AN ASSESSMENT OF OUTDOOR ENVIRONMENTAL EDUCATION AMONG SECOND GRADE STUDENTS

BY

CYNTHIA CAROL NAPIER

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Northeastern State University

Tahlequah, Oklahoma

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My deepest appreciation is sent to my parents, Tom and Carolyn Spurlock for the encouragement it took to see me through and the support necessary physically, mentally, and spiritually during this time.

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CHAPTER I

INTRODUCTION

Educators are beginning to realize that the natural environment is an ideal classroom. Traditional subject headings such as mathematics, reading, science, and geography have been concerned with the taxonomical aspects of the universe rather than relating to our immediate surroundings. Environmental education ought to be a total look at where man lives, how he lives, and why he lives (Hammerman and Hammerman, 1973). While there was a move in the 1960's and 1970's to provide outdoor education, many educators have abandoned nature due to costs and liabilities and now focus on academic basics.

A direct experience and encounter with the social, physical and cultural world provides more than learning from a book in the classroom. It provides (1) A broad based understanding of the environment both natural and man-made; (2) A clear understanding that man is a central and inseparable part of the complex environmental system and that he has the ability to alter the interrelationships of the system; (3) A fundamental understanding of environmental problems confronting man, how these problems can be solved, and the need for individual citizens and government agencies to work toward their solution; and (4) Attitudes and concerns for the quality of the environment; which will motivate him to participate in environmental problem solving (Hammerman and Hammerman, 1973).

The educational significance of gaining more environmental literacy has merit for better instructional and curricular development in the social sciences as well as the physical and biological sciences.

The most significant goal in gaining environmental or ecological knowledge lies in environmental education and literacy. This research refers to environmental education as an essential ingredient in education that should involve experiences that promote an understanding of our natural environment and the need for its protection.

This research focused on an ordinary school with a not-so-ordinary classroom setting. The focus is on the environment and the student's environmental literacy.

Research Questions

The research questions where developed to answer the questions of whether early elementary students benefit from Environmental Education and whether the out of doors is a suitable learning environment. The questions are:

1. At the second grade level, do students understand various environmental concepts?

2. In which learning setting, outdoor or indoor, do children gain a better understanding of environmental concepts?
3. Do the children enjoy the outdoor classroom setting for instruction?
4. Do the children feel involved in the outdoor learning activities?

Research Hypotheses

Changing the situational factors could change the actions of many students. Making recycled paper cheaper than new paper, providing recycling bins with convenient curb side weekly collections, and selling hamburgers in paper instead of styrofoam containers could stimulate many people into some sort of action. Even though the conservation of resources is already being done, there is still a population that is predominately nominal in their environmental literacy level. Their actions say, "We do not feel like we count," or "why should I sacrifice the convenience, I am only one person," or "what I do does not really make a difference, does it?".

The following null hypotheses were derived from the research questions. Each was tested at an alpha of .05.

Ho_1. Second grade students do not understand environmental concepts. (pre test observations)

Ho_2. There is no significant difference between test scores when students are taught in an indoor versus an outdoor setting. (outdoor post test results versus indoor post test results.)

Ho_3. There is no significant difference between the pre test or post test scores on whether the class was taught indoors versus outdoors setting. (Indoor class for pre test compared with indoor class post test and outdoor class for pre test compared with outdoor class post test.)

Ho_4. There is no significant difference between the scores of students on whether or not they felt involved in the learning activities. (Indoor class pre test compared with indoor class post test on questions number 4 and 11. Outdoor class pre test compared with outdoor class post test on questions number 4 and 11.)

Ho_5. There is no significant difference between the scores of students on whether or not they enjoyed the learning activities. (Indoor class pre test compared with indoor class post test on questions number 6 and 25. Outdoor class pre test compared with outdoor class post test on questions number 6 and 25.)

Methodology

The design selected for this study was application of a similar treatment to two selected samples, with the major variable in treatment being the location of the class. This research scheme is shown in Figure 1. The research scheme was based on similar samples of students, instructed through similar lessons, but in differing learning settings.

The study group for this research was second grade children, ages six through eight. The settings were an outdoor versus indoor classroom instruction.

The indoor instruction consisted of lecture and experiments identical to those performed outdoors except they were adjusted to fit the classroom experience. Indoors, the soil was in a box, the students looked out of the window, and the normal classroom structure of sitting at desks was maintained.

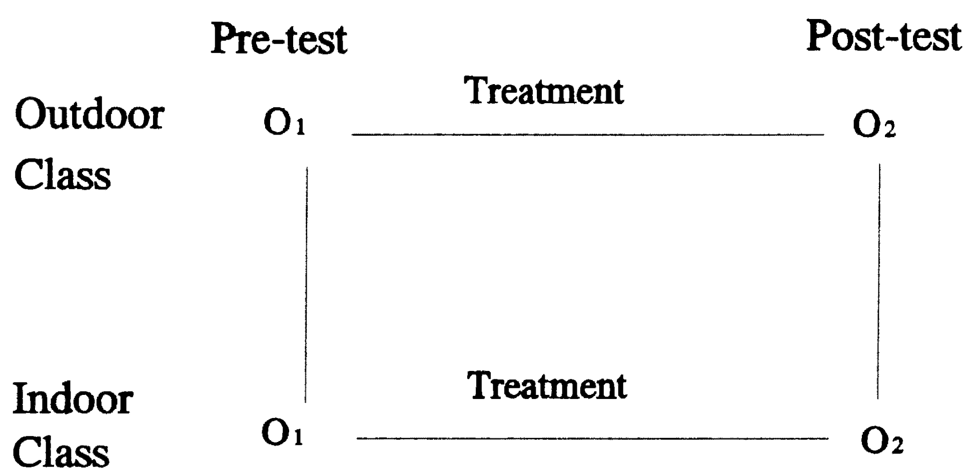

Figure 1 - Research Scheme

The outdoor classrooms are unique environmental learning laboratories created by children for children. They serve as extensions of the indoor classroom. Perkins Elementary School has a 6.2 acre section of land. It includes trees, a garden area, grasslands, and a pond. The garden area is reserved for students to grow plants of their choice. The classroom is just beyond the school next to the playground within walking distance.

The students were in the Perkins Elementary School, at Perkins, Oklahoma. The time frame was the second through the sixth week of school in the Fall of 1992. Thirty-three second grade students participated in the testing; the sample selected did not include all second grade students in Perkins Elementary School. This included two classes whose teachers allowed their students to be involved in the research.

The students were pre-tested on the first day of the learning experience prior to their outdoor education lessons. They were post-tested with the same questions six weeks later at the conclusion of the experiments. The tests administered are included in appendix A.

An analysis of variance (ANOVA) was conducted on pre-test scores for each group and a second ANOVA was conducted on post-test scores for each group. The alpha level, or level of significance selected for this study was .05.

The analysis of the data was selected to assess possible differences within or between groups on the pre-test and post-test. If differences were revealed, follow-up T-tests were conducted to identify actual causes of differences.

Pre-test and post-test results were analyzed at the Oklahoma State University Computer Center using the Statistical Package for the Social Sciences (SPSS) release 4.1 computer program. The analysis of variance was the primary statistical tool utilized; follow-up comparisons were tested with the T-test. Mean scores between pre-test and post-test results were compared between groups as shown in Figure 1.

Assumptions

The students were individuals in the second grade at the Perkins Elementary School. The lessons administered during this study were developed and taught by the primary investigator. The major assumptions on which this study was based were:

1. The lessons were administered in a similar manner.
2. The tests were administered in a similar manner.
3. Students responded accurately and honestly.

