ended questions, outdoor learning environments for early adolescents are valuable, motivating, and productive learning spaces. Preservation and creating outdoor classrooms can be a tool in beginning to give students of this age some autonomy over their learning environments at school. How to increase access to such spaces for this age group is an area that deserves more attention.

In order for the outdoor classroom or school garden to be maximally effective for younger adolescents some additional considerations should be made. In particular, for early adolescents, natural spaces are important for their social value, (Kahn & Kellert, 2002) so opportunities to socialize frequently should be included. The more access that adolescents have to natural spaces, the more they are likely to appreciate their beauty (Hester et al., 1988; Owens, 1988). Early adolescents also want to feel independent and have autonomy (Kahn & Kellert, 2002). Incidentally within this study, students who used their outdoor classroom more frequently had higher motivation levels than the 6^{th} grade group who used their outdoor classroom less. Many students at both schools expressed enjoyment and purpose in their learning. Outdoor classroom areas, therefore, should be encouraged to be at the forefront of the curriculum, rather than places for isolated bonus time.

It is also important for students to feel like they are gathering information at their own pace and, particularly for the adolescent, exploration must be matched to their strength and agility (Kahn & Kellert, 2002). Within the context of an average outdoor classroom, meeting these needs may prove to be challenging as curriculum restrictions, space limitations, and legalities interfere. Educators should be mindful of these needs, however, and strive to offer mental and physical challenges whenever possible. Perhaps this could come partially by encouraging students in the physical labor of installing or maintaining the outdoor classroom. When feasible, outdoor classrooms could be adjacent to larger natural spaces or parks that lend themselves to greater exploration, and school districts could work to provide students access to additional camps or adventure programming that promote outdoor skills.

Adolescents also benefit when their learning experiences are filled with purpose. For the students in this study, it appeared valuable to them when they felt that their explorations were meaningful and were contributing to really doing science. Another way to create meaning in an outdoor classroom is to find ways to offer community service or outreach that benefits others (Little, 1998; Magen, 1998). By keeping these things in mind, educators can maximize on the power of outdoor classrooms to motivate and teach, while encouraging student personal and social development.

REFERENCES

Adkins, C., & Simmons, B. (2002). Outdoor, experiential, and environmental education: Converging or diverging approaches? *ERIC digest.*, from www.eric.ed.gov

Anderman, E. M., Maehr, M. L., & Midgley, C. (1999). Declining motivation after the transition to middle school: Schools can make a difference. *Journal of Research and Development in Education, 32*, 131-147.

Assor, A., & Connell, J. P. (1992). The validity of students' self-reports as measures of performance affecting self-appraisals. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* (pp. 25-47). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Athman, J., & Monroe, F. C. (2001). Elements of effective environmental education programs. In A. Fedler (Ed.), *Defining Best Practices in Boating, Fishing, and Stewardship education* (pp. 37-48). Washington, D.C.: Recreational Boating and Fishing Foundation.

Athman, J., & Monroe, M. (2004). The effects of environment-based education on students' achievement motivation. [Journal]. *Journal of Interpretation Research, 9*(1).

Beard, L. J. (1998). *The relationship between outdoor classroom learning experiences and achievement and attitude of eighth grade students.* University of Southern Mississipi, Haittiesburg, MS.

Berliner, D. C. (1989). Furthering our understanding of motivation and environments. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3. Goals and cognitions.* (Vol. 3, pp. 317-342). San Diego, Ca: Academic Press, Inc.

Best, J. W., & Kahn, J. V. (1986). *Research in education* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Bixler, R., & Others, A. (1994). Observed fears and discomforts among urban students on field trips to wild land areas. *Journal of Environmental Education, 26*(1), 24-33.

Braund, M., & Reiss, M. (2004). *Learning Science Outside the Classroom*. London: Routeledge Falmer.

Buzhigeeva, M. (2004). Gender characteristics of children in the primary stage of instruction. *Russian education and Society, 4*(46), 76-88.

Carrier, S. J. (2009). Environmental education in the schoolyard: Learning styles and gender. *Journal of Environmental Education, 40*(3), 2-11.

Center for Science, M., and Engineering Education (CSMEE),,. (2000). *Inquiry and the National Science Education standards: A guide for teaching and learning*. from http://www.nap.edu/openbook.php?record_id=9596&page=115

Child Educational Center. (n.d.). The Outdoor Classroom Project: Outside...It's a whole new world.

Cline, S., Cronin-Jones, L., Johnson, C., Hakverdi, M., & Penwell, R. (2002). *The impact of community involvement on the success of schoolyard ecosystem restoration/education programs: A case study approach*. Paper presented at the Annual meeting of the American Educational Research Association.

Cone, J., & Foster, S. (1993). *Dissertations and theses from start to finish*. Washington: American Psychological Association.

Cothran, D. J., & Ennis, C. D. (2000). Building bridges to student engagement: Communicating respect and care for students in urban high schools. *Journal of Research and Development in Education, 33*, 106-117.

Csikszentmihalyi, M., & Nakamura, J. (1989). Chapter 2: The dynamics of intrinsic motivation: A study of adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3. Goals and cognitions.* (Vol. 3, pp. 45-71). San Diego, Ca: Academic Press, Inc.

de Charms, R. (1984). Motivation enhancement in education settings. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 1. Student motivation.* (Vol. 1, pp. 275-310). Orlando, FL: Academic Press, Inc.

Desmond, D., Grieshop, J., & Subramaniam, A. (2002). *Revisiting garden based learning in basic education: Philosophical roots, historical foundations, best practices and products, impacts, outcomes, and future directions*. Davis, CA: IIEP/FAO SDRE Food and Agriculture Organization, Rome, Italy UNESCO International Institute for Educational Planning, Paris, France.

Dewey, J. (1900). *The school and society: Being three lectures* (second ed.). Chicago: University of Chicago Press.

Dewey, J. (1925, 1929). *Experience and nature*. London: George Allen & Unwin.

Dewey, J., & Dewey, E. (1915). *Schools of to-morrow*. New York: E.P. Dutton.

Disinger, J., & Monroe, M. (1994). Defining environmental education: EE toolbox-workshop resource manual. In R. Wilke (Ed.), *Environmental education teacher resource handbook* (pp. 23-43). Millwood, NY: Krause International Publications.

Disinger, J. F., & Roth, C. E. (1992). *Environmental Literacy*. Columbus, Ohio: ERIC Clearinghouse for Science Mathematics and Environmental Education

Duderstadtt, H. (1996). The pretty green of schools. *European Education, 28*(3), 13.

Dunn, R., Beaudry, J. S., & Klavas, A. (1989). Survey of research on learning styles. *Educational leadership, 46*(6), 50-59.

Eccles, J. S., & Midgley, C. (1989a). Chapter 5: Stage-Environmental fit: developmentally appropriate classrooms for young adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3. Goals and cognitions.* (Vol. 3, pp. 139-186). San Diego, CA: Academic Press, Inc.

