To the Graduate Council:

I am submitting herewith a dissertation written by Carleton Lee Swafford entitled "Developing A Model for Using The Outdoor Laboratory In Elementary School Science." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

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Developing A Model for Using The Outdoor Laboratory In Elementary School Science.

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Carleton Lee Swafford

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DEDICATION

This dissertation is dedicated to my family who never doubted that I would succeed in achieving my goal:

- My wife Beverly, who has shared my dreams in nature, hiking, camping, fishing, and who filled in the gaps when I needed to work;

- My sons Chris and Corby, whom I have challenged to share with others their interest in the pursuit of nature;

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ABSTRACT

This descriptive study used a survey to determine the perceptions of outdoor education professionals concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing an outdoor laboratory for their school site. One hundred two outdoor educators from nature centers, universities, and classrooms in North America participated in the study. Educators responded to a survey developed by the researcher. Participants were asked to indicate the degree of agreement and usefulness with 70 statements about the outdoor laboratory. In addition, the study used open ended questions to give the participants an opportunity to make suggestions as to methods and materials that they had found most useful in their personal teaching.

The research indicated that elementary teachers need more hands-on experience outdoors in nature. Even though teachers might be lacking in outdoor experience and knowledge, they could start by doing simple activities with the students outside at school. When teachers spend outdoor time with students, both the teacher and the

students had fun learning together.

The respondent's suggestions demonstrated that time for planning was a concern for many teachers. Therefore they suggested that planning time could be shortened by working with another teacher or person who had already been teaching outdoors. Nature center personnel, representatives of government agencies, volunteers from nature societies, and parents are examples or personnel available to assist the teacher in planning activities that correlate with existing indoor curricula. Since time in the curriculum was a limiting factor, the participants emphasized that teachers must understand that the outdoor laboratory is an extension of the indoor classroom, a room next door, an alternate place to meet, not a separate subject to plan and teach.

The respondents agreed that teachers needed more knowledge about science, but that a degree in science was not necessary to teach in the outdoor laboratory. Over 50 percent of these outdoor professionals had degrees in areas other than science. The most frequent suggestion indicated that workshops were beneficial to teachers lacking in personal experience and knowledge of the

outdoors. Such programs provided a good source of activities, hands-on experience, and peer involvement. Additional knowledge could be gained from visiting nature centers, parks, aquariums, zoos, and other outdoor learning areas. Personnel from these organizations are usually willing to provide teaching materials, conduct site evaluations, and lead activities on the school grounds.

Finally the research suggested that the school site should be developed so that the teacher could take advantage of the local environment. This was more beneficial to students by making them aware of local problems associated with community environment. Outdoor learning made the students aware of their place in the environment thus helping them learn how to connect school learning to everyday problems.

An outdoor laboratory model was designed based on the comments and suggestions given by the participants in this study. This model is presented as a resource to guide the teacher beginning in the outdoor laboratory.

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CHAPTER I

OVERVIEW OF THE STUDY

Introduction

Students in today's society are saturated with facts about the natural world and the environment in which they live. They have learned about the environmental problems that exist in the world. Yet, even though students have been shown how science can help solve these problems, they lack opportunities to approach these problems experientially. They also fail to understand how their lifestyles can affect the environment. In addition, current teaching methods have failed to make classroom learning a unique experience in which students help solve real problems that pertain to the depletion of the earth's natural resources (Ford, 1986).

Because environmental issues concern every aspect of our lives, we have a responsibility to pass on a safer and better environment to our descendents. So that a sense of conservation might still be with us many generations hence, our children need to have a hands-on, discovery-oriented appreciation of nature that

includes animals, plants, and the chemistry of life. Our students can shape a better world through understanding and appreciation and by becoming more responsible citizens (Roller, n.d. c).

To help students gain such an understanding, government, educators, and the business community have emphasized the need for collaborating efforts in critical thinking and problem solving in order to better prepare students for their future. Excellence in effective education, cooperative learning, and learning styles continue to be issues in educational circles (Western Regional Environmental Education Council, 1992). How better to achieve this excellence than to use the great outdoors, especially the outdoors near our doorsteps to discover the mysteries of the abundance of life? A student who has first-hand experiences with nature instead of hearing just a lecture or reading from a textbook with long words and diagrams will be much more fascinated with the mysteries of life. Videos, computer simulations, and texts do provide students with challenges and problems concerning the natural environment. However, the outdoor environment itself is the best laboratory for learning when students are under the direction of a well informed-

teacher who can provide the answers to questions, challenges, and problems.

Statement of the Problem

The problem confronting the use of the outdoor laboratory is how to involve elementary school teachers. To be effective teachers, their instruction and students' learning must also relate to circumstances that arise outside the classroom experience. Because children learn best by doing, the more realistic the activity, the more meaningful and lasting the lesson will be. With realistic outdoor activities children are better prepared to solve real life problems (Roller, n.d. b).

Elementary teachers tend to lack confidence in teaching science. Their single trips to outdoor nature centers are sometimes the only outdoor learning experience that most students ever have. This nature center trip is normally done in the fifth or sixth grade with little or no follow-up from the classroom teacher after returning to the school (Roller n.d. a.).

Teachers themselves often lack nature experiences in the outdoors, creating yet another problem concerning the use of the outdoors as a learning laboratory (Northern Illinois University, 1993). Many teachers consider outdoor nature education as a separate subject to be taught, and that time for it should not be included in the daily curriculum. They try to remedy this by taking a trip to a nature center (McGarr, 1990). However, there is no pre- or post-instruction to connect this outdoor learning to the formal indoor curriculum. The result is that children fail to make a connection between the indoor classroom and the real world outside (Link, 1981).

How does a teacher create within students the knowledge, skills, attitudes, motivations, and commitments to work individually and collectively toward the solutions to current problems and the presentation of new ones (McGarr, 1990)? Clearly many outdoor education programs have not been effective in doing this. Many students are not linked to their environment through their learning experiences. For example, just because students are exposed to the facts of nature does not mean they have learned to appreciate those

facts and to use them wisely for the benefit of themselves, nature, and others.

Purpose of the Study

The use of the outdoors as a laboratory for elementary science teaching was the focus of this research study. The primary purpose of this study was to develop a model that would enable elementary school teachers to use the outdoors as a laboratory to enhance science learning.

The instructional model for the development of outdoor laboratory instruction consisted of two components:

1. How to find teaching materials and ideas to develop an outdoor laboratory.
2. How to assist teachers in sharing nature with children by developing instructional strategies, planning activities for the school yard, and locating resources for use in the outdoor laboratory.

Using a questionnaire, the researcher polled professionals in

outdoor education to identify what they perceived as the best methods, strategies, materials, and resources for elementary teachers for use in developing an outdoor laboratory for their school site and community.

Significance of the Study

As America approaches the turn of the century, its teachers will find themselves relying more on technology. They have lost touch with the "feeling" for nature. Already many educational curricula have omitted the outdoors as a learning laboratory. A teacher in the nineties could likely lead the class in a discussion of trees, ask the students to read a book, see a computer simulation of photosynthesis, and to make a mural of a rain forest viewed on a video. This would happen inside a classroom with no attempt to make the lesson more meaningful by viewing, touching, smelling, or perhaps listening with a stethoscope to a tree's sap flowing. Very likely the tree right outside the classroom would go unnoticed (Gerston, 1983).

During the past decade many educators have voiced their concern for an increase in science literacy in our nation's schools (Rutherford, 1990). Among these programs were Project 2061; Scope, Sequence and Coordination; and Earth Systems Education (Helgeson, n.d.). The learning outcomes recently established by these organizations served as benchmarks for the new National Science Standards to be established by the National Research Council of the National Academy of Sciences. These standards would require the nation's schools to provide experiences that:

1. Are personally and socially relevant;
2. Call for a wide range of knowledge, methods, and approaches to analyze personal and societal issues critically;
3. Encourage students to act in ways that reflect their understanding of the impact of scientific knowledge on their lives, society, and the world;
4. Encourage students' appreciation of scientific endeavor and their excitement and pleasure in its pursuit;
5. Develop in students an appreciation for the beauty and

order of the natural world.

(National Research Council, 1992)

For these changes to happen, teacher training must focus on scientific literacy and its importance to the future of science education. Currently, formal teacher training programs emphasize the use of textbooks, guides, and media equipment, not the living laboratory of the outdoors (Gerston, 1983). Teaching based on formal indoor education subtly tells students that learning occurs inside the classroom and stops when they are outside. One of the greatest lessons that outdoor education provides is that learning can occur everywhere, with or without textbooks (Link, 1981).

Most research studies utilize resident centers, day camps, and nature centers. Much has been written on activities to use in the outdoors. These activities involve lessons on virtually every subject of the curriculum; yet when used, they are often done with little or no integration into the school curriculum. Often the teacher uses the activity as a game or a physical activity with no reference to the indoor classwork.