Limitations

This research refers to environmental education as an essential ingredient in education which should contain experiences that promote an understanding of the natural environment and the need for its protection. The study was limited by the research design as follows:

1. There was no control group so the results can not be extrapolated beyond the population studied.
2. The study was limited to second grade students in a public school.
3. The outdoor classroom was limited to the available on-campus resource at Perkins Elementary School.

Definition of Terms

These terms are defined specifically for this study for future replication of this research. These concepts were used in the literature, research, or lessons involved.

Acre - A unit measurement of land / equal to an area that is 43,560 square feet in size.

Algae - Microscopic green plants that live in water and on land. They serve as food for other organisms.

Bacteria - Microscopic organisms that live on water and on land. They help break down organic materials into simpler nutrients in a process called decay. Bacteria release nutrients into the soil.

Bedrock - A more or less solid layer of rock usually found below the soil surface of the land.

Commodity - A useful or valuable product of agriculture such as soybeans, beets, or cattle.

Composting - Mixing decaying organic matter (food scraps, grass clippings, leaves) to form a rich soil conditioner.

Condensation - Changing a gas into a liquid; for example, when steam or water vapor turn into water.

Evaporation - Changing a liquid to a gas; for example, when water turns into steam or water vapor.

Famine - An extreme shortage of food in a given area.

Feedlot - An enclosed area in which animals such as hogs or cattle are fed before being sold for meat.

Fungi (plural of fungus) - A group of non-green plants such as molds, and mushrooms, that live on dead or dying organic matter. Fungi release nutrients into the soil.

Goods - An item or thing, such as bread, meat, or fruit, that people are willing to buy.

Habitat - An area of land in which plants and animals live, grow, and reproduce.

Humus - Highly decomposed plant and animal residue that becomes a part of the soil.

Hydrologic Cycle - the cycle of water movement from the atmosphere to the earth and back again through these steps: evaporation, transpiration, condensation, precipitation, percolation, runoff, and storage.

Irreversible - A situation where something cannot be changed back to its original condition.

Land - One of the major factors of production that is supplied by nature and includes all natural resources in their original state such as mineral deposits, wildlife, timber, fish, water, and the fertility of the soil.

Landfill - A location where solid waste (garbage) is disposed of.

Leaching - The removal of soluble minerals from the soil by the downward movement of water.

Mineral - A naturally occurring inorganic substance with definite chemical and physical properties and a definite crystal structure.

Monoculture - The cultivation of a single type of crop over an area which excludes other uses of that land.

Nutrient - A substance that supplies nourishment for an organism to live. It can be for food or chemicals depending upon the organism.

Nutrient Exchange - The process by which plant roots exchange an acid for nutrients from the soil.

Organic Matter - Plant and animal material in various stages of decomposition that may be part of the soil.

Parent Material - The earthy materials - both mineral and organic - from which soil is formed.

Percolation - The downward movement of water in soil.

Permeability - The quality of soil that allows air or water to move through it.

Photosynthesis - The process by which green plants combine water and carbon dioxide gas in the presence of light to form sugars and oxygen gas.

Pore Spaces - The area of the soil through which water and air move. The space between soil particles.

Precipitation - Rain, snow, and other forms of water that fall to earth.

Productivity - The amount of crops or animals that can be harvested from land. It can also mean the general amount of goods made in a given time or in a given area.

Respiration - The process by which organisms obtain energy when sugars combine with oxygen. Carbon dioxide and water are given off.

Runoff - Water that flows off the land into streams and other waterways.

Soil- A naturally occurring mixture of minerals, organic matter, water, and air which has a definite structure and composition and forms on the surface of the land.

Soil Color - The color of a sample of soil.

Soil Horizon - A layer of soil that is nearly parallel to the soil surface and is different from layers above and below.

Soil Mineral - That portion of the soil that is inorganic and neither air nor water.

Soil Survey - The identification, classification, mapping, interpretation, and explanation of the soil over a given area of land.

Soil Texture - The relative amounts of sand, silt, and clay in a given soil sample.

Water Storage - The locations in which water is stored. They can be above ground in lakes, rivers, and other waterways or below ground as groundwater.

Zone of Leaching - The layers in a soil from which soluble nutrients are removed by water.

CHAPTER II

LITERATURE REVIEW

Environmental Literacy

The purpose of this study was to investigate children's pre-existing knowledge of the environment and their environmental literacy. It also tested knowledge gained in two different learning settings: indoor versus outdoor. The educational significance of gaining more environmental literacy has merit for better instructional and curriculum development in the social sciences as well as the physical and biological sciences. The most significant goal in gaining environmental or ecological knowledge lies in environmental education and literacy.

This research refers to environmental education as an essential ingredient in education and that it should be experiences that promote an understanding of our natural environment and the need for its protection.

While many schools have sponsored outdoor education and school camping programs in the past, such efforts should be redoubled (Hammerman and Hammerman, 1973). Conservation-oriented and outdoor recreation agencies and societies should join together to promote public understanding and support of policies needed to overcome the continuing pollution of the environment (Kraus, 1990).

Educators have recognized that the environment is an ideal classroom. Traditional subject headings such as mathematics, reading, science, and geography have been concerned with the taxonomical aspects of the universe rather than relating to our immediate surroundings. Environmental education ought to be a total look at where man lives, how he lives, and why he lives (Hammerman and Hammerman, 1973).

A direct experience and encounter with the social, physical and cultural world provides more than learning from a book in the classroom. It provides (1) A broad based understanding of the environment both natural and man-made; (2) A clear understanding that man is a central and inseparable part of the complex environmental system and that he has the ability to alter the interrelationships of the system; (3) A fundamental understanding of environmental problems confronting man, how these problems can be solved, and the need for individual citizens and government agencies to work toward their solution; and (4) Attitudes and concerns for the quality of the environment; which would motivate him to participate in environmental problem solving (Hammerman and Hammerman, 1973).

The Hines Model of Responsible Environmental Behavior refers to environmental literacy turned into actions as shown in Figure 2. This model describes the various antecedents and factors which affect responsible environmental behavior. Although a person may be environmentally literate with a tremendous wealth of personal ethics and goals, when situational factors come into the model the person may react differently than they feel they should. A good example is that even though someone may know that an aluminum can should be recycled, there is not a recycling bin nearby so they just throw it in the trash or on the ground.

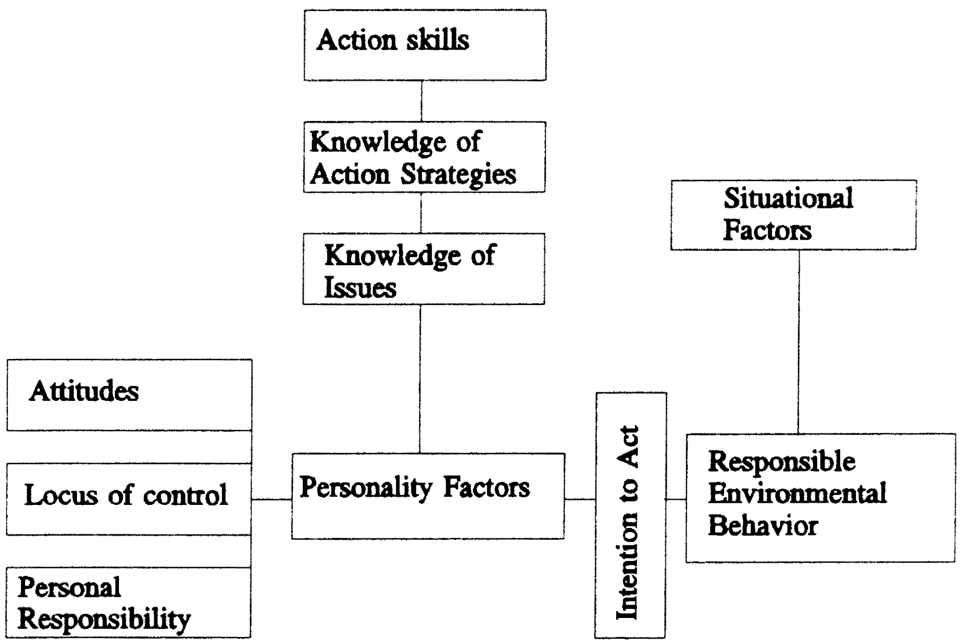

Figure 2 - Hines Model of Responsible Environmental Behavior

Environmental literacy is one of the first recommended catalysts to help someone resolve critical environmental issues. Environmental literacy is the capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore or improve the health of those systems (Roth, 1991).