Eccles, J. S., & Midgley, C. (1989b). Optimal classroom environment for adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3. Goals and Cognitions* (Vol. 3, pp. 139-186). San Diego, CA: Academic Press, Inc.

Eccles, J. S., & Midgley, C. M. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139-186). San Diego, CA: Academic Press.

Eisner, E. W. (1991). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. New York: Macmillan publishing company.

Elder, J. (2003). *A field guide to environmental literacy: Making strategic investments in environmental education*. Manchester, U.K.: Environmental Education Coalition.

Francis, M. (1988). Negotiating between children and adult design values in open space projects. *Design Studies, 9*(2), 67-75.

Fröebel, F., & Hailmann, W. N. (1887). *The Education of Man*. New York: D. Appleton and Company.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York: Basic Books.

Gardner, H. (2004). *The unschooled mind: How children think and how schools should teach*. New York: Basic Books.

Gardner, H. (2006). *The development and education of the mind: The selected works of Howard Gardner*. Abingdon, OH: Routledge.

Ginsburg, K., The Committee on Communications, & The Committee on the Psychosocial Aspects of Child and Family Health. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics, 119,* 182-191.

Glenn, J. L. (2000). *Environment-based education: Creating high performance schools and students*. Washington, DC: National Environmental Education and Training Foundation.

Gregory, G., & Chapman, C. (2007). *Differentiated instructional strategies: One size doesn't fit all* (second ed.). Thousand Oaks, CA: Corwin Press.

Gruenewald, D. A., & Manteaw, B. O. (2007). Oil and water still: How No Child Left Behind limits and distorts environmental education in US schools. *Environmental education research, 13*(2), 171-188.

Gurian, M., & Stevens, K. (2005). *The minds of boys: Saving out sons from falling behind in school and life*. San Francisco: Jossey-Bass.

Hart, R. (1977). *Children's experience of place: A developmental study*. New York: Irvington place.

Hart, R. (1979). *Children's experience of place: A developmental study*. New York: Irvington Press.

Harvey, M. R. (1990). The relationship between children's experiences with vegetation on school grounds and their environmental attitudes. *Journal of Environmental Education, 21*(2), 9-15.

Hester, R. T., Jr., McNally, M. J., Hales, S. S., Lancaster, M., Hester, N., & Lancaster, M. (1988). "We'd like to tell you...": Children's views of life in Westport, California. *Small Town, 18,* 19-24.

Hoody, L. L. (1995). *The Educational Efficacy of Environmental Education*. San Diego: State Education and environment round table.

Howse, R. B., Lange, G., Farran, D. C., & Boyles, C. D. (2003). Motivation and self-regulation as predictors of achievement in economically disadvantaged young children. [Journal]. *The Journal of Experimental Education, 71*(2), 151-174.

Hoyt, K. A. (1991). *Physical environment socialization: Development of attitudinal and aesthetic response toward built and natural environments.* Unpublished Dissertation, University of California, Davis, Davis, CA.

Huitt, W., & Hummel, J. (2003). Piaget's theory of cognitive development. *Educational psychology interactive* Retrieved August 18, 2008, from http://chiron.valdosta.edu/whuitt/col/cogsys/piaget.html

Hungerford, H. R., Peyton, R. B., & Wilke, R. (1980). Goals for curriculum development in environmental education. *Journal of Environmental Education, 11*(3), 42-47.

Ibrahim, H., & Cordes, K. A. (2002). Foundations of outdoor recreation. In S. Moyer (Ed.), *Outdoor recreation: Enrichment for a lifetime* (2nd ed., pp. 1-15). Champaign, IL: Sagamore publishing.

Jackman, W. S. (1891). *Nature study for the common school*. New York: henry Holt and Company.

Jones, E., & Cooper, R. (2006). *Playing to get smart*. New York: Teachers college press.

Jordan-Knight, E., Mclellan, G. K., Tai, L., & Taylor-haque, M. (2006). *Designing outdoor environments for children: Landscaping schoolyards, gardens, and playgrounds*. New York: McGraw-Hill.

Kahn, P. H., & Kellert, S. R. (2002). *Children and nature: Psychological, sociocultural, and evolutionary investigations*: Massachussetts Institute of Technology.

Kilpatrick, W. H. (1916). *Froebel's kindergarten principles critically examined*. New York: The Macmillan Company.

King, I. (1912). *Social aspects of education: A book of sources and original discussions with annotated bibliographies*. New York: The Macmillan company.

Kohn, A. (1993). *Punished by rewards: The trouble with gold stars, incentive plans, A's, praise, and other bribes*. New York: Houghton Mifflin Company.

Kohn, A. (1999). *The schools our children deserve: Moving beyond traditional classrooms and "tougher standards"*. New York: Houghton Mifflin

Krechevsky, M., & Seidel, S. (1998). Minds at work: Applying multiple intelligences in the classroom. In R. Sternberg & W. M. Williams (Eds.), *Intelligence, instruction, and assessment: Theory into practice* (pp. 17-43). Mahweh, NJ: Lawrence Erlbaum Associates.

Lehrer, J. (2009). Nature essential for the brain scientists report. *Boston Globe*. Retrieved February 6, 2010, from http://www.childrenandnature.org/news/detail_print/1622/

Lepper, M. R., & Hodell, M. (1989). Intrinsic motivation in the classroom. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3. Goals and cognition.* (Vol. 3, pp. 73-105). San Diego, CA: Academic Press, Inc.

Lieberman, G. A., & Hoody, L. L. (1998). *Closing the achievement gap: Using the environment as an integrating context for learning*. San Diego, CA: State education and environment roundtable.

Linnenbrink, E. A., & Pintrich, P. R. (2002). Motivation as an Enabler for Academic Success. *School Psychology Review, 31*(3), 313-327.

Little, B. R. (1998). Personal project pursuit: Dimensions and dynamics of personal meaning. In P. T. P. Wong & P. Fry (Eds.), *The human quest for meaning: A handbook of theory, research and applications* (pp. 193-212). Mahwah, NJ: Erlbaum.

Llewellyn, D. (2002). *Inquire within: Implementing inquiry-based science standards*. Thousand Oaks, CA: Corwin Press.