The need for utilization of the outdoors as a place of learning seems obvious. Few research studies, if any, have been done on the classroom teacher using the school site or community as an outdoor laboratory. The results of this study should fill the need for such use.

The model resulting from this study will permit:

1. Expanding teachers' understanding of the outdoor laboratory as an integral part of the total instructional program;
2. Helping teachers to recognize the types and kinds of outdoor-oriented resources;
3. Extending the opportunities for developing materials;
4. Providing experiences specific to the school site and the community;
5. Creating opportunities for the teacher and the student to have a greater understanding and appreciation of nature;
6. Enriching the total learning experience;
7. Stimulating independent study; and
8. Providing activities for teacher workshops.

Assumptions

The following assumptions undergirded this study:

1. Professionals and teachers chosen for this study are a representative sample of outdoor educators from the United States and Canada.

2. The understanding and appreciation of nature is an important concept in a technologically dependent society.

3. Adequate and appropriate resources and resource materials are a crucial and necessary part of all forms of organized learning.

4. Students with outdoor learning experiences can better provide solutions to some of the environmental problems than could students without such experiences.

5. In any area of curriculum, trained professional personnel can facilitate the effective learning of others.

Limitations

The limitations of the study were as follows:

1. Because the questionnaire was sent to nature center directors for the director or staff member to complete, there was no assurance that an outdoor professional would actually be the respondent.

2. The respondent might have misinterpreted a question, and the researcher would have been unable to assist in clarifying the item.

3. The response rate of mailed questionnaires, if low, might have adversely affected the representativeness of the sample from which the data was collected.

4. The study is limited to the perceptions of the respondents as to why a classroom teacher does not use the outdoor laboratory.

Delimitations

1. The sample in this study would be limited to the outdoor

instructional staff of the organization to be surveyed.

2. The questionnaire would be validated by four experts in the educational and outdoor education fields for content and construct validity.

3. The professional outdoor educators surveyed would be taken from a sample across the United States and Canada. This delimitation was an effort to glean from a broad base of knowledge to establish the best model possible.

4. The model would be developed for use by elementary school teachers.

Definition of Terms

The following terms are defined below for the purpose of this study:

Elementary Teachers

Teachers involved in formal schooling of children in grades K-8.

Model

A set of plans, principles, or guidelines to follow in implementing the use of the outdoor laboratory. The model could apply to any teaching situation regardless of its geographic location. It is basically designed to provide teachers information and conditions that should be met to start in outdoor teaching and learning for their students.

Outdoor Education

A teaching method or strategy chosen by the teacher as the most effective means of insuring a student's mastery and appreciation for selected objectives of the curriculum. Outdoor education involves students in out-of-classroom activities which are direct and relevant and which are difficult to provide in the classroom (Payne, 1985 a).

Outdoor Laboratory

A place in or around the school, its community or another outside setting (e.g., a park, open field, stream, pond, or forest)

conducive to studying nature.

Resident Center

A school facility, camp, park, or university center that involves teachers and students in a program of activities related to the school curriculum for a period of several days.

Organization of the Study

The study is organized into six chapters. Chapter I consists of the statement of the problem and the related questions, the purpose of the study, the significance of the study, assumptions, limitations, delimitations, and definitions of terms.

Chapter II consists of a review of the related literature and is divided into five parts:

1. The importance of outdoor education,
2. The standards for science education reform as they relate to the outdoor laboratory,
3. The benefits of using outdoor learning,

4. The criteria for effective science teaching, and

5. The elementary teacher outdoors.

Chapter III presents the methods and procedures for data collection. Chapter IV includes the presentation and analysis of the data. Chapter V presents a summary, conclusions, and recommendations from the study.

Finally, Chapter VI presents an instructional model including plans, principles, and guidelines to follow for implementing the use of the outdoor laboratory.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction to Outdoor Education

Although many teachers think outdoor education is a separate subject to be taught, one must remember that it is a teaching method, not a separate discipline, chosen by the teacher as the most effective means of ensuring a student's mastery of selected objectives in the curriculum. This mastery involves the student in outdoor activities which are relevant to the lesson being taught and would otherwise be impossible to provide in the indoor classroom (Payne, 1985 a). Such experiences not only enrich learning, they spark new interest, raise questions, and motivate students to dig deeper into the lesson upon their return to the classroom (Roller, n.d. a).

The National Science Teachers Association (1990) has stated that exemplary science programs contain experiences and knowledge applicable to students' lives, everyday problems, and social issues. It suggested that teachers should use a variety of teaching methods

that provide hands-on learning through exploration, employ process skills, and offer opportunities in science using inquiry.

School must become a place where thinking and problem solving are nurtured as processing skills. In the hands of a creative teacher science has the power to accomplish these things in the classroom, but in many cases can be achieved better outside. Here the teacher can encourage original thought, creativity, and inquiry into the known and unanswered (Payne, 1985 b).

Today it is increasingly evident that education must concern itself with an awareness of the environment and man's relationship to it, and not only with learning in a classroom (Roller, n.d. a). These real problems of must be included in all studies throughout school grades and taught where they happen -- in the outdoors (Roller, n.d. c).

America's future depends greatly on the character and quality of the education that the nation provides for all its children. This future depends on the wisdom with which humans use science and technology. It also depends upon the character, distribution, and effectiveness of the education that its people receive. It is not the

content, but rather the focus on the particulars that is essential to scientific literacy (Rutherford, 1990).

Historical Perspectives

Education in the outdoors has been part of the school curriculum for more than 60 years (Hammerman, 1980). Prior to the 1950's outdoor learning was conducted through school camping programs as an alternative to the traditional curriculum. This "school camping" as it was called, was effective in giving students a tangible knowledge of the natural world, developed cooperative social skills, and provided good wholesome recreation. The great attraction for this type of learning was its holistic problem-centered style of teaching.

In the late 1950's and early 1960's educators started using the term "outdoor education" to describe outdoor teaching and learning. "Resident outdoor schools" as they are called were formed by various public and private institutions across the nation. These outdoor schools provided places for students and their teachers to go and

learn about nature (Smith et al., 1963) With the ecology movement of the 70's, educators realized that students needed to develop a conscious awareness about the importance of the environment in their lives. Students actions and attitudes toward the environment would effect the rest of their lives and those who followed them.

This emphasis on the study of ecology and the environment lead to another new term, "environmental education." In that generation of outdoor learning, relationships between people and nature were emphasized. A variety of educational, recreational, and adventure programs involved students and their teachers in the outdoor learning environment. By the 1980's several new programs were being devised to assist teachers in using outdoor learning skills in the total curriculum (e.g., Project WILD). Outdoor educators realized that many students had failed to learn that they may impact the environment and that they are accountable in the use of the earth's natural resources (McGarr, 1990). Classroom teachers needed to integrate outdoor and indoor learning to help students have a meaningful knowledge of the environment.

Science Education Reform

The current interest in science education reform came from the numerous education studies conducted in the 1980's. The National Science Foundation (NSF) was one of the first organizations to attempt to define and describe exemplary science programs across the United States. The program called *Project Synthesis*, brought together visions of experts from a wide range of professional and educational scientific organizations, including the National Science Teachers Association (NSTA), the American Association of Physics Teachers, the American Chemical Society, the National Association of Geology Teachers, and the National Association of Biology Teachers. This *Search for Excellence*, as it was called, sought out and honored science programs kindergarten through twelfth grade. Through out each grade level a major emphases was given to teaching that provided learning opportunities, laboratory experiences, small group activities and *out-of-school experiences* that enabled students to deal with real world situations and problems (National Science Teachers Association, 1990).

More recently the American Association for the Advancement of Science (AAAS) proposed the importance of scientific literacy for all Americans. The organization defines a scientifically literate person as (Rutherford, 1990):

> . . . one who is aware that science, mathematics, and technology are interdependent human enterprises with strengths and limitations; understands key concepts and principles of science; is familiar with the *natural world* and recognizes both its diversity and unity; and uses scientific knowledge and scientific ways of thinking for individual and social purposes (p. ix).

For a student to achieve this scientific literacy, AAAS supports teaching and learning that starts with questions about nature and engaging students in activities, that lead to exploration, discovery and concept mastery through inquiry. "In other words teach science as science is done (Lawson, 1995, p. 5)."