Environmental Literacy is a continuum of competencies ranging from zero competency to a very high competency which can be divided into three working levels designated as nominal, functional, and operational environmental literacy. Fostering and nurturing environmental literacy at some level of competency is the primary objective of environmental education. In order to assess and evaluate the potential value and effectiveness of any environmental education program, that program should state with considerable precision the degree of environmental literacy competency it aspires to and the degree of environmental literacy that is assumed of those entering the program.

The three levels of Environmental Literacy have been defined in previous research (Roth, 1991).

Nominal environmental literacy.

Specifies a person able to recognize many of the basic terms used in communication about the environment and able to provide a rough, if unsophisticated, working definition of their meaning. Persons at the nominal level are developing an awareness and sensitivity towards the environment along with an attitude of respect for natural systems and concern for the nature and magnitude of human impacts on them. They also have a very rudimentary knowledge of how natural systems work and how human social systems interact with them.

Functional environmental literacy.

Specifies a person with a broader knowledge and understanding of the nature and interactions between human social systems and other natural systems. They are aware and concerned about the negative interactions between these systems in terms of one or more issues and have developed the skills to analyze, synthesize and evaluate information about them using primary and secondary sources. They evaluate a selected problem/issue on the basis of sound evidence and personal values and ethics. They communicate their findings and feelings to other. On issues of particular concern to them, they evidence a personal investment and motivation to work towards remediation utilizing their knowledge of basic strategies for initiating and implementing social and/or technological change.

Operational environmental literacy.

Specifies a person who has moved beyond functional literacy in both the breadth and depth of understandings and skills and routinely evaluates the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment. This person demonstrates a strong sense of investment in and responsibility for preventing or remediating environmental degradation both personally and collectively, and is likely to be acting at several levels from local to global in so doing.

Challenges

The challenge of outdoor education is then a term of observable behaviors. People should be able to demonstrate what they have learned. A national survey of environmental education programs shows that there are already a number of programs existing for the public of every age group to learn about outdoor education (Rakow and Lehtonen, 1988). The issue is how to teach the students how to behave in environmentally literate ways and get them to act upon their knowledge.

No matter how many times people are told they need to do something, or how many times they are shown the consequences of their actions, the only way they would act upon the information is if they have a sense of ownership. For example, when someone feels that what they are doing affects the environment, and that a change in behavior would make a difference, then they may act differently.

In researching the question on what kind of outdoor education could be implemented as training, there are many programs available. Outdoor education, in its simplest aspect, merely says: Don't try to bring the world into the school. Rather, take the children out to where the world is (Dacey, 1981). Outdoor education begins just a step outside the door of the school.

On the way to and from the school, our youth pass by and through the very things that they go into the classroom to study (Dacey, 1981). Outdoor education is education in, about and for the outdoors (Donaldson and Donaldson, 1973). Its guiding principle is that statement from L.B Sharp, "Those things which can best be taught outdoors should there be taught," (Hammerman and Hammerman, 1973). Outdoor education is also defined as the utilization of the out-of-doors to facilitate and enrich learning related to the school curriculum (Hammerman and Hammerman, 1973). The answer is to find the best location or setting for the education to take place. This education should simulate the real world in a child's eye as a form of play.

Changing the situational factors could change the actions of many students. Making that recycled paper cheaper than the new paper, providing recycling bins with convenient curb side weekly collections, and selling hamburgers in paper instead of styrofoam containers would stimulate many people into some sort of action. Even though a lot is already being done, there is still a population that is predominately nominal in their environmental literacy level. Their actions say "we do not feel like we count." And "why should I sacrifice the convenience, I am only one person and, what I do, does not really make a difference, does it?"

Hines had an excellent idea for training people, telling them the consequences of their action is important but the act upon that information would only be shown when situational factors are favorable. Therefore, this research focuses on education taking place early, with children, so a sense of making a difference can be established and environmental illiteracy would be a thing of the past.

Learning Settings

In Leisure

Leisure is an appropriate setting for environmental education. It is appropriate and essential to the educational system when one considers what happens in leisure provides the best opportunities for learning.

Leisure has its classical roots in "Schole" from the Greek. Schole meant activities freely chosen. Schole has directly influenced the English concept of school and is the root word from which "school" was derived. Thus leisure and school have similar classical roots. Leisure as an English word came from the Latin word "licere" meaning to be permitted. Leisure is therefore related to the English word license (Kraus, 1990). Considering its classic etymology, leisure can be summarized as an opportunity for learning.

Although Americans tend to think of "leisure" as being time oriented, leisure is more correctly viewed as activities of choice, performed in a preferred setting, with an appropriate state of mind. Leisure offers the key elements necessary for learning to occur.

Leisure has been devalued in western cultures as people place emphasis upon work and productivity in society. Yet leisure may be the most important factor in establishing the quality of one's life and provide the enrichment necessary to make life enjoyable.

What happens in leisure? Among the leisure options for people in western cultures are - (1) Recreation or an opportunity to relax, especially in the sense of refreshing oneself, (2) Education or contemplation, ranging from day-dreaming to meditation, (3) Association with others, resulting in friendship and social involvement, (4) Moonlighting or using leisure to have a second job of choice, (5) Religious activity such as going to church or church related activities (Kraus, 1990).

Literally defining leisure for what it is supposed to be leads the way to an ideal foundation for environmental education. A question still exists on how to train the more than five billion people on the earth about the environment and the delicately sustainable balance. The idea that learning can, and ought to, occur outside the classroom by direct experience was the customary means of passing on the essentials of human culture from one generation to the next. The gradual evolvement of outdoor education was influenced by philosophical and socio-cultural factors (Hammerman et al., 1985). So the educating of the earth's population should be naturally passed on from one generation to the next, but it is not being done effectively. Education is missing the mark.

There are many ways to educate students. Unfortunately traditional education has fallen into a rut of lecture and tests. Other options are available and have been suggested by outdoor educators since Comenius. The following poem by C. Harold Fablers demonstrates this alternative:

I have five senses
you must reach
if I'm to learn
and you're to teach.
With taste, touch, smell.
And sight so clear,
Why must I receive all
sense by ear?

Currently, American schools operate in a system of a defined place and time for education. This has worked for many concepts but the actions of students show that the environmental education has missed the mark. Students are not acting favorably for the environment in their out of school actions. The reduce, reuse, recycle concept has not shown environmentally favorable results.

Learning is the basic consideration wherever education occurs - indoors or outdoors. Learning is the basic consideration in each outdoor education experience, whether the lesson is a very brief one, just outside the classroom, or an extended one (Hug and Wilson, 1965). Children need many appropriate experiences and a variety of opportunities to be in control of situations.

Play and leisure allow children to be better prepared for the educational challenges they face. Play and leisure are related, yet dissimilar terms. Play is the basis of all higher forms of mental development (Manwell, 1992).

<u>At Play</u>

We owe it to our students to provide opportunities and time for play and leisure. Students who participate in a variety of play experiences have better organizational skills. They show improvements in attention span and time on task (Manwell, 1992). Teachers must recognize the importance of play. They must be cautious of highly structured activities and rigid routines. Play should be viewed as a legitimate educational form and not as a waste of time (Manwell, 1992).