Loss, C. G., & Loss, C. P. (n.d.). Progressive Education. Retrieved September 3, 2008, from http://www.answers.com/topic/educational-progressivism

Loughland, T., Reid, A., & Petocz, P. (2002). Young people's conception of environment: A phenomenographic analysis. *Environmental education research, 8*(2), 187-197.
Louv, R. (2006a). *Last child in the woods: Saving our children from nature deficit disorder* Chapel Hill, NC: Algonquin books.
Louv, R. (2006b). Leave no child inside. *Sierra, July/ August 2006*.
Louv, R. (2007). Leave No Child Inside: The growing movement to reconnect children and nature, and to battle "nature deficit disorder". *Orion Magazine*, March/April 2007.
Maehr, M. L. (1989). Thoughts about motivation. In C. Ames & R. Ames (Eds.), *Research on motivation in education. Volume 3.* (Vol. 3, pp. 299-315). San Diego, CA: Academic Press, Inc.
Maehr, M. L., & Meyer, H. A. (1997). Understanding motivation and schooling: Where we've been, where we are, and where we need to go. *Educational Psychology Review, 9*(4), 371-409.
Magen, Z. (1998). *Exploring adolescent happiness: Commitment, purpose and fulfillment*. Thousand Oaks, CA: Sage.
Marsden, W. W. (1997). Environmental education: Historical roots, comparative perspectives, and current issues in Britain and the United States. *Journal of Curriculum and Supervision, 13*(1), 6-29.
McCombs, B., & Whisler, S. (1997). *The learner-centered classroom and school*. San Francisco: Josey Bass.
Mckeown, R. (2003). EE does not equal ESD: Defusing the worry. *Environmental education research, 9*(1), 117-128.
Meece, J. L. (2003). Applying learner-centered principles to middle school education. *Theory into practice*.
Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annual Reviews of Psychology, 57*, 487-503.
MetaMetrics Inc. (2010). What is a Lexile measure? Retrieved June 12,, 2010, from http://www.lexile.com/about-lexile/lexile-overview/
Miller, L. K. (1904). *Children's Gardens for school and home: A manual of cooperative gardens*. New York: D. Appleton and Company.
Montessori, M. (1912). *The Montessori method: Scientific pedagogy as applied to child education in "The children's house" with additions and revisions by the author* (A. E. George, Trans. second ed.). New York: Frederick A. Stokes.
Nava-Whitehead, S. M. (2002). *The effect of the nature's classroom environmental education program on middle school student performance.* Boston College, Boston, MS.
New York Times. (1900). Europe's garden schools; Practical education given to foreign boys and girls; *New York Times*. Retrieved July 25, 2008, from http://query.nytimes.com/mem/archive-free/pdf?_r=1&res=9906E7D81039E733A25753C3A96F9C946197D6CF&oref=slogin

No Child Left Inside Act of 2009, H.R. 2054, 111th Congress, 1st Session, 2009 Accessed from http://www.govtrack.us/congress/billtext.xpd?bill=h111-2054 on April 15, 2010

No Child Left Inside Act of 2009 S. 866, 111th Congress, 1st Session, 2009. Accessed from http://www.govtrack.us/congress/billtext.xpd?bill=s111-866 on April 15, 2010

Nolen, S. B. (2003). Learning environment, motivation, and achievement in high school science. *Journal of Research in Science Teaching, 40*(4), 347-368.

North American Association for Environmental Education. (1999). *Excellence in environmental education: Guidelines for learning (K-12)*. Rock Springs, GA: North American Association for Environmental Education.

Ollendick, T. H., & King, N. J. (1991). Origins of childhood fears: An evaluation of Rachman's theory of fear acquisition. . *Behavior Research and Therapy, 29*(2), 117-123.

Owens, P. E. (1988). Natural landscapes, gathering places, and prospect refuges: Characteristics of outdoor places valued by teens. *Children's Environments Quarterly, 5*(2), 17-24.

Patton, M. (1990). *Qualitative evaluation and research methods.* Newbury Park, CA: Sage Publications.

Pelligrini, A. D., & Bohn, C. M. (2005). The role of recess in children's cognitive performance and school adjustment. [Journal]. *Educational Researcher*, January/ February 2005, 7.

Pestalozzi World. (n.d.). From "The development of education". Johan Heinrich Pestalozzi (1746-1827) The Approach and Method of Education. *Pestalozzi World: Educating Children for a Better Life* Retrieved July 25, 2008, from http://pestalozziworld.com/pestalozzi/methods.html

Rahm, J. (2002). Emergent learning opportunities in an inner city youth gardening program. *Journal of Research in Science Teaching, 39*(2), 164-184.

Ryan, R. M., Connell, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In C. Ames & R. Ames (Eds.), *Research on Motivation in Education. Volume 2. The Classroom Milieuu* (Vol. 2, pp. 13-51). Orlando, FL: Academic Press, Inc.

Schmidt, J. A., Shernoff, D. J., & Csikszentmihalyi, M. (2007). Individual and situational factors related to the experience of flow in adolescence: A multilevel approach. In A. D. Ong & M. v. Dulmen (Eds.), *The handbook of methods in positive psychology* (pp. 542-558). Oxford, U.K.: Oxford University Press.

Shernoff, D. J., & Csikszentmihalyi, M. (2009). Flow in schools: Cultivating engaged learners and optimal learning environments. In R. Gilman, E. S. Huebner & M. J. Furlong (Eds.), *Handbook of Positive Psychology in Schools* (pp. 131-146). Abingdon, Oxon, U.K.: Routledge.

Simmons, D. (1993). Facilitating teacher's use of natural areas: Perceptions of environmental education opportunities. *Journal of Environmental Education, 29*(3), 23-31.

Sternberg, R. J., & Grigorenko, E. L. (2001). A capsule history of theory and research on styles. In Robert (Ed.), *Perspectives on Thinking, Learning, and Cognitive Styles* (pp. 276). Mahweh, NJ: Lawrence Erlbaum Associates.

Stevens, R. G., & Rea, M. S. (2001). Light in the built environment: Potential role of circadian disruption in endocrine disruption and breast cancer. *Cancer Causes and Control 12*, 279-287.

Subramaniam, A. (2002). Garden-based learning in basic education: A historical review. *4H Center for Youth development. University of California Monograph.*

Tandy, C. A. (1999). Children's diminishing play space: A study of intergenerational change in children's use of their neighborhoods. *Australian Geographical Studies, 37*(2), 154-164.

The National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform; A report to the nation and the Secretary of Education, United States Department of Education*. Retrieved April 10, 2010, from http://datacenter.spps.org/sites/2259653e-ffb3-45ba-8fd6-04a024ecf7a4/uploads/SOTW_A_Nation_at_Risk_1983.pdf

The Leave No Child Behind Act of 2001, H.R. 1990, 107th Congress, 1st Session, 2001. Accessed from http://www.govtrack.us/congress/billtext.xpd?bill=h107-1990 on April 15, 2010

The Leave No Child Behind Act of 2001, S.940, 107th Congress, 1st Session , 2001. Accessed from http://www.govtrack.us/congress/billtext.xpd?bill=s107-940 on April 15, 2010.

Theissen, B. (2009). Math 301 ANOVA Assumptions. Retrieved April 17, 2009, from http://homepage.mac.com/bradthiessen/stats/m301/4a.pdf

Thorp, L. G. (2001). *The pull of the earth: An ethnographic study of an elementary school garden.* Unpublished disertation, Texas A&M University, College Station, TX.

Twiss, J., Dickinson, J., Duma, S., Kleinman, T., Paulsen, H., & Rilveria, L. R. (2003). Community gardens: Lessons learned from California Healthy Cities and Communities. *American Public Health Association, 93*(91).

UNESCO-UNEP. (1975). The Belgrade Charter: A global framework for environmental education, 1-4. Retrieved October 20, 2008, from http://portal.unesco.org/education/en/files/33037/10935069533The_Belgrade_Charter.pdf/The%2BBelgrade%2BCharter.pdf

Volk, T., L., & Cheak, M., J. (2003). The effects of an environmental education program on students, parents, and community. *The Journal of Environmental Education, 34*(4), 12-25.