Currently, the National Research Council is in the process of introducing National Science Education Standards to be implemented by schools across the nation. These standards from the National Research Council (1992) that relate to outdoor teaching include:

1. to guide, teach, and give students ample opportunities to

demonstrate what they know and are able to do;

2. to make a dramatic shift in the emphasis of school science from what students know to how they know it;
3. to build understandings of fundamental ideas that will focus students on the quality and usefulness of knowledge rather than on passively accumulating information to add to how much they know;
4. to encourage teachers to create learning environments that will enable students to acquire a body of knowledge while developing the intellectual skills needed to equip them to use and increase their understanding of science throughout their lives;
5. to spend fewer dull hours in classrooms memorizing unconnected technical terms;
6. to provide experiences through school science programs that are relevant, with a wide range of knowledge, using methods and approaches that help the student critically analyze personal and societal issues;
7. to foster the student's appreciation of beauty and order in

the natural world;

8. to train exemplary teachers that will be empowered to use non-traditional methods to meet the spirit and the intent of these new standards which will give direction and encouragement to those contemplating the change.

The outdoor classroom can help to realize and implement these standards.

Outdoor Learning

Science test scores in Vermont are an example of the benefits of outdoor learning. Scores have been raised in elementary schools where the teachers have been working with the Vermont Institute of Natural Science. The institute's goals are to give children skills they can use to learn and discover basic natural science concepts and facts. Through hands-on outdoor activities, science process skills and integrated curriculum skills are taught. Here it has been shown that students and teachers learn best when their activities are engaged in discovery learning, and they feel good about themselves in the

process. Some of these activities are sorting, classifying, role playing, and using senses. Every student or teacher can feel the joy of success no matter what his skill and abilities are (Lingelbach, 1986).

Many students and their teachers enjoy going outside. There are students who rush to see who can be the first to get outside, for outside students are always doing something; they are constantly busy. They hate to come back inside. "Who can make it back last?" they challenge. The student who can make it out first and back last is probably the one most bored, fearful, anxious, and disinterested while in the classroom. His interests lie outdoors (Payne, 1985a).

The outdoors also offers opportunities for small groups to work together and share ideas. It is full of nature experiences that are important to children and conducive to collaboration. The outdoors lends itself to creating situations in which children discover and use a wide variety of concrete materials (Payne, 1985b). Children find the outdoors invigorating, stimulating, interesting, and friendly. There, children can grow academically, personally, and socially. When they return to the classroom they can relate more positively to their peers through their outdoor experiences (Northern Illinois

University, 1993).

Science Taught Outdoors

The effectiveness of learning is often heightened in outdoor settings. Students need first-hand experiences with the living world. They also need to understand how to separate the real world from the television make believe world (Western Regional Environmental Education Association, 1991). The reason children and teachers should go outdoors is that this is where children can become a part of the natural world. They watch and wonder while they develop curiosity, caring and discovery. The outdoors thus nurtures an inquiring mind. The outdoors can be as near as a backyard, school yard, or a nearby open place. Students need to learn that nature exploration can and should happen right outside their own back doors (Lingelbach, 1986).

Natural explorations lead students to understand and to remember important concepts. In addition, confidence can be gained first hand on a relatively small scale by using local field experience,

leading students to more efficiently embrace ideas that involve wildlife in the global ecosystems (Western Regional Environmental Education Association (1992).

Scientific literacy has become necessary for all students. A fundamental premise of science teaching reform is for schools not to teach more content, but schools should teach less in order to teach better. By putting more energy and thought on fewer topics teachers can introduce ideas gradually in a variety of contexts, reinforcing and extending them as the learner matures (Rutherford, 1990). The in which students process information is enriched with actual observations. These observations provide a context for connecting the indoor curriculum to a variety of real-life problems relevant to the student's own environment.

Outdoor Teaching

Outdoor teaching is done at nature centers and outdoor schools where small groups of children have an opportunity to be involved, but any teacher with an open mind and a little curiosity can teach in

the outdoors (Sisson, 1982). A classroom teacher can make a more lasting impression by using the student's surrounding environment for questions and solving problems (Payne, 1985 b). The outdoor classroom may take many forms. It does not have to be at an outdoor school or some other distant place. Parks and nearby areas are excellent outdoor classrooms (Western Regional Environmental Education Association, 1991). The outdoors should be an extension of the classroom -- a giant learning center and laboratory (Payne, 1985b).

A teacher should not hesitate to participate in outdoor activities just because he/she does not have a degree in biology or is not a naturalist. Many teachers and students learn together as they explore together (Sisson, 1982). The teacher's job is to help children make reasonable decisions and to learn *how* to think, not *what* to think (Western Regional Environmental Education Association, 1992).

Summary

Current science reform suggests that teachers need to use

resources that relate textbook concepts to everyday life. Outdoor learning experiences provide a vision relevant to fostering students' appreciation of beauty and order in nature. These experiences open new dimensions that cannot be found anywhere else, thus making learning meaningful and fun.

In addition to making learning meaningful and fun, outdoor activities invite students to be problem solvers and critical thinkers. This learning through discovery fosters a *holistic* growth, academically, personally, and socially. This all can happen just outside the classroom walls.

Unaided by the walls of the classroom and the covers of a textbook, the teacher may feel insecure in teaching because of a lack of experience or training. Many outdoor activities can begin by the teacher and student exploring the area around the school together. Just by opening the door the teacher can have new resources that encourage students to dig deeper into the lessons on return to the classroom (Gerston, 1983).

CHAPTER III

METHODS AND MATERIALS

Introduction

The research dimension of the study involved the collection of data to develop a model to enable elementary school teachers to use the outdoors as a laboratory to enhance science learning. Using a questionnaire, the researcher polled professionals in outdoor education to identify what they perceived as the best methods, strategies, materials, and resources for elementary teachers for use in developing an outdoor laboratory for their school site and community.

Survey Design

The survey was chosen as the form of research method most appropriate for obtaining data about the best methods, strategies, materials, and resources that exemplary classroom teachers and other outdoor professionals in the field considered most useful in

their outdoor education work. The survey method also allowed participants to give open comments or insights from their personal experience that might be used to outline a model for the use of the outdoor laboratory.

A four-part, self administered survey was designed to obtain the desired information from a sample of three groups of professional outdoor educators, nature center personnel, college professors, and exemplary classroom teachers. Respondents were required to indicate their perceptions by using a modified Likert-type scale (see Appendix B). The categories for the survey were compiled by the researcher based his experiences with classroom teachers requesting resources and materials to use in the classroom and on a review of the literature. At the end of each category, participants were encouraged to make suggestions or additions to the listed items in each category.

The survey was accompanied by an information sheet which explained the purpose of the study. The information sheet included a personal data section to be completed by each respondent so that demographic characteristics of the population sample could be

determined. The survey was field-tested by four outdoor professionals representative of the population to be sampled. This included at least one professional in each of the three groups: nature center personnel, college professors, and exemplary classroom teachers. Necessary revisions were made by the researcher under the direction of the major professor.

Sample Population

For the purpose of this study the sample population was chosen from a group of outdoor professionals across North America which consisted of three sub-groups. Following is the description of these sub-groups and how they were selected.

Survey of Nature Center Educators

This sub-group consisted of outdoor teachers at the 1261 nature centers listed in the *Directory of Natural Science Centers* (1990), published by the Natural Science for Youth Foundation, Roswell, Georgia. Any nature center using at least five of the twelve

national outdoor teaching curricula listed in the *Directory of Natural Science Centers* (see Appendix D), was included in the population. The sample was chosen by selecting every other nature center in the population as listed in the directory. It was estimated that the total sample would consist of approximately 125 to 150 individuals. The questionnaire was sent to the director. It might have been answered by the director or a staff member teaching at that facility.

Survey of College and University Professionals

A list of college and university professors was compiled from a review of literature (e.g., Wilson, 1993) and recommendations by other professionals. Professors were contacted to obtain a list of any other educational institutions that offered courses or degree programs in outdoor education. A total of 29 professors were identified in this process and were used as the survey group.

This sub-group was sent the same questionnaire with an additional request (see Appendix A) to identify classroom teachers in their area they felt were exemplary teachers who were currently

using the outdoor laboratory in their teaching curriculum.

Survey of Exemplary Classroom Teachers

This sub-group was identified by the college professionals in group two. The size of this group was determined by the number of names nominated. When the total group was compiled, a sample was chosen (i.e. every third name on the list). This group was sent the same questionnaire as the other two groups.

Procedures for Analyzing Data

The data obtained in the survey questionnaires were treated according to the following steps. Within each of the three classifications above, an analysis of the characteristics of the sample population was made to determine teaching level, position, outdoor teaching experience, and what training was most beneficial to outdoor educators. For each participant category, the percentages of responses to each question were derived. These percentages indicated the value each group of respondents assigned to a

particular classification of methods, strategies, materials, or resources. The percentages for each participant group were compared to those of other groups for each question, and a total sample average for each question was determined. The activity suggestions were categorized and tallied. The most frequently listed activities were included in the model. Finally, suggestions made by the participants for additional methods, strategies, materials, or resources were grouped according to the above four suggestions and reported.