Playing is not a waste of time, but a very important part of the education children receive. A poem written by Anita Wadley of Gateways to Learning sums up the importance of play very well:

Just Playing

When I'm building in the block room, please don't say,
I'm "just playing,"
for you see I'm learning as I play, about balance, shape and size.
Who knows I may be an architect someday.

When I'm getting all dressed up, setting the table,
caring for the babies,
please don't say, I'm "just playing," for you see
I'm learning as I play.
I may be a mother or father someday.

When you see me up to my elbows in paint, or standing at an
easel, or molding and shaping clay,
please don't let me hear you say, "He's just playing",
for you see I'm learning as I play.
I'm expressing myself and being creative.
I may be an artist or an inventor someday.

When you see me sitting in a chair
"reading" to an imaginary audience,
please don't laugh and think I'm "just playing,"
for you see I'm learning as I play.
I may be an teacher someday.

When you see me combing the bushes for bugs,
or packing my pockets with choice things I
find, don't pass it off as "just play,"
for you see I'm learning as I play,
I may be an teacher someday.

When you see me engrossed in a puzzle or some
"plaything" at my school,
please don't feel the time is wasted in "Play,"
for you see I'm learning as I play,
I may be a scientist someday.

When you see me cooking or tasting foods,
please don't think because I enjoy it it's "just play,"
for you see I'm learning as I play,
I'm learning to follow directions and to see differences.
I may be a cook someday.

When you see me learning to skip, hop, run, and move my body
please don't say, I'm "just playing,"
for you see I'm learning as I play.
I'm learning how my body works.
I may be a doctor or an athlete someday.

When you ask me what I've done at school today,
and I say, "I just played,"
please don't misunderstand me,
for you see I'm learning as I play.
I'm learning to enjoy and to be successful in my work.
For I'm a child and my work is play.

Many of the lessons taught in the outdoor classroom can be viewed as play. They are an important method with which to reach the students. The Preparation for Life theory supports this concept. In essence play is instinctive and is a part of the animal's educational experience. Through play the animal practices those things which he must follow later in life. It is, in a sense, preparation for living and a hereditary trait. This theory leaves no explanation for adult play (Meyer and Brightbill, 1964).

Another play theory, Self Expression, states that play is the natural urge for action. It recognizes the nature and capacity of man, his anatomical and physiological structure, his psychological inclinations, and his desire for self-expression (Meyer and Brightbill, 1964). This is a widely accepted and seemingly plausible theory. This provides the explanation for play only that the organism is present.

Whatever the play theory, using play in learning aids in the retention of knowledge.

The New Environmental Education Paradigm: it introduces a different way of learning. It is a program for the development of education to include outdoor education. In our world, the horizons extend beyond the classroom, across town, and into the country. With science knocking on the surface of the moon, it is not enough for children to remain in classrooms and look out. They must experience directly the excitement, pressures and problems of the real world (Swan, 1987). This can be included in any setting but this research focuses on the ordinary school with a not so ordinary classroom setting.

Recreation consists of activities or experiences occurring in leisure, usually voluntarily chosen and pleasurable, although activities may be carried on to achieve other personal or social goals. It may also be regarded as the emotional state resulting from participation, or as a social institution, a field of professional service, or a business. When carried on as part of organized community or voluntary agency programs, recreation should be constructive and socially acceptable, in terms of widely shared community standards (Kraus, 1990). The salient features of recreation can be summarized as: (Caneday, 1992)

1: Personal participation

2: Voluntary involvement

3: Activity based

4: Occurs during leisure

5: Inherent satisfaction

6: Wholesome, socially acceptable.

Soil Analysis and Recommendations

The focus of this study was to investigate children's outdoor education experience using a science unit studying the soil. The educational significance of gaining more environmental knowledge has merit for better instructional and curriculum development in the social sciences as well as the physical and biological sciences.

Soil is the foundation of terrestrial communities. It is the site of the decomposition of organic matter and the return of the mineral elements to the nutrient cycle (Smith, 1990). The soil acts as a pathway between organic and mineral worlds. It is a natural product formed from weathered organisms. Soil is not just an abiotic environment of plants but is full of life. It is filled with little animals, bacteria, and fungi that make it an abiotic and biotic system.

A close examination of the soil reveals changes in texture and structure. A vertical cut through the soil is known as a soil profile. It contains layers called horizons. The horizons vary in thickness, color, texture, structure, consistency, porosity, acidity, and composition. For the purpose of this research the program revolved around the soil and environmental literacy through outdoor education versus indoor education.

CHAPTER III

RESEARCH METHODS AND DESIGN

The purpose of this study was to investigate children's pre-existing knowledge of the environment and their environmental literacy. It also tested knowledge gained in two different learning settings: indoor versus outdoor. The educational significance of gaining more environmental literacy has merit for better instructional and curriculum development in the social sciences as well as the physical and biological sciences. The most significant goal in gaining environmental or ecological knowledge lies in environmental education and literacy.

This research refers to environmental education as an essential ingredient in education and that it should be experiences that promote an understanding of our natural environment and the need for its protection. While many schools have sponsored outdoor education and school camping programs in the past, such efforts should be redoubled (Hammerman and Hammerman, 1973). Conservation-oriented and outdoor recreation agencies and societies should join together to promote public understanding and support of policies needed to overcome the continuing pollution of the environment (Kraus, 1990).

Educators are beginning to realize that the environment is an ideal classroom. Traditionally subject headings such as mathematics, reading, science, and geography have been concerned with the taxonomical aspects of the universe rather than relating to our immediate surroundings. Environmental education ought to be a total look at where man lives, how he lives, and why he lives.

The cognitive schemata used to organize the learning process for this unit was a strategy involving students in relating what they already know, what they want to learn, and finally analyzing what they did learn through classroom discussion and a pre-test/post-test survey. The first activities conducted involved creating the cognitive schemata.

Hypotheses

The hypotheses tested were:

Ho_1. Second grade students do not understand environmental concepts.

Ho_2. There is no significant difference between test scores when students are taught in an indoor versus an outdoor setting.

Ho_3. There is no significant difference between the pre test or post test scores on whether the class was taught indoors versus outdoors setting.

Ho_4. There is no significant difference between the scores of students on whether or not they felt involved in the learning activities.

Ho_5. There is no significant difference between the scores of students on whether or not they enjoyed the learning activities.

Approval for the study was granted through the Internal Review Board from Oklahoma State University, Stillwater, Oklahoma. This approval was designed to protect the participants in the study related to their rights as human subjects, disclosure of the research process, and identification of personal information.

The pre-test and post-test results were analyzed at the Oklahoma State University Computer Center using the Statistical Package for the Social Sciences (SPSS) release 4.1 computer program. The analysis of variance was the primary tool utilized; follow-up, post hoc comparisons were tested with the T-test. An ANOVA was conducted on pre-test scores for each group and a second ANOVA was conducted on post-test scores for each group. The level of significance, or alpha, was set at .05 for this study.

The indoor instruction consisted of lecture and experiments identical to those performed outdoors except they were adjusted to fit the classroom experience. Indoors, the soil was in a box, the students looked out of the window, and the normal classroom structure of sitting in desks was maintained.

The students were in the Perkins Elementary School, at Perkins, Oklahoma. The classes were divided by the school's administration as two individual classes prior to the beginning of the school year. The teachers volunteered their students to be a part of the learning experience. The time frame was the second week of school through the sixth week in the Fall of 1992.

A questionnaire was developed specifically for this research for use as the pre-test and post-test. The questions were derived from examples reviewed in the literature and from suggested questions based on the concepts presented in Project Wild. The teachers from the second grade classes at Perkins Elementary School assisted with the test development to edit for age appropriateness.