Webley, P. (1981). Sex differences in home range and cognitive maps in eight-year old children *Journal of environmental Psychology, 1*, 293-302.

Wigfield, A., Lutz, S. L., & Wagner, L. A. (2005). Early adolescents development across the middle school years: Implications for school counselors. *Professional School Counseling, 9*(2).

Wilson, E. O. (1984, 2000). *Biophilia*. Boston, MS: The President and Fellows of Harvard College.

Yager, R. (1991). The constructivist learning model. *Science Teacher, 58*, 52-57.

Zar, J. H. (1996). *Biostatistical analysis* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

APPENDICES

Appendix A. Athman and Monroe Achievement Motivation Inventory

Please respond as honestly as possible. There are no right or wrong answers	Strongly Agree	Agree	Not Certain	Disagree	Strongly Disagree
1. I'm doing a good job of learning in school.	SA	A	NC	D	SD
2. I often feel like I have little control over what happens to me in school.	SA	A	NC	D	SD
3. It doesn't matter whether or not I learned from an assignment, as long as I get a good grade on it.	SA	A	NC	D	SD
4. In my opinion, what is taught in my classes is not worth learning.	SA	A	NC	D	SD
5. I often worry that I am not very good at school.	SA	A	NC	D	SD
6. I sometimes get to make choices about what and how I learn.	SA	A	NC	D	SD
7. The only reason I try to do well at school is to please my teachers or parents.	SA	A	NC	D	SD
8. Most of what I'm learning at school is important to me.	SA	A	NC	D	SD

9. At times I feel that I'm not good at anything at school.	SA	A	NC	D	SD
10. When I try hard, I do well on my schoolwork.	SA	A	NC	D	SD
11. I try to learn as much from my schoolwork as I can.	SA	A	NC	D	SD
12. School is usually boring.	SA	A	NC	D	SD
13. I feel I always need help with difficult schoolwork.	SA	A	NC	D	SD
14. It doesn't matter how much effort I put into my schoolwork, because I get the same grades whether I try hard or not.	SA	A	NC	D	SD
15. I do not want to learn a lot of different things in school. I just want to learn what I need to get a good job.	SA	A	NC	D	SD
16. I'm usually interested in what I'm learning at school.	SA	A	NC	D	SD
17. I feel good about my ability to do schoolwork.	SA	A	NC	D	SD
18. At school, I have many questions I don't get to ask.	SA	A	NC	D	SD
19. I do my schoolwork so my teachers and parents don't get mad at me.	SA	A	NC	D	SD
20. Going to school is a waste of time.	SA	A	NC	D	SD

Appendix B: Permission Statements

Permission slip for participation in study on the influences of gardening and outdoor classrooms on student motivation in the sciences

Hello,

Two schools within Moore Public Schools have been selected to be the site of a research study because of their existing outdoor classroom facilities. This study will look at how participating in these programs may influence children's motivation at school. Hannah Harder will be the main researcher for this project. She has degrees in biology and English and is working on a master's degree in environmental science at Oklahoma State University. She has extensive experience working with K-12 education both in the classroom and out.

This study is going to highlight some of the great accomplishments Moore schools are doing. As part of this study, your student may be asked to complete two very brief 15 minute surveys in the spring semester about their experiences in the school's outdoor classroom and to answer a few very short writing questions about what they have enjoyed about their experiences. Your child's personal information will be coded so researcher will not be able to identify them specifically. Data will be stored at the school and on the researcher's personal computer.

Allowing your child to participate in this study is entirely voluntary. Your child will not be punished in any way regardless of if they participate or not. In addition to your permission, your child will also be given the option to opt out. You may choose to remove your student from the study at any time for any reason. However, the more students that we can get to participate, the more complete the research will be. Also, in order for the data to be complete, we really need your student to complete both surveys.

The survey does not require anything beyond what your students are already doing as part of their science curriculum at school. Therefore, there are no known increased risks to your student. I am excited about working with your school and sincerely hope that you will choose to allow your student to participate. Should you have any questions about this study you may contact Hannah Harder at (405) 842-8507. Additionally her OSU advisor, Dr. Lowell Caneday, may be reached at 405-744-5503 or David Peak, Principal of Central Junior High may be contacted at 405-735-4540 and Dr. Loretta Autry may be contacted at 405-735-4110. If you have questions about your student's rights as a research volunteer, you may contact irb@okstate.edu *Or c*ontact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676

<u>Please return this permission request by DATE to your student's teacher.**</u>**

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy of

this form has been given to me. I agree to let my student ____________________

Print students' name

participate in the study. **TURN and Complete BACK SIDE =>**

________________________ _______________

Parent/Guardian Name (printed) Date

________________________ _______________

Parent/Guardian Name (signature) Date

I certify that I have personally explained this document before requesting that the participant sign it.

________________________ _______________

Signature of Researcher Date

To be completed by the student:

Hello,

My name is Hannah Harder. I am really interested in what students like you think about your outdoor classroom experiences. I am also interested in finding ways to make science more fun. I think that more schools should have programs where they get to do science outside. I also would like to tell lots of people about how great Moore Schools are. I am doing a research study to try and show the benefits of programs like your outdoor classroom.

But, I need your help! Would you be willing to help me out by doing two short surveys where you give your honest opinions about how you are feeling? I ***really*** hope you will participate. More students doing the survey will give me better information. However, if you choose not to participate you will not be punished in any way. This will not affect your grades. What do you think? Would you like to help in a real science experiment and help your school to get noticed?

Sincerely,

Hannah Harder

(Please check one box)

__Yes, I will help and do the surveys.

__No, I will NOT do the surveys. I understand I will not be punished for this choice.

______________________________ ________________

Print your name here Date

____

Sign your name here

Permission slip for participation in study on the influences of outdoor classrooms on student motivation in the sciences

Hello,

As you know, your school has been selected to be the site of a research study because of their existing outdoor classroom facility. This study will look at how participating in these programs may influence children's motivation at school. Hannah Harder will be the main researcher for this project. She has degrees in biology and English and is working on a master's degree in environmental science at Oklahoma State University. She has extensive experience working with K-12 education both in the classroom and out.

As part of this study, you may be asked to complete a brief written questionnaire about your experiences with your students in this learning environment and how you used your outdoor classroom during the study period. Data will be stored at the school and on the researcher's personal computer.

The survey will require only about 15 minutes of your time and is voluntary. There are no known increased risks to you to participate. I am excited about working with your great school and sincerely hope that you will choose to participate. Should you have any questions about this study you may contact Hannah Harder at (405) 842-8507. Additionally her OSU advisor, Dr. Lowell Caneday may be reached at 405-744-5503 or David Peak, Principal of Central Junior High may be contacted at 405-735-4540 and Dr. Loretta Autry may be contacted at 405-735-4110. If you have questions about your student's rights as a research volunteer, you may contact irb@okstate.edu *or* contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676

<u>Please return this permission slip by DATE.**</u>**

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy of

this form has been given to me. ____________________

Print adult's name

________________________ _______________

Adult's signature Date

I certify that I have personally explained this document before requesting that the participant

sign it.