CHAPTER IV

PRESENTATION OF DATA

Introduction

The purpose of this study was to develop a model based upon the perceptions of outdoor education professionals concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing an outdoor laboratory for their school site and community. In regard to the standards for the model, this analysis attempted to address the following statement: How elementary teachers could share nature with children by developing instructional strategies, by planning activities around the school yard, and by locating resources for use in the outdoor laboratory. Outdoor professionals from the following three groups served as the study's sample: nature center educators, college and university professors, and exemplary classroom teachers who are involved in outdoor education.

This chapter contains the data of the study. The data

presented were collected through a questionnaire mailed to each outdoor educator included in the study sample. The responses were summarized in the following sections. A Likert-type scale of 1=strongly agree to 5=strongly disagree was used by the respondents to rate questions 1-19. Another Likert-type scale of H=highly usable, M=moderately usable, L=least usable, and U=undecided was used to rate questions 20-70. Finally, the responses to the final four open-ended questions were categorized and tallied to be included in the model.

Outdoor professionals represented three different sub-groups and their responses to the questionnaire were expected to be different because they had different roles in education. The purpose of this study was to find out what these groups perceived as the best methods, strategies, materials, and resources for elementary teachers to use in developing outdoor laboratories for their school sites and communities. Therefore, no correlations were drawn between, or among the sub-groups.

Percentages were calculated for each of the questionnaires 70 statements. The model developed was determined by the

percentages, which indicated the overall level of agreement between respondents. Responses of strongly agree/agree and highly usable/usable were regarded as positive indicators.

Survey Results

The responses to the survey by the outdoor professionals are presented in Table 1. The total number of responses from the survey sample was 102. This was a response rate of 61.8 percent for the total group.

To establish a demographic profile of the survey group each respondent was asked five questions about his or her present occupation, teaching levels, education, years active in teaching outdoor education, and other experiences that were beneficial in their training. Table 2 summarizes the responses to these five questions.

In question one the respondents were asked to indicate their present occupation. The largest groups were represented by 53 outdoor educators and 41 coordinators or directors of outdoor

Table 1. Survey Sample of Outdoor Professionals, Number, and Percentage of Responses

Respondents	Total Sample	Total Response	Return Percentage
Nature Center Educators	101	65	64.3
College/University Professors	29	16	55.1
Classroom Teachers	35	21	60.0
Totals	165	102	61.8

teaching facilities. There were twenty two respondents that indicated they were classroom teachers and thirteen who were college professors. Two other respondents served as a school superintendent or supervisor.

Since the respondents were allowed to mark all the choices that applied to their employment many checked two or even three answers. Twenty responded as "other" than the above listed choices. These are listed in Appendix C and indicate that several of the respondents may have served in more than one position within their organization.

Question two asked the respondents to mark all the age levels with which they teach or work. The majority, 80 of the respondents worked with elementary age children. Middle school was the next age level with 63 responses, followed by adults with 46 responses, secondary with 45, and college with 42 responses. Of the respondents that chose "other" levels pre-school received four responses and family groups received three responses. Those groups with two or less responses were teachers, special needs, and intercity students.

Table 2. Demographic Data of Survey Respondents

Question #	Statement	Number Responses
1.	Present occupation:	
	Outdoor educator	53
	Coordinator/director	41
	Other (Appendix C)	20
	College professor	13
	School superintendent/supervisor	2
2.	Teaching levels:	
	Elementary	80
	Middle	63
	Adults (outside college)	46
	Secondary	45
	College students	42
	Other (Appendix C)	21
3.	Formal education:	
	Graduate school, major	68
	College, major	23
	Graduate school non-major	9
	Other	3
	High school	1
	College non-major	1
4.	Years active in teaching outdoor education:	
	0 - 5 years	10
	11 - 15 years	22
	6 - 10 years	21
	16 - 20 years	21
	21 - 25 years	13
	25 +years	12

Table 2. Demographic Data of Survey Respondents (continued)

Question #	Statement	Number Responses
5.	Other experiences beneficial in their training:	
	Workshops	67
	College courses (Appendix C)	66
	Other experiences (Appendix C)	44
	Audubon or Natural History Clubs	37
	Volunteer	28
	Scouts	27
	4H	7

The highest academic degree was marked in question three. Seventy seven respondents marked that they had taken graduate schooling, with 68 receiving a master or doctorate as their highest degree. Another 24 had attended college and 23 had obtained a bachelor's degree. Only one indicated that he or she had only a high school diploma.

This group of respondents represented a variety of degrees and majors. Appendix C listed the specific degrees of the respondents choosing to show their major field of study. The respondents were mainly divided into two groups by their majors, education (48 responses) and life sciences (32 responses). Other respondents indicated majors outside of these fields. Two were in geography, two in museum studies, one in liberal arts, and one masters in business administration.

Question number four (see Table 2) asked the participants to indicate the number of years they had been active in outdoor education. A total of 64 participants listed six to twenty years experience. Twenty-five participants had twenty or more years of experience and only ten had less than five years experience.

Question five requested the participants to indicate "experiences beneficial in their training." Workshops (67) and college courses (66) received the highest scores in this area. The next highest responses were "other experiences" (44). The "other experiences" are listed in Appendix C. They included a variety of outdoor sports and recreation activities. Summer camps (41), and participation in natural history clubs (37) were rated the next highest groups.

One additional question, number 6, was used to establish why teachers do not use the outdoor laboratory. The results of this question were shown in Table 3. The rank average shown is inversely proportional to the responses. The statement ranked averaged first (2.75) by the respondents for not using the outdoor laboratory was "lacking experience in the outdoors". Six other statements were ranked in the following order: knowledge of nature (3.13), time in the teaching schedule (3.53), not required in the curriculum (4.24), time to plan activities(4.26), classroom management (4.83), and fear of the outdoors (4.86). Some respondents wrote in additional reasons for not using the outdoor

Table 3. Outdoor Professionals Perceptions' of Why Classroom Teachers Choose Not To Use The Outdoor Laboratory

Rank	Statement	Rank Average
1.	Lacking experience in the outdoors	2.75
2.	Knowledge of nature	3.13
3.	Time in the teaching schedule	3.53
4.	Not required in the curriculum	4.24
5.	Time to plan activities	4.26
6.	Classroom management	4.83
7.	Fear of the outdoors	4.86
8.	Other experiences (see page 43)	

laboratory. Three of these reasons were funds (6 responses), transportation (4 responses), and barren school sites (2 responses).

Outdoor Teaching

The first category on the questionnaire was identified as outdoor teaching (see Table 4.) This category identified general perceptions of the respondents about outdoor teaching (questions 1-19) and indoor teaching methods (questions 20-35) that would be usable in an outdoor laboratory.

A majority of the respondents were in agreement in their overall general perceptions of outdoor teaching. Table 4 indicated that the three factors rated highest with a percentage of 100.0 were: statement 3, "A child's appreciation and awareness for the environment should start in the early elementary grades," statement 6, "Outdoor learning helps the student realize that learning can happen anytime, anywhere, with or without books," and statement 7, "Outdoor teaching does not have to involve a lot of equipment." The next highest factors received a percentage of 99.0: statement 8,

Table 4. Outdoor Professionals' Perceptions of Outdoor Teaching — Percentage of Agreement

Statement #	Statement	Percentage of Agreement
3.	A child's appreciation and awareness for the environment should start in the early elementary grades.	100.0
6.	Outdoor learning helps the student realize that learning can happen anytime, anywhere, with or without books.	100.0
7.	Outdoor teaching does not have to involve a lot of equipment.	100.0
8.	Outdoor learning should be integrated into the existing indoor curriculum.	99.0
16.	Attending an outdoor workshop would be helpful in getting ideas for activities. (eg. Project WILD.)	99.0
4.	An outdoor science activity can be a starting point to enrich the whole indoor curriculum.	98.0
5.	A yearly trip to the local nature center or park should not be the only outdoor experience for a student.	98.0
12.	A survey of the school yard resources would help the teacher decide which activities would work best.	93.1
18.	Using an existing curriculum supplement like *Project Learning Tree* is an excellent way to get a teacher started.	92.2

Table 4. Outdoor Professionals' Perceptions of Outdoor Teaching — Percentage of Agreement (continued)

Statement #	Statement	Percentage of Agreement
1.	An elementary school teacher is able to teach outdoors if he/she is willing to try a few simple activities.	91.2
11.	The teacher should visit the outdoor area prior to taking the children outside.	90.2
15.	The best way for a teacher to start going outside with children, is to make a decision to go out and try a few simple activities.	87.3
14.	Teaching strategies used indoors often work outdoors too.	85.3
2.	It is not necessary for a teacher to have formal training in science to teach outdoors.	83.3
19.	A teacher that has control inside the classroom will be able to control the children outdoors also.	71.5
10.	The teacher must plan an activity, not just go outside on a random walk.	69.6
13.	Students may never change their attitudes about the outdoors until they see their teacher as a role model.	52.9
17.	A teacher should collect some basic equipment before taking students outside.	52.9
9.	Outdoor teaching does not require a lot of extra time for a teacher to prepare.	38.2

"Outdoor learning should be integrated into the existing indoor curriculum," and statement 16, "Attending an outdoor workshop would be helpful in getting ideas for activities (e.g., Project WILD)." The lowest level of agreement was 38.2 percent in statement 9, "Outdoor teaching does not require a lot of extra time for a teacher to prepare." Eleven of the 19 statements in this category received a 90 percent agreement or higher.