The test is shown in Appendix A. This test instrument permitted a maximum "correct" score of 75. Several of the questions were worded in such a way that scoring was reversed from the actual responses given by the students. For example, a student may have responded "disagree" when the preferred response was "disagree." If disagree was coded as a "1" on the test instrument, it was coded "3" for computer entry. All preferred responses were coded as "3;" all neutral or noncommittal responses were coded as "2;" and all non-preferred responses were coded as "1."

The pre-test was administered at the beginning of class. The questions were asked orally and the students circled the number closest to their perceived correct response on the form given to them. The statistics were to compare the pre-test and post-test means based on knowledge gained through the learning activities.

As a whole class, without any prior discussion, students were to write a list stating any facts they already possess regarding soil. They titled this class list "What I Know About the Soil."

The students then engaged in creating a list of what they want to learn about the soil. These are specific questions that were answered during the lessons. This class list was titled "What I Want to Learn About the Soil."

Curriculum

Learning

That which is best learned inside the classroom should be learned there. That which should better be learned in the out-of-doors through experience, dealing with the native materials and life situations should be learned there (Dacey, 1981). "Let the earth teach" is the method for the outdoor learning experience. Appendix B includes the learning activities that involved the soil and students lessons. These are soil unit suggestions adopted from resources including Project Wild (Western Regional Environmental Education Council, 1987).

CHAPTER IV

ANALYSIS OF DATA

Introduction

The focus of this study was to investigate the students' outdoor education experience using a unit studying the soil. The educational significance of gaining more environmental knowledge has merit for better instructional and curriculum development in the social sciences as well as the physical and biological sciences.

Approval for the study was granted through the Institutional Review Board from Oklahoma State University, Stillwater, Oklahoma.

Pre-test and post-test results were analyzed at the Oklahoma State University Computer Center using the Statistical Package for the Social Sciences (SPSS) release 4.1 computer program. The analysis of variance was the primary tool utilized; some comparisons were tested with the T-test. An ANOVA was conducted on pre-test scores for each group and a second ANOVA was conducted on post-test scores for each group. The alpha level for this study was .05.

Mean scores between pre-test and post-test results were compared between groups. Appendix C reports the mean responses from each student for each individual question. This portrays the actual changes in response by the groups from pre-test to post-test. Table 1 reports the analysis of variance on the pre-test given prior to any lessons. The analysis of variance compares the two groups, indoor class and outdoor class, on their knowledge prior to entry into the classroom activities.

TABLE 1

ANOVA - PRE-TEST BY GROUP

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	360.963	1	360.963	10.762	.003*
Residual	1039.765	31	33.541		
Totals	1400.727	32	43.773		

* <.05 = significant difference

The analysis of variance showed that the two groups were not identical upon entry into the study. The specific cause of the variation between the study groups was revealed by a post hoc T-test. The outdoor class was shown to have a significantly lower mean on the pre-test than the indoor class did.

The statistics resulting from the post hoc T-test are shown in Table 2. The test results were coded so that a correct response was worth a possible three points. For example, the correct response could have been to circle the number one, then that was coded into the equation with a value of three points. The correct response could have been a one, two, or three to help the students answer honestly and not just circle all of one column on the answer sheet. Therefore, a higher mean score signifies the better test results.

TABLE 2

T-TEST - OUTDOOR AND INDOOR GROUP PRE-TEST

Study Group	Number of Students	Mean	Standard Deviation	T	P
Outdoor Class	16	36.5	6.261	-3.28	.003*
Indoor Class	17	43.12	5.314		
Totals	33				

* <.05 = significant difference with 31 degrees of freedom

Although the individuals in these classes were randomly assigned by faculty and administrators at Perkins Elementary School, there were differences in the knowledge shown by the two groups. The group selected for the outdoor class was shown to have a significantly lower knowledge base concerning soil than that shown by the indoor class.

Despite this difference, the principal investigator proceeded with the study.

The post-test scores from both the indoor and the outdoor classes were tested using an analysis of variance. This analysis of variance would reveal any differences between the two groups on their knowledge at the end of the treatment period, the actual lessons on soil. Both groups had studied the same material for the same period of time. The only treatment variable was the location of the classes. Table 3 shows the results of the ANOVA on the post-test scores.

TABLE 3

ANOVA - POST-TEST BY GROUP

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	2.342	1	2.342	0.077	.783
Residual	945.173	31	30.489		
Totals	947.515	32	29.610		

Since there was no significant difference shown between the groups on the post-test, no additional statistical analysis was needed. However, proper comparison with the pre-tests would be aided by a T-test. The post-test results showed the results in Table 4.

TABLE 4

T-TEST - OUTDOOR AND INDOOR GROUP POST-TEST

Study Group	Number of Students	Mean	Standard Deviation	T	P
Outdoor Class	16	44.06	6.223	0.28	.783
Indoor Class	17	43.53	4.771		
Totals	33				

The T-test showed that no significant difference existed between the groups at the end of the study period. Inspection of the statistics showed that the outdoor group had increased in mean score, while the range of scores had also decreased. The indoor class did not increase in mean score but remained the same.

Two further statistical tests were conducted to assess changes within the two study groups attributed to the treatment. These results are shown in Table 5 and Table 6.

TABLE 5

T-TEST - OUTDOOR GROUP

Study Group	Number of Students	Mean	Standard Deviation	T	P
Pre-test	16	36.50	6.26	-4.83	.002*
Post-test	16	44.06	6.223		
Totals	32				

* < .05 Significant difference with 32 degrees of freedom

TABLE 6

T-TEST - INDOOR GROUP

Study Group	Number of Students	Mean	Standard Deviation	T	P
Pre-test	17	43.11	5.311	-0.316	.674
Post-test	17	43.52	4.771		
Totals	33				

A visual construct of the research design and the statistical analysis is shown in the following figure 3. The significant difference between the indoor and outdoor groups upon entry into the study is shown as is the significant difference between the pre-test and post-test scores for the outdoor group. All other relationships were shown to be non-significant at the .05 level.

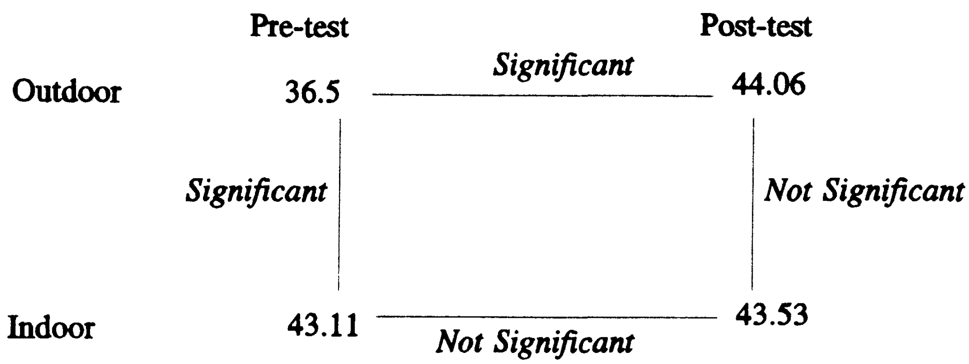

Figure 3 - Research Design and Statistical Analysis

Null Hypotheses

Ho_1. Second grade students do not understand environmental concepts.

The pre-test revealed the level of knowledge, awareness, and attitude present in the sample selected from second grade students at Perkins Elementary School. This was shown with mean scores of 36.5 for the outdoor class and 43.12 for the indoor class. The highest possible coding for the score was seventy-five. The scores do indicate that the students have some knowledge, awareness, and attitude of the environment. This may have been the result of a variety of experiences prior to the six-week instruction.

As a result Ho_1. was rejected.

Ho_2. There is no significant difference between test scores when students are taught in an indoor versus an outdoor setting.

Second grade students do not understand environmental concepts. There is no significant difference between test scores for students taught in an indoor versus an outdoor setting.