________________________ _______________

Signature of Researcher Date

Appendix C: Instructions for the Study

Today we are going to take a very brief survey.

Your school has been selected as an important site to learn more about whether outdoor classrooms are helping students like you learn science. You will not put your name on this survey. This study is just for fun and information. It will not affect your grade. In fact, your teachers and I will not even know which one is yours. I just want you to be really honest and to follow the directions. I hope you will choose to fill out the survey, but no one will make you. Completing this survey will give me better information to make your outdoor classroom better and will help me to finish my project.

Please clear off your desk and take out a pencil. Raise your hand if you don't have a pencil and I will bring one to you. Follow the directions very carefully. It is important that you don't copy from your neighbor and that you give answers about how you really feel. I want to know what you think. I will tell you how to fill out the top part. Then I will read you each question and we can all work through it at the same time.

Identification: DO NOT write your name on the study!

[*During the pre-test, every student survey copy will have a pre-assigned number written on it that corresponds to the students alphabetical ranking within the class according to the teachers' grade book. The teacher will assign the numbers and the researcher will have no knowledge of individual student names. The teacher will not get to see the completed surveys. During the post test and based upon the student numbers and initials the teachers will give them a survey that has the same identification code on it as the first study that the students will complete.*]

Participation: I hope you will help, but you do not have to. The choice is up to you. Please check one of the boxes. **__** Yes, I will fill out the survey and want it to be used to help research.

__No, I won't do the survey. (You will not be in trouble if you do not want to participate).

Date: Write today's date

Grade: Circle the grade that you are in now

Sex: Circle whether you are a boy or girl

Previous experience: Please circle the correct statement

-I attended school at Central Junior High [Briarwood Elementary] in the fall and participated in their outdoor classroom

-I did not participate in the outdoor classroom in the fall

Survey: Please respond as honestly as possible. Remember there are no right or wrong answers! If you think the statement is very true of you circle strongly agree (SA). If something is a little true circle agree (A). If something doesn't make sense, or you don't know circle not certain (NC). If something is somewhat untrue circle disagree (D) and if it is very untrue of you circle strongly disagree (SD).

Thanks very much for your help!

Appendix D: Student Pre- and Post-test Survey Sample

DO NOT WRITE YOUR NAME ON THIS SURVEY

ID Code______

Please check one of the boxes:

__ Yes, I will fill out the survey and want it to be used to help research.

__ No, I won't do the survey. (You will not be in trouble if you do not want to participate).

Date_____

I am in__6th 7th __**grade** (Please circle the correct response.)

I am a __boy or a girl______ (Please circle the correct response.)

Previous experience (Please circle one) :

-I attended school at Central Junior High [Briarwood Elementary] in the fall and participated in the outdoor classroom

-I did not participate in the outdoor classroom in the fall

Survey directions:

If you think the statement is very true of you, circle strongly agree (SA). If something is a little true, circle agree (A). If something doesn't make sense, or you don't know, circle not certain (NC). If something is somewhat untrue, circle disagree (D) and if it is very untrue of you, circle strongly disagree (SD).

Questions	**Strongly Agree**	**Agree**	**Not Certain**	**Disagree**	**Strongly Disagree**
1. I'm doing a good job of learning in the outdoor classroom.	SA	A	NC	D	SD
2. I sometimes get to make choices about what and how to do things in the outdoor classroom.	SA	A	NC	D	SD
3. The only reason I care about participating in the outdoor classroom is to please my teachers or parents.	SA	A	NC	D	SD

4. I often worry that I am not very good at science.	SA	A	NC	D	SD
5. Most of what I'm learning about how things work in the outdoor classroom is important to me.	SA	A	NC	D	SD
6. When I come to the outdoor classroom, science makes more sense to me.	SA	A	NC	D	SD
7. I try to learn as much about science from the outdoor classroom as I can.	SA	A	NC	D	SD
8. The outdoor classroom is usually boring.	SA	A	NC	D	SD
9. I feel good about my ability to do science.	SA	A	NC	D	SD
10. At school, I have many questions about how things work in the outdoor classroom I don't get to ask.	SA	A	NC	D	SD
11. I help in the outdoor classroom so my teachers and parents don't get mad at me.	SA	A	NC	D	SD
12. The outdoor classroom is a waste of time.	SA	A	NC	D	SD

[post survey only] Please think about the time that you have spent in the school outdoor classroom in the last year. In complete sentences and paragraphs, answer both of the questions below. This will help to improve the outdoor classroom. There are no right or wrong answers.

1. What do you do in the outdoor classroom?

2. What parts of the outdoor classroom do you like best?

Appendix E: Teacher Open-Ended Response Questions

Teacher Open Response Questions: In order to have a better understanding of how your outdoor classroom was used throughout the year, please tell me about the following information to the extent that you are able.

Name______________________
School_____________________
Position____________________
Number of years in current position_____
Date___________

1. What do you consider to be the most successful features of your school outdoor classroom [wetland] program?

2. Do you think participation in the school outdoor classroom [wetland] program motivates students to put their best effort into learning? If the response is yes: What characteristics of your program would you identify as having the greatest impact on student motivation?

3. How has the program affected (either positively or negatively) the way that you teach/perform your administrative duties?

4. What are the biggest obstacles your outdoor classroom [wetland] program has faced?

5. How many times did you use the outdoor classroom with your students before February 16^{th} (Mrs. Wilhelm?)
   Before Feb 19^{th} (Mr. O'Halloran)?

6. How many times did you use the outdoor classroom between February 16 and May 8^{th} (Mrs. Wilhelm?)
   Between Feb 19^{th} and May 4^{th} (Mr. O' Halloran)?

7. Can you describe in detail as many as possible individual lessons and objectives?

8. What changes in the outdoor classroom (or its inhabitants) were engaging or noteworthy to you and your students?

9. Can you describe in detail some special events that you had throughout the year? (Such as earth day, memorial for the student that was killed, chalk events)

Appendix F: Administrator Open-Ended Response Questions

Administrator Open Response Questions:

Name_____________________
School____________________
Position___________________
Number of years in current position_____
Date___________

1. What do you consider to be the most successful features of your school outdoor classroom [wetland] program?

2. Do you think participation in the school outdoor classroom [wetland] program motivates students to put their best effort into learning? If the response is yes: What characteristics of your program would you identify as having the greatest impact on student motivation?

3. How has the program affected (either positively or negatively) the way that you teach/perform your administrative duties?

4. What are the biggest obstacles your outdoor classroom [wetland] program has faced?

Appendix G: Student responses to open-ended questions

The responses to open-ended student questions exactly as they appeared. Student code is followed by sex with (F) = Female and (M) = Male. Code groupings are by class period so that all students with a code of A# are in period one, B# are in period two etc.

Central Junior High 7th grade responses

A3 (M): Q1: We learn about the animals and the plants and what happens in life. Q2: The animals and plants.