Table 5 illustrated specific indoor teaching methods that would be usable in the outdoor laboratory. Cooperative learning and discovery learning were valued slightly higher than inquiry, problem solving, experiments, discussions, and questioning. The use of debate, worksheets, and lecture received the lowest ratings.

Equipment

Equipment that would be useful to the student and classroom teacher was the second category on the questionnaire. These items were identified for the students in questions 36-42 and for the teachers in questions 43-55.

Table 5. Outdoor Professionals' Perceptions of Indoor Teaching Methods Usable in The Outdoor Laboratory — Percentage of Usability

Statement #	Teaching Method	Percentage of Usability
20.	Cooperative Learning	99.0
23.	Discovery Learning	99.0
24.	Discussions/Questioning	98.0
25.	Experiments	98.0
28.	Inquiry	98.0
29.	Problem Solving	98.0
27.	Integrating Across the Curriculum	96.1
32.	Storytelling	95.1
31.	Simulations	94.1
22.	Demonstrations	92.2
30.	Role-playing/Drama	91.2
33.	Visualization/Relaxation	85.3
21.	Debate	52.9
34.	Workbooks/Worksheets	48.0
26.	Lecture	34.3
35.	Other	10.8

Table 6 indicated that for student equipment, respondents placed the highest score on containers and hand lens (97.1 percent). Binoculars, notebooks, and aquatic nets scored slightly lower. Garden tools received the lowest rating of 85.3 percent.

Statement 42 asked participants to list other suggestions for student equipment. Over 23.5 percent of the participants suggested equipment that would be useful for student's in the outdoor laboratory. Many items were similar to those already listed in this section. Ten respondents simply suggested other containers: for example, plastic tubs, bug boxes, plastic bottles, or any recycled container from home. Some respondents noted that glass or breakable containers should not be used for safety reasons.

An item suggested by eight respondents was student field guides, such as laminated identification sheets or published guides similar to the *Golden Field Guide Series.* Seven respondents noted that students should have appropriate clothing and shoes for outdoor activities. Other items suggested included water bottle, fishing pole, backpack, maps, scissors, string, and glue. Notes attached to the suggestions stated: "The activity demands the equipment to be used";

Table 6. Outdoor Professionals' Perceptions of Materials/Equipment Usable in the Outdoor Laboratory — Percentage of Usability

Statement #	Item	Percentage of Usability
Student Equipment		
36.	Hand Lens	97.1
38.	Notebook/Clipboard	91.2
39.	Container (e.g., ziplock bag)	97.1
40.	Aquatic Net	90.2
37.	Binoculars	87.3
41.	Garden Tool	85.3
42.	Other (see page 50)	23.5
Teacher		
46.	Day Pack/Shoulder Bag	97.1
45.	Container	95.1
47.	Field guides (bird, rock, tree, etc.)	91.2
53.	String	88.2
54.	Thermometers	86.3
51.	Ruler	81.4
43.	Blindfold	80.4
48.	Garbage bags (for raincoats)	80.4
50.	Microscope (field type)	80.4
52.	Soil Test Kits	80.4
49.	Knife	79.4
44.	Camera	77.5
55.	Other (see page 52)	24.5

"Lots of items could be used"; or "To do some activities nothing at all was needed." One respondent said, "All that is needed is an inquisitive mind." These four statements infer that equipment should be used only as needed, if at all.

When asked to rate suggestions for teachers, the respondents placed a higher value on day packs, shoulder bags, containers, and field guides. Other items of high value were a ruler, microscope (field type), soil test kit, thermometer, string, and garbage bags to be used for raincoats. A camera received the lowest score.

In statement 55 the participants were asked to suggest other items the teacher would need. Suggestions were made by 24.5 percent of the respondents. These responses were categorized into three areas: 1) simple activities done in the school yard, 2) detailed studies of the school yard or other areas, and 3) trips away from the school. Area 1 suggestions for equipment implied that for hands-on experiences, games, or observations "Little or no equipment is needed." Area 2 suggestions were whistle, hand lens, clipboard, more containers, buckets, insect nets, and models or pictures of items to be observed. Equipment selection would depend on the activity

that was planned. For area 3, thirteen respondents' suggestions for equipment placed highest value on a first aid kit. Other ideas included a list of student names, permission forms, and even one suggestion for a cellular phone.

In addition to the above suggestions to statement 55, the respondents listed humor and enthusiasm as personal traits a teacher would need. "A sense of wonder," the love of nature, and "willingness to try new things" were regarded as essential to a teacher in the outdoor laboratory.

Instructional Resources

Examples of teaching materials and resource programs comprised the third category on the questionnaire. Table 7 showed that the three programs rated highest were *Project WILD* (92.2%), *Project Learning Tree* (88.2), *and Aquatic WILD* (87.3). This was not surprising since most of the 50 State Education Departments use these resources to conduct workshops and they provide these materials free to teachers. Twenty percent of the respondents

Table 7. Outdoor Professionals' Perceptions of Instructional Materials/Resources Usable in the Outdoor Laboratory — Percentage of Usability

Statement #	Materials/Resources	Percentage of Usability
66.	Project WILD	92.2
65.	Project Learning Tree	88.2
57.	Aquatic WILD	87.3
64.	OBIS	67.6
56.	Audubon Adventures	56.9
58.	Class Project	54.9
59.	Earth Keepers	52.0
68.	Save Our Streams SOS	51.0
69.	Sunship Earth	44.1
62.	Living Lightly in City/Planet	42.2
63.	NEED	20.6
70.	Other(s) (see page 55)	20.6
61.	Green Box	15.7
67.	REEP	14.7
60.	Essence	8.0

suggested other materials for classroom use. The most often mentioned resources were: *Nature Scope* from the National Wildlife Federation, *Sharing Nature with Children* by Joseph Cornell, *Project WET*, and *Nature Quest* (see Appendix F). Several other regional programs were suggested as "highly usable" but would not be available to all teachers. These included programs from the Tennessee Valley Authority (TVA), New Jersey Audubon Society, the Baltimore Aquarium, and other organizations across the United States.

The final question asked respondents to, "List up to five organizations in your state/province that provide materials for teachers to use in the outdoor laboratory." Here a general agreement among the respondents included a variety of government agencies, private natural history organizations, and utility and business groups. These groups were localized and vary greatly in the materials, programs, instruction, and volunteer help provided to schools.

Activities

The last category asked three questions related to outdoor teaching and asked respondents to list favorite activities to use in the outdoor classroom. Responses in this category were summarized and tallied to give a general perception of the answers reported in the survey. A summary of the open-ended remarks that appeared most frequently is presented below:

How do you suggest a teacher plan for the first trip outdoors?

1) Start with areas of science that interest you and make your own study activities. (28 responses)
2) Spend time outdoors, get familiar with the area, and survey the school yard. (18 responses)
3) Keep the activity simple, easy to plan, with little or no equipment. (15 responses)
4) Do an exploratory field trip of the school yard. Let the children listen, touch, and observe. Make it a sensory experience that will capture their attention. (15 responses)
5) Assess why you are going outside and what you plan to accomplish. Set your goals and objectives for the activity. (14 responses)

6) Establish a few simple rules to prepare students for going outside. (14 responses)
7) Attend an outdoor training workshop. (13 responses)
8) Go with another teacher or experienced person until you are comfortable taking groups outdoors. (13 responses)
9) Correlate field activities with indoor classwork through follow-up and debriefing activities. (8 responses)
10) Visit a local nature center, park, or museum for suggestions for simple activities to do in the local environment. (4 responses)
11) Take students to a resident camp or outdoor center. (4 responses)

How should teachers integrate outdoor activities into their daily schedule?