A positive increase was shown between the pre-test and post-test means for the outdoor group. This positive increase indicates that these students have a better understanding of their relationship to the physical and social environment. The mean score shift from the pre-test to the post-test on the outdoor group was from a 36.50 to 44.06 which showed a positive increase. The comparisons of means in Table 5 revealed a significant difference in the pre-test and post-test scores for outdoor participants on the survey. By contrast the indoor class showed no change in knowledge level during the test period.

As a result of the significant gain in knowledge shown by the outdoor group and the demonstration of no gain in knowledge among the indoor group, the null hypothesis Ho_2. was rejected.

Ho_3. There is no significant difference between the pre test or post test scores on whether the class was taught indoors versus outdoors.

There was a significant difference on the pre-test scores between the indoor versus the outdoor group. The students in the outdoor group had significantly lower mean scores on the pre-test. Therefore, the increase on the post-test mean scores show an exceptional improvement from the outdoor education experience.

The mean score for the indoor group does not show a statistically significant change. This lack of significant increase in the mean score for the indoor group is attributed to less involvement of the students in the learning experience. The indoor experience permitted learning to take place. But, the indoor class had limited interaction with the outdoors.

This value was tested at the .05 level and the null hypothesis was rejected. The exposure to the plants, animals, and nature gave the students an opportunity to develop perceptions about these situations. The awareness of soil, animals, and the habitats and conservation were communicated in a way that appears to create a positive attitude in students. This increase in knowledge showed a similar increase in positive perception of the environment.

As a result of the identified significant difference, Ho_3 was rejected.

Ho_4. There is no significant difference between the scores of students on whether or not they felt involved in the learning activities.

Students were asked if they enjoyed the outdoor learning environment and if they enjoyed being taught out-of-doors. To assess differences in knowledge based upon a sense of involvement, students were divided into groups by their responses to questions four and eleven in the pre-test. Twenty-six students indicated they "liked" being out-of-doors, while seven students indicated they were uncertain. Table 7 indicates the results of the analysis of variance of mean pre-test scores based upon enjoyment of the outdoor learning environment.

TABLE 7

ANOVA - PRE-TEST BY INVOLVEMENT

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	256.837	1	256.837	6.960	.013*
Residual	1143.890	31	36.900		
Totals	1400.727	32	43.773		

* significant at the .05 level

Table 7 shows the comparison of the mean pre-test scores for all respondents regardless of the class group they were in, but analyzed based on whether they enjoyed the outdoor setting. At the pre-test there was a significant difference between students based upon their sense of involvement in the outdoor learning setting.

Of the seven students who indicated they were uncertain of their comfort level in the out-of-doors, three were in the outdoor class and four were in the indoor class. Further analysis on the groups based upon a sense of involvement in the out-of-doors revealed the actual differences in mean pre-test score. These differences are shown in Table 8.

TABLE 8

T-TEST - SENSE OF INVOLVEMENT

Study Group	Number of Students	Mean	Standard Deviation	T	P
Involved	26	38.462	6.275	-2.96	.013*
Uncertain	7	45.286	5.155		
Totals	33				

* significant at the .05 level

The students who felt a sense of involvement in outdoor learning scored significantly lower on the pre-test than did those students who were uncertain of their comfort level in the out-of-doors. These scores among the "uncertain" students would indicate that they had a better knowledge base than their peers, but that it had probably been learned in an indoor setting.

At the post-test, the students were divided for analysis based upon their responses to these same issues. One of the students who had been in the indoor class and all the students who had been in the outdoor class now indicated they "liked" the outdoor learning setting. Two of the indoor students remained uncertain and one indoor student indicated a strong dislike of the outdoor setting.

An analysis of variance on the post-test scores based upon sense of involvement and enjoyment revealed no significant differences between the groups. These results are shown in Table 9.

TABLE 9

ANOVA - POST-TEST BY INVOLVEMENT

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	4.315	2	2.158	0.069	.934
Residual	943.200	30	31.440		
Totals	947.515	32	29.610		

As a result of the identified significant differences between students based upon involvement in the out-of-doors at the pre-test, Ho_4 was rejected.

Ho_5. There is no significant difference between the scores of students on whether or not they enjoyed the learning activities.

Students were asked directly if they thought learning in the out-of-doors was fun and whether the out-of-doors was an appropriate place for learning. At the pre-test, twenty-eight students believed the outdoors was fun and a good place to learn new things. Two students were uncertain as to their position, while three were certain that the outdoors was not fun. One student in the uncertain category and one of the students who disliked the out-of-doors were in the outdoor class. An analysis of variance revealed no differences in pre-test scores based upon whether students thought the outdoors was fun.

TABLE 10

ANOVA - PRE-TEST BY PERCEPTION OF FUN

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	99.846	2	49.923	1.151	.330
Residual	1300.881	30	43.363		
Totals	1400.727	32	43.773		

Following the lessons, attitudes concerning fun in the outdoors combined with learning had changed for some of the students. Two students were now uncertain of their feelings, while one still disliked the out-of-doors as a place for fun or learning. The actual movement in attitude was shown with all students who had participated in the outdoor class responding that they had fun in the outdoors and that it was an appropriate place to learn. Two of the indoor class who had disliked the outdoors were uncertain at the end of the lessons, while one remained certain that the outdoors was not fun and not appropriate for learning. The actual results of the analysis of variance on the post-test by sense of fun and appropriateness of the outdoors for learning is shown in Table 11.

TABLE 11

ANOVA - POST-TEST BY PERCEPTION OF FUN

Source of Variance	Sum of Squares	DF	Mean Square	F	P
Main Effects	11.648	2	5.824	0.187	.831
Residual	935.867	30	31.196		
Totals	947.515	32	29.610		

The students thought the outdoors was fun and appropriate for learning. There was no difference on test scores either before or after the lessons based upon a sense of fun. Therefore the null hypothesis Ho_5 was not rejected.

Summary

The results from the two tests administered to the students who participated in the environmental education experience have been reported in this chapter. The data were obtained from a comparison of responses to the twenty-five item questionnaire. The pre-test was administered the first day of the program. The post-test was administered six weeks after the lessons when a final summarization day culminated at the end of the experiments.

The instrument used in this study measured knowledge and affective behavior. All students where given the same treatment; no control group was used. Although no certainty exists that a change in attitude would result in a change in behavior patterns, these lessons directed a change in attitude in the environmentally positive direction. This could result in observable changes in behavior for students.

The comparisons began with the pre-test means of second grade students. This was then followed by the post-test means of the same second grade students. The two classes were different at the start based on pre-test differences between groups, but not at the end in most areas based on post-test results. This can be explained by varying degrees of individual differences. When both classes were taught the same information, they had the same informational foundation upon which to build the rest of the education.

The category to test whether the students felt involved or not showed that they did feel involved and were interested in interacting in the lessons. The students overwhelmingly enjoyed the outdoors as a classroom for their school activities.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The soil is an abundant natural resource that should not be overlooked in learning or growing for the Outdoor Classroom experience. Utilization of the soil in learning experiences would aid the student in a new appreciation of what an important job the soil does everyday. These activities aid in the student's perspective of soil as an important resource and increased environmental literacy. Students should understand the importance of soil in the balance of nature for the wildlife habitats as well as for characteristic life forms.

The focus of this study was investigating children's outdoor education experience using a science unit studying the soil. The results indicate that learning about the environment showed a greater gain and had a better retention of knowledge when taught in the outdoor classroom.

In the outdoor environment the students were in a more relaxed atmosphere with fewer restrictions placed on them than in a normal classroom. Exploring was permitted and encouraged; talking to other students while they did their work was acceptable. By extending the learning environment beyond the classroom, the textbook knowledge is enriched. It was enhanced by practical knowledge gained through first hand experiences with people, places, and things. The knowledge obtained through the direct approach should help each student see the unity of all life.