A4 (M): Q1: Learn about animals and plants. Q2: The pond and all the animals and things we learn about.

B4 (M): Q1: We do project and talk about plants. We work with people that sit with us. Q2: The pond. Plant trees. All of the animals.

B9 (M): Q1: We have planted stuff. We look at the animals, the trees. We do a jounal about the O.C. We whatch the animals eat. And we see little baby turtles. And there's a lot of plants we write about and lean about. Q2: everything is great

B13 (M): Q1: We study the plant and animal life. We study the weather. We take notes on what the animals and plants do. Q2: I like seeing the animals the best. I like being able to go outside in the middle of class. I like how the plants seem to get bigger every time I go out there.

C1 (M): Q1: We learn about the ecosystem and environment. We learn about life and weather. Q2: The animals, and the biodiversity in the O.C. I also love the fish and turtles.

C3 (M): Q1: We mostly make observations about life in the O.C. Then we see how plants grow and what they need to grow. We make observations about almost everything then we discuss them. Q2: I like the pond It has the most life and It is the most interesting part of the O.C.

C4 (M): Q1: Well, we make observations about Spring, plant life, and mammals. We make observations. I love the pownd[scratched out] pond I like the turtles all the animals I love the trees. The plant life. The Verity of fish in the pond.

C5 (M): Q1: We observe nature. Watching things grow. learning how they live. Q2: I enjoy watching the animals, plants, and incects. I also enjoy learning new things about each speiceis. I like being outside also.

C6 (M): Q1: understand science and nature. Q2: Pond, Tree, birds, turtles.

C8 (M): Q1:We do plant observations. Plant diversity, we look at the outdoor classroom like when it was earth day we planted plants. Q2: I like it all the way around, it looks cool.

C9 (M): Q1: I examine the forms of life living in the O.C. I write down observations that I make in the O.C. Q2: I like the heavly vegateded parts of the O.C. The forms of life that live in the grasses, trees, ect. are facinating.

C12 (M): Q1: We record data and plant flowers and feed the fish and record pond temp. and feed turtles and the birds.. Q2: I like best the pond, flowers, turtles and lizards.

C13 (M): Q1: We get to obsserve ananles. We get to see fish in the O.C. We see how turtles reproduce. Q2: I like the pond. I like to see the birds. I like the outdoors while having class. I like Mr. O.

C15 (M): Q1: We take field notes, we study life, we make journals, and we listen, watch, & learn as much as we can. Q2: I like the smell, most of the look. I don't like most of the man made stuff and the sound of some things. I just like it.

C16 (M): Q1:We make observations of different things in the outdoor classroom and other things. Q2: Seeing animals in their natural environment.

D3 (M): Q1: We observe different things. We look at animals. We look at plants. Q2: The plants. Being outside. Observing things.

D5 (M): Q1: We walk around and look at the plants + animals. We get to see them like we would in the wild. It is more like what a sintest would do in real life. A sintest wouldn't sit in the library and read a book because then they wouldn't discover new things. Q2: Deffinatly when Mr. O Feeds the turddles or takes Bull [class bull snake] out with us and lets him cral around Because that isnt something everyone gets to see. I really do enjoy the O.C.

D7 (M): Q1: We learn about nature. We observe different things. Q2: I like the turtles and the different plants that are growing. It's fun when we get to observe what the turtles do and all the other species there.

D11 (M) Q1: Look at birds chirp. Listen to the water in the pond. Look at the animals. Q2: The quiet-shruby-wild parts.

E3 (M): Q1: We usually take one main subject + try to find 20 examples of it. Q2: When we get to look at the fish.

E5 (M): Q1: look at animals and plants. The Turtles + the pond.

E10 (M): Q1:We do the outdoor journal and see turtles and other animals Q2: The turtles

E11 (M): Q1: [Student left blank] Q2: [Student left blank]

E12: (M): Q1: We look and take notes and learn a lot. Q2: The whole outdoor classroom.

E13 (M): Q1: I watched how life effects other people, take care of the environment and to look at other animals. Q2: Feed animals, plant plants, listen to birds, and pick up trash.

E16 (M): Q1: It is cool. It helps me get in peace. Q2: The pond.

A2 (F): Q1: I take notes about things there. Q2: I like the pond and the tall grasses best. They calm me.

A5 (F): Q1: We go out + analyze plants. We planted flowers. We watch Mr. O feed turtles. Feed birds too. Q2: I like all of the outdoor classroom. It’s all fun to me.

A6 (F): Q1: We go out there and do observations and we go and learn about the animals and plants. Q2: the part when we get to learn about the fish + tertals in the pond it’s really fun.

B2 (F): Q1: We learn about nature. We also learn to recognize different types of plants. We have also learned about how some animals hibernate. Q2: I like the pond and where the animals are.

B3 (F): Q1: I learn about nature. The outdoor classroom is about as natural as places get now a days. Q2: I like the pond! It has pretty little fishies. ☺

B5 (F): Q1: We study the plants and animals. The turtles are all different. We study indications of spring. We record all of our observations in our notebooks. Q2: Everything, because when we're in the outdoor classroom we get to be close to nature. We learn about different plants and how they help our planet. We learn how to save our planet and be more aware to our environment. The environment in the outdoor classroom is calm and peaceful and helps me to learn more about our planet.

B7 (F): Q1: We take notes on what we learned. We have to find examples of things. Q2: When we have to find examples on stuff and watching birdies! Just seeing science in reality.

B8 (F): Q1: We observe the animals in the outdoor class room. We plant flowers for earth day. We look for turtels. Q2: The part I like best are when we plant flower + look for turtles.

B11 (F): Q1: We do alot of things in the O.C. We get to plant flowers, are free to examine plants, examine the behaviors of different animals and sometimes we get to feed the animals. Q2: I really don't have a favorite part. I Like it all! But I think the big thing that I like is conecting with nature. That's really important to me.

B12 (F): Q1: In the outdoor classroom we learn about animals, plants & insects. I learn how they all survive. Q2: everything.

C2 (F): Q1: We study science. We study life. We usually find twenty things about something like "indications of Spring." Q 2: I love the life in there and the peace. I like the turtles + the birds + snakes + every single living thing out there

C7 (F): Q1: We mostly learn about the environment and our surroundings, we also talk about what happens outdoors and how animals interact with eachother. Q2: I like looking at the pond and we get to flip over lilly pads to see if there are baby snails or any new fish. We also get to feed the fish sometimes. I like the turtles too, we get to hold them sometimes. ☺ [Star drawn]

C10 (F): Q1: We learn about lots of animals + plants. We also take data on the weather. + how plants + animals react to it. It is ussually fun to go to the outdoor classroom because you get to be in nature. Q2: I like hearing the animals. I don't really know why it just has a peaceful affect on me. Its kinda like being in a little bitty zoo but more natural more peaceful. ☺

C11 (F): Q1: I take observations on animals & plant life. I witness life growing and developing in the O.C. Q2: The large trees and I enjoyed planting. The O.C. is a different atmosphere. We like actually doing work out there.