1) Teachers should go outside and look for ways to meet curricular goals through outdoor experiences. Take any class outdoors - - e.g., drama, spelling, math, language arts. (45 responses)
2) Set aside a special time daily, weekly, or monthly to take students outdoors. (18 responses)
3) Create thematic or cross-curricular units that incorporate the outdoors. (15 responses)
4) Choose a concept or skill you want to develop and take it outdoors. (10 responses)
5) Do a class or group project e.g., observation station,

feeder, plot area. (10 responses)

6) Start slow and build programs by choosing simple, easy activities. (9 responses)
7) Solve real-life problems or experiences. (8 responses)
8) Use WILD, PLT, Aquatic WILD, OBIS, or Project WET curriculum guides. (8 responses)
9) Bring the outdoors inside to build excitement and enthusiasm to go outdoors later. (8 responses)
10) Organize a curriculum review committee to develop the outdoor programming. (3 responses)

How would you encourage classroom teachers to use the outdoor laboratory?

1) Provide the teacher support in the form of lesson plans, time, equipment, books, and parent and administrative help. (17 responses)
2) Help the teacher develop an understanding and awareness of how the outdoor laboratory can be used for any class and can be connected to the total curriculum. (15 responses)
3) Encourage participation in outdoor workshops (e.g., WILD) and inservice activities. (14 responses)
4) Model an activity. (14 responses)
5) Encourage the development of the school site as an outdoor laboratory. (6 responses)
6) Observe student enthusiasm in outdoor activities

(3 responses)

List up to three examples of science activities that can be used anytime or anywhere by any teacher unfamiliar with the outdoor classroom.

The respondents returned over 150 activity sheets, booklets, and suggestions for activities that could be used anytime, anywhere, by anyone. The activities listed most frequently were from Project WILD, PLT, Aquatic WILD, and OBIS.

Summary

The analysis of the data revealed a number of major themes that were inherent in the responses of the participants:

1. A child's appreciation and awareness for the environment should start in the early elementary years.
2. Attending a workshop in outdoor training would be helpful for a teacher in using the outdoor laboratory.
3. Outdoor education should be integrated into the existing indoor curriculum.

4. A yearly trip to a nature center or park should not be the only outdoor experience for a child.
5. Learning can happen anytime, anywhere, outdoors, or indoors.
6. Teachers can use the outdoor laboratory without formal training if they are willing to attend a workshop or work with an experienced person.
7. Indoor classroom methods and strategies can work outdoors.
8. State-sponsored workshops are excellent for teacher training in the use of the outdoor laboratory.
9. Outdoor teaching does not require a lot of equipment.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Purpose

The primary purpose of this study was to develop a model that would enable elementary school teachers to use the outdoor laboratory to enhance science learning. Outdoor education professionals were polled concerning their perceptions of the best methods, strategies, materials, and resources for elementary teachers to use in developing an outdoor laboratory for their school site and community. The information obtained through the survey could be used by elementary classroom teachers as a model for science instruction that would include the use of the outdoor laboratory.

Participants

A survey instrument was developed and mailed to a sample of outdoor professionals in three groups: 1) nature center educators listed in the *Directory of Natural Science Centers* (1990), 2) college and university professors teaching outdoor education, and 3) exemplary classroom teachers. The survey instrument was administered by mail to 102 nature center educators, 28 professors, and 35 classroom teachers. The subjects were given ten weeks to complete and return the surveys. One hundred and two responded for an overall response rate of 61.8 percent. Survey respondents were asked to indicate their level of agreement or disagreement with the survey statements and to rate the level of usefulness of various methods, strategies, and curriculum materials by means of a Likert-type scale.

Procedure

Preparation for teaching science in the outdoor laboratory was the topic of this investigation. The goal of the investigation — the identification of the best methods, strategies, materials, and

resources for elementary teachers to use in developing an outdoor laboratory for their school site — was accomplished in three steps:

1. Selected professionals were surveyed concerning their ideas, perceptions, and recommendations for using the outdoor laboratory to teach elementary science.

2. An analysis of survey responses was done to identify the methods, strategies, materials, and resources that would be needed in outdoor teaching and relevant to the elementary science curriculum.

3. An instructional model was developed to guide teachers in the use of the outdoor laboratory on their school site.

The instrument developed to collect survey data was entitled *Using the Outdoor Laboratory In Elementary School Science.* The opinion statements contained in the instrument were formulated after a review of related literature and consultation with six outdoor professional representing two from each of the groups. The survey instrument consisted of four sections: (I) Outdoor Teaching, (II) Equipment, (III) Instructional/Resources, and (IV) Activities. The objective statements were contained in sections I- III of the

instrument. In section IV, respondents were asked to indicate the best way to help teachers in organizing their first trip outdoors and activities that could be done anytime, anywhere, by any teacher.

After data collection was completed, survey responses for the 70 statements were coded onto scantron sheets. Percentages of agreement and levels of usefulness were tabulated. Summaries of the six demographic questions and the open-ended questions were tallied for the entire sample. The total of the responses were reported in Chapter IV.

Section I (Outdoor Teaching) of the survey instrument was divided into two parts. Part one consisted of nineteen general statements about outdoor teaching. Thirteen statements were found to have a 85 percent or higher agreement among the respondents. Statements, three, six, and seven had 100 percent agreement among all the respondents. Part two asked that participants indicate the usefulness of indoor teaching methods for the outdoor laboratory. Twelve of the indoor teaching methods rated an 85 percent or better as being useful in the outdoor setting. Two methods, cooperative learning and discovery learning, were rated highest in this section.

Of the twenty suggested materials for teachers and students in Section II (Materials), thirteen were identified as usable by respondents 85 percent or more of the time. Some respondents identified other items necessary for teaching outdoors, but most stated that selection of appropriate teaching materials "depends" on the activity chosen to be done by the group.

The three instructional programs rated highest in Section III (Resources) were, *Project WILD* (92.2%), *Project Learning Tree* (88.2%), and *Aquatic Wild* (87.3%). Even though these included activities that did not require the use of the outdoor laboratory, the overall consensus was that these programs were readily available, easy to use, and took less planning time on the part of the teacher.

Section IV concerned helping teachers organize and plan activities for first-time outings. These subjective responses were grouped to represent the general comments and suggestions of the participants as a whole and were reported in the findings of this chapter.

Discussion

Strategies

Teachers are very conscious of the time involved in planning and developing any classroom curriculum. To implement outdoor education, most beginning teachers will spend more time planning an activity, but the more experience a teacher has outdoors, the easier outdoor class planning becomes. Time commitments will be minimal if the activities are simple, well planned, and require little or no equipment. The participants stressed need to understand that the outdoor laboratory is not a new subject, but an alternate place to conduct classes that are already being taught indoors. Eventually planning for outdoor classes will become a part of the regular lesson plans enriching the quality of the whole class and will increase the student's interest in the subject.

Planning Activities

The key to getting teachers and students involved in outdoor learning is to get them outside. One of the easiest ways to get

outside is to explore the local area around the school. Before planning any activity, the teacher should go outdoors and spend some time getting to know the surrounding environment. A survey or inventory could be done for the area. For teachers who need assistance in doing this, local volunteers from nature centers, private environmental groups, and representatives from government agencies are available to assist in conducting school site assessment.

Students have been conditioned that the *outdoors* is a playground. Doing outdoor activities does not equal recess. Students need to know what is expected of them before they go outside. To do this the teacher should have a few simple rules and establish the goals and objectives of the group's activity.

Teachers need to set a special time to go outdoors. This does not have to be daily, but a regular time that the students will look forward to and plan on going outside. Outdoor activities should correlate with the indoor curriculum. This is helpful for the teacher in lesson planning and provides a rationale for doing an activity.

Teacher Training

Workshops and outdoor training programs are one of the best ways to show teachers the possibilities of outdoor education. Strong communication of what programs and materials are available to teachers is needed. A one-day inservice like *Project WILD* is enough to help a first-time teacher get started. Teachers do not have to be experts about the environment to conduct simple activities outdoors, but they do need to be patient and open-minded.

Materials

The respondents to the questionnaire consistently expressed that outdoor teaching does not have to involve a great deal of equipment (statement 17, 96.7%). Any equipment used must be relevant to the students' experiences and apply to the specific lesson being taught. Many respondents commented that the equipment used in the outdoor laboratory strictly "depends" on the curriculum or activity chosen (i.e., binoculars or soil test kit). One stated:

> For teachers and kids, in any environment, no piece of equipment has *essential* meaning outside the context of its use.

Other suggestions about equipment needed were:

> Less is better. This is a good list, but kids and teachers need to know it doesn't take a lot of equipment to go outdoors and explore, investigate, and discover new things.
>
> It's amazing how little space or equipment is needed.
>
> None is necessary for many beginning activities; often you just need a tree or a rock.

Activities

Outside activities do not have to require much equipment nor do they have to be complex. Respondents suggested that teachers find simple activities that supplement the existing curriculum. These activities are readily available in *Project WILD* or activity programs like *OBIS*. These can be easily found in activity guides available to teachers through state agencies and other environmental sources. Not only do these require little equipment and time to plan, they also provide curriculum correlation to most of the major science textbooks (e.g. Holt, Merrill, and others).