The study was completed in the Perkins Elementary School Outdoor Classroom in Perkins, Oklahoma. The field testing for this study occurred in the school year, fall of 1992. Thirty-three second grade students participated in the testing; two separate classrooms of students.

The students were pre-tested on the first day of the learning experience prior to their outdoor education lessons. They were post-tested six weeks later at the conclusion of the experiments.

Although instruments and articles in the outdoor environmental education have differed from one study to another, similar findings have been reported (Gross and Pizzini, 1979 and Jernigan and Wiersch, 1978). The influence of one's attitudes toward outdoor concepts is affected the most in early years. Subject matter can be utilized to effect an attitude change toward outdoor concepts.

The instrument used in this study measured knowledge and affective behavior. All students where given the same treatment; no control group was used. Although no certainty exists that a change in attitude would result in a change in behavior patterns, these lessons directed a change in attitude in the environmentally positive direction. This could result in observable changes in behavior for students.

The comparisons began with the pre-test means of second grade students. This was then followed by the post-test means of the same second grade students. The two classes were different at the start based on pre-test differences between groups, but not at the end in most areas based on post-test results. This can be explained by varying degrees of individual differences. When both classes were taught the same information, they had the same informational foundation upon which to build the rest of the education.

The category to test whether the students felt involved or not showed that they did feel involved and were interested in interacting in the lessons. The students overwhelmingly enjoyed the outdoors as a classroom for their school activities.

Summary of Findings

Conclusions

As a nation we cannot afford environmentally insensitive and illiterate citizens. Students perceive the outdoors as a place to see certain natural objects and to hear, smell, and feel of them as well. This investigation shows that being in the environment being studied about, helps to stimulate learning for some fields of study more than does the classroom.

The major research questions and findings are briefly summarized in this chapter.

1. At the second grade level, do students understand various environmental concepts?

The participants had a prior understanding of some environmental concepts from previous classroom experience, television, and other people. After the lessons were completed the students in the outdoor group had significantly improved their mean scores illustrating their knowledge, awareness, and attitude for the environment. Some differences in a base of knowledge are evident in the test results due to student's individuality. The students were able to benefit from the activities presented. This is positive because the experience helped expose all students to environmental education concepts.

2. In which classroom setting, outdoor or indoor, do children gain a better understanding of environmental concepts?

After participating in the environmental activities, the understanding of environmental concepts increased significantly in the outdoor classroom. The indoor class obtained the same information but their test scores did not show the significant increase in mean scores. So the conclusion from this indicates that the outdoor atmosphere was conducive to gaining a better understanding of environmental concepts.

3. Do the children enjoy the outdoor classroom setting for instruction?

The significant positive response for the outdoor classroom setting for instruction was evident even for the class that learned indoors. As a result this change in attitude was not significant but only a reaffirmation that the students did like to learn in the outdoor classroom and still enjoy the outdoors as a learning experience.

4. Do the children feel involved in the outdoor learning activities?

The significant positive response for the outdoor classroom setting for instruction was evident even for the class that learned indoors. As a result this change in attitude was not significant but only a reaffirmation that the students did feel involved in the outdoor classroom and enjoy the outdoors as a learning experience. The outdoor environmental program allows for knowledge to be obtained and "hands on," type of activities to be experienced. This helps to develop a more physical and intellectual student.

When a teacher is trying to provide information to students, they need to involve the students in the project. They need to get them to search out information and to freely interact with the teacher and their classmates. The outdoor classroom must be conducive to freedom of speech and freedom of action.

This researcher concludes that the outdoor classroom is effective in promoting the understanding of environmental problems. It also helped the growth of positive changes in attitudes of the outdoors, the improved value of hands on learning, and an awareness of the need for environmental responsibilities.

Recommendations

On the basis of the findings in this study and the related literature, the following recommendations are presented.

The positive feedback from the students in the outdoor class indicate that hands on learning experiences are crucial to environmental education concepts. It is not the curriculum that helped contribute to the increase in scores. If it were, the students of the indoor group would have significantly improved their scores also. It was the outdoor, "hands on," experience that made the difference on how much the children learned, enjoyed, and especially experienced in the lessons.

In-service teacher training programs directed toward the areas of pollution and outdoor education should be made available to school teachers and staff. Even making part of the teacher education program include outdoor education would significantly increase the chance of this learning experience. There are many teachers in the school systems who teach the information but choose to share it in the indoor setting rather than going outside.

The "hands on," approach should be encouraged in the outdoor teaching to establish that much needed contact with the earth. This is sometimes thought of as play and has been found to be conducive to individual learning. Students would then be able to make concise decisions about the sensitive world in which they live.

Since the introduction of the outdoor classroom at Perkins, the school has taken a direction of outdoor and environmental education. The 1993 musical production by the fourth and fifth grade students was Allison's Tern. This was written and directed by the school's music teacher about an endangered bird in the Payne County area. The program addressed critical conservation and preservation issues on the elementary as well as the adult level.

We have said that the outdoor classrooms motivate students and provide teachable moments. They also reinforce basic skill subjects and provide opportunities for the development of an attitude of caring for and protecting the environment while using it in intelligent ways to meet human needs.

If environmental issues are to become an integral part of instruction designed to change behavior, instruction must go beyond an "awareness" or "knowledge" of issues. Students must be given the opportunity to develop a sense of "ownership" and "empowerment" so that they are fully invested in an environmental sense and prompted to become responsible active citizens (Hungerford and Volk, 1990).

This research indicates a need for education to return to basic values, concrete experiences, and the foundation of family values that education began with many years ago. Society is trying to produce outcome based education through student's professional test taking skills. This research indicates experience oriented education and hands on skills are required instead. Both cognitive and affective factors should be considered holistically in the teaching-learning process. In practice, however, such an approach is the exception rather than the rule (Iozzi, 1989).

This researcher encourages each teacher to go outside and let the earth teach. They should become knowledgeable of environmental education curriculum and be open to communicating this information to their students.

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APPENDIX A

QUESTIONNAIRE

QUESTIONNAIRE

NAME____________________ TEACHER____________________

AGE____________________ ____________________

DIRECTIONS:

The following statements are about different things in the outdoors. The way you answer the statements will help outdoor leaders know what you like and dislike about the outdoors. Here is an example of what you are to do.

I enjoy going fishing. 1 2 3

You simply circle one of the three numbers on your test as shown above. The three numbers mean this:

1 = You AGREE or LIKE it a little bit

2 = You are UNDECIDED or DON'T KNOW if you like or dislike it

3 = You DISAGREE or DON'T LIKE it

In the example above the person was undecided about fishing so he circled "2". If the person enjoyed going fishing he probably would have circle "1". In other words, THERE ARE NO RIGHT OR WRONG ANSWERS. All you do is answer the statements carefully. Please answer all of the statements. It is very important to give a truthful answer for this is how we can tell which activities you like and dislike.