C14 (F): Q1: We do a lot of different things in the outdoor classroom such as observing signs of spring and reproduction. We also went in and planted a flower on Earth day so each of us would have a chance to touch the Earth. We also learned a lot about the different species living in the outdoor classroom, such as the animals, trees, and flowers. Q2: I really like the pond and looking in it and seeing all the different species living in that pond alone. I also enjoy that there's a wide variety of animals living there, so instead of just sitting in class, we can actually go outside and it can be shown to us.

C17 (F): Q1: We observe nature. We learn about indications of things such as Spring + Fall. Q2: I like everything the pond, the plants, the lizards, the turtles, + some of the birds.

C19 (F): Q1: Observe turtles, birds, fish, & insects. We also observe plants. Q2: I like looking at the different varities of flowers. ☺

C20 (F): Q1: In the outdoor classroom, I observe seasonal changes, insects, birds and animals plant life and other fun things. Q2: The part I like best is the turtles and the pond. I like being outside mostly though.

D4 (F): Q1: In the outdoor classroom we get to observe animal and plant behavior and take notes on it. We also get to just relax and listen to the nature around us. Q2: I like the animals the best. Because they are not trained and they are not caged up. They are just free to roam anywhere they want to go.

D6 (F): When we are in the outdoor classroom we observe what is going on with all of the animals. Also we get to learn about Nature. We get to learn about different species of life. Q2: I like the turtles out there. I also like the pond and the fish out there. I like to see the birds that fly around.

D8 (F): Q1: We always asove and wight down osbervations. We take alot of nots. We sometime will the two adaptationn of an ananimal. We have learned so interesting thing in the OC. Q2: The aniamis and: The beutiful plants. There are many things that are neat. but what makes it specail feels like a great place to be. It is verry fun I always enjoy the outdoor class room (alot!)

D9 (F): Q1: In the O.C. we learn about science! We learn about real, live, interesting science. We record p.t. [pond temperature] + study the animals, (such as turtles, fish, + birds.) I especially love the O.C. because we get a break from the class room. Q2: I love being able to be outside. It's awsome to be able to look at nature, for real, not in a book! ☺

D10 (F): Q1: We are doing a journal right now about the different things going on like observations We even got to plant flowers. We get to experience the outside/ nature. We learn a lot about animals and nerture. Q2: Experiencing nature. getting to go outside.

D12 (F) Q1: I think the outdoor classroom is a amazing place. I love to hear the birds sing and the water fall on the pound. It makes you feel like you are in the forest to listin to everything. Q2: I like most of the outdoor classroom is when everybody is quite. I can hear mother nature. And I like to walk around and see all the living things and how the turtules eat and things like that.

D13 (F): Q1: We write about the animals. We learn about plants. We get to plant flowers on Earth day. We get to learn about the days and how the shade line gets bigger or smaller. Q2: Just the warm sun hitting you and how you get to see the animals. Also how Mr. O tells us about the outdoors.

D14 (F): Q1: I take notes and learn about scienc. I learn about how life in plantes work. I leson to my surrouning to hear birds. I do not yell in the O.C. Q2: I like it by the mapol tree. You can look up and see birds. Its good when it is hot outside, you can see what it has been throug.

E2 (F): Q1: We look for examples of certain things like biodiversity and ecology. We planted flowers on Earth day. We look for signs of reproduction. We fill out our outdoor classroom journal. Q2: I like all of the different kinds of plants. I like the pond. I like the different types of animals in the O.C.

E4 (F): Q1 We take observations on ecology + biospecies so that we can learn more about them + share with the class what we observed. We also, well, we mainly observe all kinds of things, that are interesting to me. Q2: I like the fish pond and the trees + flowers + the plants + the animals -(especially the birds + butterflys), well i can’t choose a favorite, but I love the O.C. and everything in it.

E6 (F): Q1: We learn about science terms & Animals & plants. We also observe things. Q2: I like the big Maple tree and flowers.

E7 (F) Q1: Learn more about science. We take notes. Q2: All of it. the turtles.

E8 (F): Q1: We go in the outdoor classroom, and we observe want we see, feel, hear. We do work and some times we just hang out and look at all the beauiful plants and the pond in the outdoor classroom. Q2: I love the pond with the fishes in the outdoor classroom. I also love the trees and plants. The birds and other animals that are in the outdoor classroom are awesome.

E15 (F): Q1: I get my work done then I walk around ant talk with friends. Q2: Everything! [extra large font]

E 17 (F): Q1: We take observations of bio-diversity, and ecology, and how things are changing. Q2: That we don’t have to sit in a chair and read out of the text book. It helps me bc I learn better with hands on. I hate to read out of the text book!!

E18 (F): Q1: Write stuff down Q2: The turles, and the pond

****

Briarwood Elementary 6th grade responses

A2 (M): Q1: You get to see the stuff so you can study it more easily. Q2: Not sitting down. Getting to see + work with stuff.

A7 (M): Q1: We draw with chalk and do [?]. It’s really fun. Q2: I like the pond.

A9 (M): Q1: Science. Q2: Nothing.

A11 (M): Q1: Nonliving and living things. Going out to the pond. Try to find frogs or snakes.

B7 (M): Q1: We go to the wetlands and its fun! We study the water. We also study what kinds of animals live there. Q2: Just being able to have the privilige to study more things that I like better, and hopefully my friends too.

B8 (M): Q1: We work harder than is possible indoors. We do many outdoor activities. We make quantitative and qualitative observations. Q2: The fact that we’re not cramped in a building. I like going to research in the wetlands. I like the experiment we do.

B9 (M): Q1: We normally go to learn about ecology. Some times it can be for a special occasion, though. After a schoolmate died recently we put a memorial there. Q2: I like the lake part. It’s very calm, iridesent, and even pretty. I also like the shade of the gazebo.

B13 (M): Q1: We study nature. We study habitat and animals. Q2: learning about how science works and how it affects us every day

B14 (M): Q1: Science. Some what geography. We learn about the pond. Q2: going outside!! I like running around the pond. I like hanging.

B15 (M): Q1: When we go to the pond we usualy go and talk. We also observe + look at snakes + stuff. Q2: I thing going outside is fun. I also like to talk to my friends.

B16 (M): Q1: We do a lot of ecology out there and we do study the temperature of different places. Q2: I like the area around the pond because many things live there.

B18 (M): Q1: We usually write about it. We draw, or we observe. We take in water to learn about the [incomplete thought]. Q2: The bridge, and the pond. The rest is usually boring. I really don't like the outdoors classroom.

C5 (M): Q1: We do some expirements. We color with chalk. We also do some Geo. Q2: I like it when we play with chalk. It is fun.

C7 (M): Q1: We learn about the coc ecosystems. We learn about animals. Q2: I like to see the colorful animals. I also like Fresh air.

C8 (M): Q1: We see what is going on. We see what the temp is of different things. Q2: Getting to do stuff with nature. We have done stuff with land water, and air.