Other suggestions were to "Use what time you already have to do activities." This could be accomplished by using existing lesson

plans and imagining how they could be done outdoors. Teachers who take advantage of these first-hand experiences and a child's natural curiosity about nature are well on their way to discovering new dimensions in teaching. A respondent wrote:

> Stretch yourself and *risk* the adventure- -you'll never turn back. You'll be *hooked* for the rest of your teaching career.

To take advantage of these everyday outdoor applications in the classroom, many respondents suggested setting a time daily, weekly, or monthly to allow the student and the teacher to learn together.

Resources

In the review of the fourteen programs in Section III of the questionnaire, the participants rated *Project WILD*, 92.2%; *Project Learning Tree*, 88.2%; and *Aquatic WILD*, 87.3% as the most usable programs for a beginning teacher. Several of the other programs were listed as equally usable, but were rated lower because they were limited in content, material intensive, out-of-print or were mostly indoor activities. Equipment selection for use of any of these

programs should be appropriate and would depend on the activity chosen by the teacher.

School Site

Many of the participants felt that the school yard and the surrounding grounds were the resources most often ignored by teachers, especially in urban and inner city schools. Ninety three percent of the respondents agreed to statement 12, that "A survey of the school yard resources would help the teacher decide which activities would work best." Not only would a survey help in choosing an activity, it could help the teacher to become more familiar with the local environment. Participants felt that many classroom teachers were unaware of this resource and funds available for developing the school site. For instance, the Department of Education in Tennessee (see Appendix E) has grants available to teachers for the creation of school yard habitats. With problems involving the cost of off-campus trips, transportation, and scheduling, the on-school outdoor laboratory site is becoming the best option for environmental study. One respondent summed it up by saying,

> The local area (school site) first supersedes any need to teach kids about tropical forest or other exotic environments. . . . They need to have personal stewardship for their own environment.

The development of the school site called for the teacher to be innovative and creative in developing special programs for the school site. Many teachers do not have time to plan such programs by themselves, but they could involve volunteers, fellow teachers, parents, and administrators. Some nature centers offer this service free to teachers who are trying to develop an outdoor learning area. A respondent wrote,

> Our school's outdoor classroom has helped many of the teachers become more comfortable in teaching outdoors. . . . Once a teacher is outside, creativity takes over and they begin (sic) to think of things to do.

Outdoor Schools and Resident Camps

Many respondents felt that a visit to a resident outdoor program could be an invaluable experience for the students and the teacher. A participant comment was,

> In schools that do a two-day trip (e.g., fifth grade), this is the highlight of the school year. It's highly valuable and could be improved by pre- and post-classroom follow-up. If every school did this, the children would benefit.

A resident outdoor education experience would be another way that a teacher could get started. Most of the resident centers would provide the pre- and post-activities, and some could be able to provide an educator to visit the school site to facilitate such activities. This would give a teacher a springboard from which to develop other programs throughout the year.

Conclusions

This study was undertaken in order to determine the perceptions of outdoor education professionals concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing an outdoor laboratory for their school site and community. In addition, the study gave the participants an opportunity to make suggestions as to methods and materials that they had found most useful in their personal teaching. Findings from the study were used to design a model for classroom teachers to use in developing science lesson plans for their classrooms. This model is presented in Chapter VI.

The following conclusions were drawn from this study:

1. The research indicated that elementary teachers need more hands-on experience outdoors in nature.

2. Teachers needed more knowledge about science that could be gained through outdoor personal experiences.

3. Teachers lacking in outdoor knowledge could start by doing simple activities with the students outside at school.

4. When teachers spent outdoor time with students, both the teacher and the students had fun learning together.

5. Time for planning was a concern for many teachers. Planning time could be shortened by working with another teacher or person who had already been teaching outdoors. Nature center personnel, representatives of government agencies, volunteers from nature societies, and parents could assist the teacher in planning activities that correlate with existing indoor curricula.

6. Since time in the curriculum was a limiting factor, a teacher must understand that the outdoor laboratory was an extension of the indoor classroom, a room next door, an alternate place to meet, not a separate subject to plan and teach.

7. This research suggested that the school site should be developed so that the teacher could take advantage of the local environment. This was more beneficial to students by making them aware of local problems associated with community environment. Outdoor learning made the students aware of their place in the environment thus helping them learn how to connect school learning to everyday problems.

8. The respondents agreed that a degree in science was not necessary to teach outdoors. Over 50 percent of these outdoor professionals had degrees in areas other than science.

9. The survey indicated that workshops were beneficial to teachers lacking personal experience in the outdoors. Such programs provided a good source of activities, hands-on experience, and peer involvement.

10. Additional knowledge could be gained from visiting nature centers, parks, aquaria, zoos, and other outdoor learning areas. In addition, personnel from these organizations were usually willing to provide teaching materials, conduct site evaluations, and lead activities on the school grounds.

11. The research suggested that teachers could attend an outdoor school with their students for a day or overnight stay for a first-time experience. Learning activities brought back would provide experiences for starting outdoor activities on the school site.

In conclusion, the researcher has synthesized available information from outdoor education professionals regarding methods, strategies, materials and resources for use in the outdoor laboratory. It was hoped that the results of this study would serve to further emphasize the need for the use of the outdoor laboratory in elementary school curricula. Also, the researcher hoped that teachers would be encouraged to use the outdoor laboratory as an alternative to the indoor classroom, thus giving their students a practical understanding of the outside world in which we have lived.

Recommendations

The results of this study generated several recommendations:

1. Studies should be undertaken that would measure the effect of learning in the outdoor laboratory as compared to the

indoor classroom in the areas of problem-solving, student's retention level and concept formation.

2. Educators need to take a comprehensive look at the effectiveness of the outdoor laboratory in the total education picture of the future.

3. Increase pre and inservice teacher training in the outdoor laboratory as to provide training, materials, and personal experiences.

4. Establish state programs to provide incentives and rewards for exemplary teachers in outdoor/environmental education.

CHAPTER VI

MODEL OF THE OUTDOOR LABORATORY

Introduction

This model will provide a set of plans, principles, and guidelines for the elementary teacher to follow in using the outdoor laboratory. The use of this model will enhance and extend effective learning in any elementary science class regardless of its geographic location. It is designed to provide elementary teachers with information and conditions that should be met to begin outdoor teaching and learning with students.

The outdoor laboratory is designed as a primary tool for elementary school teachers to use in beginning an outdoor laboratory. Its structure is based on comments and suggestions given by the participants of this study. It has six main steps (see model on page 80) to begin using the outdoor laboratory. Some activities are suggested as examples but it's impossible to list all the outdoor activities that would be useful for all elementary school

teachers and students in every learning environment. Therefore, the following model is presented as a resource to guide the teacher beginning in the outdoor laboratory. This is to get the teacher started and is not intended to be the curriculum. Because all teachers and the school environments in which they live are different, it is the teachers who must determine which activities best fit their teaching needs.

Outdoor Laboratory Model

So where does a teacher start? This model will provide some suggestions from outdoor educators across the nation on how to get started in the outdoor laboratory.

Getting started in using the outdoor laboratory is much the same as learning any new activity. The participants in the study recommended that new teachers start with an activity that is simple and easy to do. Create hands-on experiences the students will not forget. Allow time for reflection, giving feedback, and encouragement