Page 1

1 = You AGREE or LIKE it a little bit

2 = You are UNDECIDED or DON'T KNOW if you like or dislike it

3 = You DISAGREE or DON'T LIKE it

1. If you live in the city you do not have to be concerned with soil conservation. 1 2 3

2. The amount of water runoff is affected by people. 1 2 3

3. There are more interesting things to do than to learn about plants and animals in the outdoors. 1 2 3

4. Working with students in the outdoors is fun. 1 2 3

5. My class alone cannot do much to improve the environment. 1 2 3

6. Learning in the outdoors is fun. 1 2 3

7. Worms are helpful to the environment. 1 2 3

8. Outdoors is not a place for school but for playing. 1 2 3

9. Wildlife do not have a problem living where I live. 1 2 3

10. Schools should spend more time teaching about conservation. 1 2 3

11. I enjoy being with my teachers in the outdoors. 1 2 3

12. If I am not interested in the outdoors, I should not have to learn about it. 1 2 3

Page 2

1 = You AGREE or LIKE it a little bit

2 = You are UNDECIDED or DON'T KNOW if you like or dislike it

3 = You DISAGREE or DON'T LIKE it

13.	When natural resources are used up on the earth we can get them from another planet.	1	2	3
14.	Plants and animals help make soil.	1	2	3
15.	People cause more pollution than factories.	1	2	3
16.	I like small streams in the woods.	1	2	3
17.	Nature interests me.	1	2	3
18.	I like books about nature.	1	2	3
19.	There is little I can do to stop pollution.	1	2	3
20.	All kinds of plants are needed on earth.	1	2	3
21.	Spiders and bugs are helpful to people.	1	2	3
22.	All soils are alike.	1	2	3
23.	Plants do not need soil to live, they only need water and light.	1	2	3
24.	There is plenty of soil so soil conservation is not important.	1	2	3
25.	It is fun to learn in the outdoors.	1	2	3

APPENDIX B

LESSONS

LESSON 1

Objectives: Students should be able to 1) evaluate the importance of plant and animal matter as contributors to soil and 2) recognize that wildlife in many forms contributes to the diversity and balance of ecological systems.

Method: This was an experiment that dealt with soil and earthworms.

1- We collected six clear containers of soil from the outdoor classroom. Three were used for the indoor classroom and three for the outdoor classroom.

2- We "Played" or experimented with the soil so the children could see what it could do. Note that even though it may have looked infertile it was still rich in nutrients. We used all of their senses to experience the soil. First we ran water through the soil, then some students weighed it in our hands, made mud cakes, smelled of it, and even a few tasted it.

3- We titled each of the six containers as Indoor or Outdoor (1) control (2) soil and compost (3) soil, compost and earthworms.

4- As the instructor, I added compost to containers 2 and 3 and six earthworms to container 3 for each classroom.

5- For six weeks we watered lightly (rainstorms).

6- After that we "played" or experimented with the soil again the looking at the worms and plant growth of grass and weeds.

7- We had a classroom discussion on the findings. In the results I helped them describe the importance of plant and animal matter contributions to soil. Almost all of the children were more interested in the worms than anything else.

LESSON 2

Students examined the role of plant roots in soils. They also searched through soil samples for living plant and animal organisms.

1- The teacher lined the inside of a pint and quart glass jar (one of each) with paper towels. The students filled the jar with soil they dug up from the outdoor classroom and provided the dirt for the indoor students. We allowed the students time to search through the soil for living plants and organisms. I poured water in the jars and placed several bean and radish seeds between the paper towels and the jar. We kept the jars warm and moist inside with sunlight on them for six weeks. Each student in the outdoor classroom filled a cup with soil and planted a radish or a bean seed in their cup. The indoor students filled their own cups with dirt brought in large tubs to the classroom. These grew beside the soil in experiment one and the glass jars. The students were instructed that in order for the plants to grow they needed soil, water, and light. They all received the same amount of water and light, but the soil could have come from anywhere in the outdoor classroom.

2- The students observed the plant growth. Some of the plants grew well, while others died or never grew at all. After six weeks we closely observed the root tips in the glass jar so the students could see what was going on under the soil in their cups. We discussed what role plants play in soil formation, what the root hairs do for the plant, and why the plants in soil grew so well compared to our plants in the glass jars that did not touch the soil. The students observed that the soil allowed the plants to thrive while the plants without access to the soil were short and would die and wither.

LESSON 3:

This activity was used in order to help students describe relationships between precipitation, runoff, and aquatic habitats. It also introduced the learners to the school's weather station and helped them to trace the course of water to aquatic habitats.

The major purpose of this activity was for students to increase their awareness and appreciation for some things they may take for granted - rainfall, runoff, and the connections between surface waters and aquatic habitats.

1- We determined the area of the outdoor classroom using a map provided by the administration. The formula used for calculating area was: Area = Length X Width or A = LW.

2- Then we determined the amount of rain that fell in the area using the school weather station from the day before's information.

3- Next we calculated the volume of rainfall. In this lesson the area equals 50,000 square feet and the rainfall for the night before was 2.3 inches.

The students observed a visual of what a cubic foot looks like using a box I made out of paperboard.

4- Then we calculated the weight of the rain. Water weighs 62.5 pounds per cubic foot. As a point of interest, the average second grader weighs about 60 to 70 pounds. This made our lesson even more personal. The total weight of the rain was divided by 2,000 pounds to equal tons and a book from the library showing a picture of an African elephant that weighs about 5 tons was shown to help the students understand what a ton looks like. When reduced to a small enough number we had a total of 431 elephants of rain on the outdoor classroom overnight (this was during the time of Hurricane Andrew!)

5- This impressed upon the students that there are remarkable amounts of water moving through the water cycle. All of the water eventually finds its way to a wildlife habitat.

6- We went on a tour of the schools weather station and discussed the findings. The students were encouraged to know things like: How much water is absorbed by different surfaces on the school site, what kinds of potential pollutants the water comes in contact with, the Cimarron River is the location of the nearest aquatic wildlife habitat that gets the school's runoff, runoff is responsible for erosion, transportation, and deposition of sediments scoured from the lands surface.

APPENDIX C

PRE- AND POST-TEST ITEM RESPONSES

Pre- and Post-test Item Responses

Response Means

Item Number	Indoor Group Pre-test	Indoor Group Post-test	Outdoor Group Pre-test	Outdoor Group Post-test
1	1.88	1.94	1.74	2.53
2	2.24	1.83	1.74	2.41
3	1.88	2.00	2.70	1.41
4	2.71	2.78	2.84	3.00
5	1.76	2.47	1.16	2.00
6	2.35	2.89	3.00	3.00
7	2.24	2.83	2.63	2.94
8	1.50	2.06	1.37	1.76
9	2.00	1.67	1.42	1.27
10	2.53	1.78	2.32	2.24
11	2.58	2.83	2.94	2.94
12	2.18	2.61	2.42	2.53
13	2.06	1.83	1.95	2.00
14	2.12	2.22	1.42	2.94
15	1.14	1.39	1.42	2.41
16	1.17	2.78	1.39	2.71
17	2.65	2.72	2.73	2.82
18	1.17	1.67	1.32	2.94
19	1.76	2.88	1.58	2.94
20	1.71	2.94	2.88	2.94
21	1.94	2.00	1.42	2.88
22	2.41	2.50	1.58	2.50
23	1.76	2.83	2.00	2.76
24	1.53	2.28	1.47	2.71
25	2.53	2.83	2.94	3.00

VITA

Cynthia C. Napier

Candidate for the Degree of

Master of Science

Thesis: AN ASSESSMENT OF OUTDOOR ENVIRONMENTAL EDUCATION AMONG SECOND GRADE STUDENTS

Major Field: Environmental Science

Biographical:

Personal Data: Born in Tulsa, Oklahoma, July 8, 1966, the daughter of Mr. and Mrs. Tommy M. and Carolyn Spurlock, Sr.

Education: Graduated from Inola High School, Inola, Oklahoma, in May 1984; received Associate of Arts Degree in Liberal Arts from Rogers State College at Claremore, Oklahoma in May, 1986; received Bachelor of Science Degree in Business from Northeastern State University at Tahlequah, Oklahoma in December, 1989; completed requirements for the Master of Science degree at Oklahoma State University in July, 1993.

Professional Experience: Plant Safety and Environmental Administration, John Zink Company, Tulsa, Oklahoma, June, 1986, to July, 1990. Environmental Engineer, Rockwell International, Tulsa, Oklahoma, July, 1990, to October, 1991.