C11 (M): Q1: We observe the animals in their environment. We plant plants to learn what they do. We do chalk projects. Q2: I like the pond, kazee bo, and Bridge the most.

C12 (M): Q1: Its okay. Its funner. Q2: being outdoors.

C13 (M): Q1: learn draw investigate. Q2: walking around the Air not having to sit around.

A3 (F): Q1: We do things about non botic and botic and observations. Q2: I like the pond area mostly.

A4 (F): Q1: put some cups in fence and go to the wetlands try to play with chalk and do some work. Q2: go to the wetlands play with chalk.

A6 (F): Q1: We take thermometers sometimes and measure different things. And we would study what kind of biome it is. Then studying that ecosystem. Q2: Studying the ecosystem. And figuring out what kind of biome it is.

B2 (F): Q1: We walk around, and look at stuff like, animals or trees. Then we learn about them, and write about them. Q2: I like being outside instead of sitting down and being stuck indoors all day. Also I like to see all of the animals outside.

B3 (F): Q1: We learn about the water. We learned about abiotic factors. We learned about biotic factors. Q2: Walking around. The plants.

B5 (F): Q1: We usually study about the plant life, and take surveys on what we see living or nonliving. Q2: To go out into the wet ands and study about the plant life and insects we see to study them.

B6 (F): Q1: We don't go outside and learn. We always stay inside. Q2: That there are living things in it. I like that the wet lands have ducks and fish. I think its bad when the lake drys up.

B10 (F): Q1: I just really learn about the animals and soil. We do like to study there. It helps alot. Q2: I really love just about everything about it because its easier to learn. We get to study science upclose.

B11 (F): Q1: We learned about biotic and abiotic things. Q2: I like to go outside so we don't have to sit in chairs all day.

B12 (F): Q1: We do lots of projects like surveying the pond area. We dont go out to the pond after, but when we do, we do fun projects. It helps us learn how wildlife works + science. Q2: I like all the posters Mrs. Wilhelm puts up. They are fun to look at and you can learn from them. The pond is very important, its the only part of wildlife in Briarwood Elementry.

B17 (F): Q1: Science like exerping stuff. Note taking. And sometimes fun. Q2: Get out of class. Kinda but ya learnin' outside.

C1 (F): Q1: We study insects, trees, plants. We also get to make surveys and different stuff. We get to color on the sidewalk with chalk. Q2: I love getting to go to the outdoor classroom and look at the pretty pond.

C2 (F): Q1: Sometimes we go out there to survey the land. Sometimes we go out there to have fun. Q2: being out there learning science.

C3 (F): Q1: We get to go to the wetlands. We get to do project. Q2: Just going outside.

C4 (F): Q1: We always have fun, but learn at the same time. I get to do things myself, and learn. Q2: I like when we take notes. I also like describing what I see.

C6 (F): Q1: We obsurve the nature, wright on the sidwalk with chalk and we walk around. Q2: That we learn about nature and things around there.

C10 (F): Q1: We learn about the ecosystem. Q2: I like going to the wetlands + doing projects.

Appendix H: Approval Letter from Institutional Review Board for Study with Human Subjects

Oklahoma State University Institutional Review Board

Date:	Friday, January 23, 2009
IRB Application No	GU0816
Proposal Title:	The Impacts of Two School Outdoor Classrooms on 6th and 7th Grade Student Motivation Levels in Science
Reviewed and Processed as:	Expedited (Spec Pop)

Status Recommended by Reviewer(s): Approved Protocol Expires: 1/22/2010

Principal Investigator(s):

Hannah Ruth Harder	Lowell Caneday
1442 NW 46th	184 Colvin Center
Oklahoma City, OK 73118	Stillwater, OK 74075

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

✓ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia Kennison, Chair
Institutional Review Board

VITA

Hannah Ruth Harder

Candidate for the Degree of Master of Science

THESIS: THE IMPACTS OF TWO SCHOOL OUTDOOR CLASSROOMS ON 6TH AND 7TH GRADE STUDENT MOTIVATION LEVELS IN SCIENCE

Major Field: Environmental Science, emphasis environmental education

Biographical:

Personal data:

Presenter at mini-session: *Making spaces engaging places: Designing for children*, National Association of Interpretation Region VI meeting, Tulsa, OK, 2008

Environmental Education scholarship recipient, National Association of Interpretation, Fall 2007

Presenter at Teacher Continuing Education Day, *Maintaining and using outdoor classrooms.* Moore Public Schools, Moore, OK Fall 2008

Ted Mills Environmental Education Scholarship recipient, Oklahoma State University, Stillwater, OK 2007, 2008

Education:

Completed the requirements for the Master Arts in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in May, 2010.

Bachelor of Arts, English Writing; Westmont College, Santa Barbara, 2004

Bachelor of Arts, Biology; Westmont College, Santa Barbara 2004

Experience:

Science Curricula developer, Advanced Academics, Fall 2007- Spring 2008

Part time Zoo educator, Oklahoma City Zoo, Fall 2006 - Spring 2007

Water educator and volunteer training coordinator, Oklahoma Water Resources Board 2004-2007

Professional Memberships:

Master Gardener Association, Fall 2009 – present

National Association of Interpretation, Fall 2007 – present

Oklahoma Association of Environmental Education, 2004 – 2007

Oklahoma Consortium for Environmental Literacy, 2004 –2006

Oklahoma Sustainability Network, 2004- 2007

Name: Hannah Ruth Harder Date of Degree: July, 2010

Institution: Oklahoma State University Location: Stillwater, Oklahoma

TITLE OF STUDY: THE IMPACTS OF TWO SCHOOL OUTDOOR CLASSROOMS ON 6TH AND 7TH GRADE STUDENT MOTIVATION LEVELS IN SCIENCE

Pages in Study: 160 Candidate for the Degree of Master of Science

Major Field: Environmental Science

Scope and Method of Study: Using a Two-way ANOVA, the impacts of two outdoor classrooms on changes in urban Midwestern 6^{th} (n = 35) and 7^{th} grade (n = 61) student motivation levels in science at two schools was assessed using a modified Achievement Motivation Index instrument at two time periods over 13 weeks. Students were also asked to answer open-ended questions over what they did in their outdoor classrooms and what they liked best.

Findings and Conclusions: Scores of both 6th grade males and females decreased while scores of 7th grade males and females increased. When controlling for grade and sex with alpha of .05, only the main effect of school, $F (1,92) = 6.17$, $p =.015$ was found to be significant. Scores across all groups were highly clustered in the highly motivated range of scores, despite the death of a 6th grade student during the week of the second sampling date. Because of circumstantial conditions and because homogenity of variance was not met, findings were limited to within the research situation.

Responses to two open-ended questions indicated that outdoor classrooms were highly valued almost unanimously by students. Biota, water, structures, and peer relationships were among the most important elements of the outdoor classrooms to the students. Student preferences from both grades and sexes revealed that outdoor classrooms allowed for kinesthetic learning that was distinguishable from classroom or textbook learning and also provided them with meaningful and real science learning experiences.

ADVISER'S APPROVAL: DR. LOWELL CANEDAY