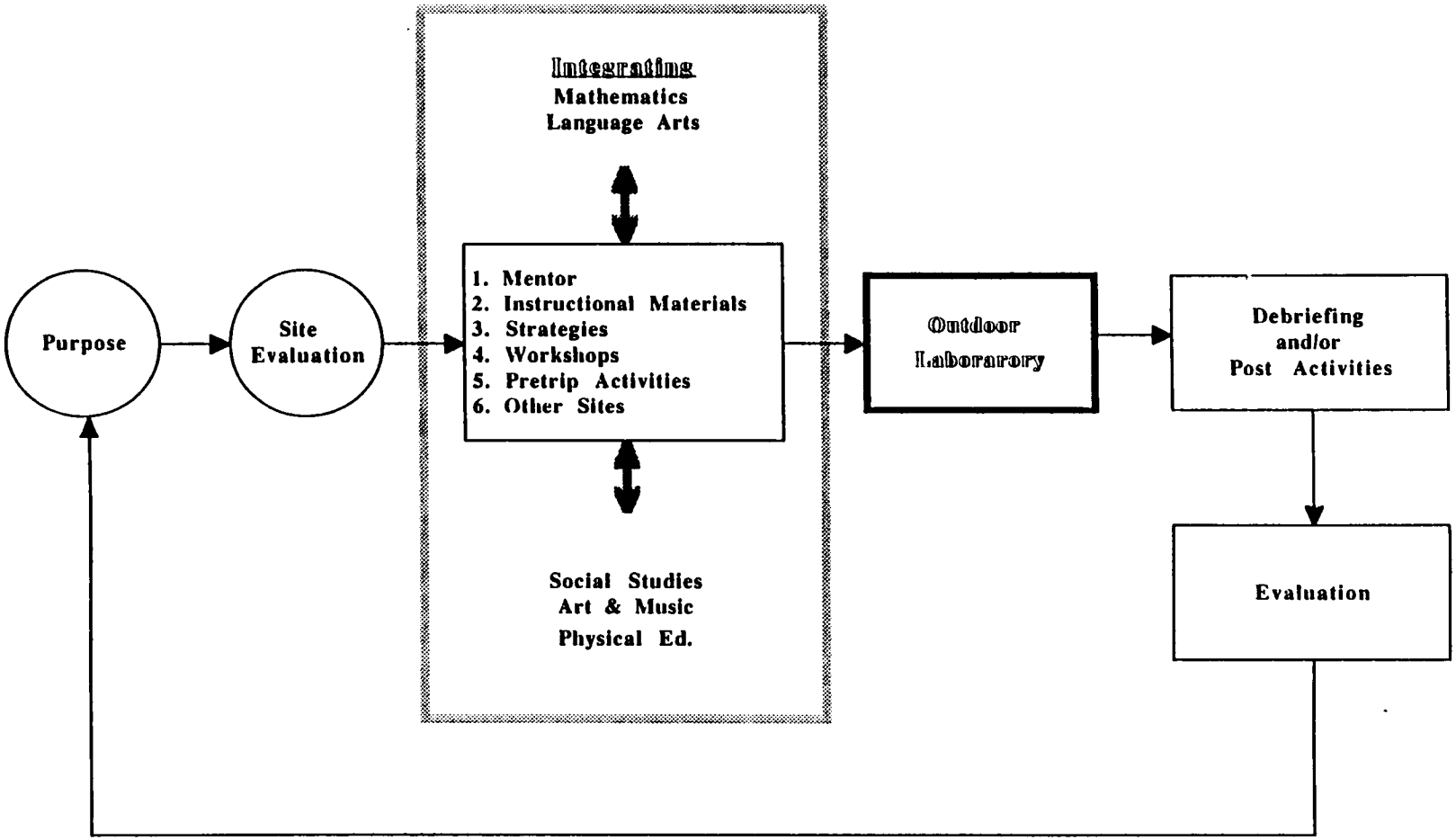

Figure 1. Outdoor Laboratory Model

There is more than one approach to getting started and choosing that first activity. Starting can be as simple as taking a group out for a walk or using a Project WILD activity such as "How many Bears?" Teachers could be mentored with a more experienced co-worker, visit a nature center, or attend an outdoor workshop. All of these activities will help the teacher become more comfortable using the outdoor laboratory.

Step 1--Purpose

First the teacher must decide the purpose(s) for going outdoors. The purpose may be to enhance observation skills, obtain data, or seek a pleasant setting for reading. The teacher may want to introduce a new topic, reinforce a concept, or provide a real-life context to an indoor lesson. Whatever the purpose, the use of the outdoor laboratory and its resources permits the expansion of the classroom to include the entire world of the student.

Once a purpose(s) has been decided, the teacher is ready to open the door to the new classroom to explore its contents to see how it can be used to meet these goals.

Step 2 -- School Site Evaluation

A critical need of most new teachers in the outdoor laboratory is experience. Before taking students outside the teacher must become familiar with the laboratory area. Any good teacher would not walk in the first day of school and start teaching without being aware of the contents of the room. How many desks are there? What is stored on the shelves and in the cabinets? Where are the textbooks? What is in the files that may be useful? These are all important questions to ask about the indoor classroom.

It is equally important for teachers to know what is in the outdoor laboratory. They need to check out the locality and explore, looking for anything that could be used in teaching. They should look for things that interest them or their students. Where would students want to go? Are there any open areas, woods, or places where wildlife could be found?

The teacher should spend time in the outdoor laboratory. A good time to do this is when things other than people can be seen. After school hours, weekends, or evenings allows time to see, hear, and think without the distraction of the students. Other teachers at

the school may have experience in using the area. Arrange for them to help inventory the site and make suggestions as to how they use certain areas.

If an experienced teacher is unavailable in the school, check with the local nature centers, Audubon clubs, or colleges. These sources should have experienced personnel who would be willing to come and walk the site. They will be trained to evaluate the area and can make suggestions that would be appropriate for this particular site.

It is also helpful to visit teachers who have developed outdoor laboratories at other schools. Find out how they began, how they use volunteers, and which activities seem to be most useful.

A good inventory should suggest things that could be done outdoors. Some experienced teachers make the inventory the first trip outside with their students. This will involve the students in the planning process making it a more meaningful learning experience. Working together the teachers and the students can discover new things on the school grounds that may be used at a later time.

Step 3 -- Planning

The model gives six suggestions by which a teacher may select to plan for the first trip outdoors. A teacher could start with one or do all six. After completing the first activity in the outdoor laboratory, the teacher should spend time with the students debriefing. This not only allows the student to reflect on the activity, but the teacher may evaluate his or her success with this particular activity. At this point the teacher may repeat any or all of the planning suggestions until the he or she becomes comfortable using the outdoor laboratory.

Teaching in the outdoor laboratory is an ongoing process that will continue as long as teachers let the natural world guide their imagination, creativity, and desire to challenge their students in hands-on learning.

Mentor -- If possible, teachers should find an experienced person who would be willing to coach them. This could be another teacher at the school, a teacher in the district, a parent, a naturalists, or anyone who teaches outdoors. Talking with someone who is

experienced with the outdoor laboratory is an excellent way to survey the school site or plan activities.

Locating a knowledgeable co-worker is an excellent source of information. This person would have lesson plans and activities for the immediate area. A teacher should arrange to accompany him or her on an outing and let this person demonstrate his or her expertise. The co-worker may be willing to loan materials or team teach on the first outing.

If no one is available at school, contact the local superintendent's office to find other teachers nearby who are experienced outdoor educators. Visit their school and outdoor laboratory.

Local nature centers, Audubon clubs, and wildlife and forestry agencies often have personnel who will come to schools for assistance. If personnel are not available to come to the school, they will make the teacher aware of any workshops, tutoring sessions, or teacher inservice that they offer.

Instructional Materials -- Instructional materials do not need to be developed from scratch. These materials are readily available

from local, state, regional, and national sources. Instructional materials are varied and can be useful in planning until a teacher can make plans on his or her own.

Project WILD activities are a great beginning. These activities can be conducted with little or no equipment. They are integrated with many of the major science textbook companies curriculum scope and sequence. These activities are cross referenced by subject, skills, and content. They can be incorporated into any science area and have a variety of activities for grades K- 8.

In addition to Project WILD, a teacher could use Aquatic WILD or Project Learning Tree. All three programs are available nationally from most state education, wildlife, or forestry agencies (see Appendix E). These government agencies cooperate with nature centers, museums, and other educational groups to offer these teaching materials free to teachers.

Many books can be obtained for outdoor activities. These can found in local bookstores, school supply stores, nature centers, parks, aquariums, zoos, and catalogs. Two popular books are *Sharing Nature With Kids* by Joseph Cornell and *Ten-Minute Field Trips*, by Helen

Ross Russell (see Appendix F). The authors give some excellent suggestions for working with children in the outdoor laboratory.

The National Wildlife Federation publishes a series of activity booklets called *Nature Scope*. These are filled with materials to correlate indoor learning to the outdoor laboratory.

Another program, produced by Lawrence Hall of Science, is called *Outdoor Biological Instruction Series (OBIS)* (see Appendix D). This program contains a box of individual activities that require little or no equipment for outdoor activities. Any needed equipment is made by the student during the activity or before going outside. OBIS activities are designed to represent virtually every habitat that could be found near any school setting, rural or urban. Examples of these activities include the seashore, ponds, woods, lawns, sidewalks, and many more.

In suggesting the equipment needed, most outdoor educators recommend activities that use as little as possible. Equipment should only be used as needed, if at all.

It is good for a teacher to have a daypack or tote bag to carry a few items to be used as needed. A hand lens and items like ziplock

bags would then be readily available for curious investigators.

Depending on the activity, other items could be carried such as field guides, maps, string, plastic bottles, or insect nets. On longer trips away from the school, it would be advisable to have a first-aid kit. One participant even suggested a cellular phone could be useful in emergencies.

Strategies -- Many teaching strategies or methods can be used in the outdoor laboratory. Cooperative learning, discovery learning, questioning, experimentation, inquiry, and problem solving have been listed as the most useful to experienced outdoor educators. These are also strategies that a teacher frequently uses in the indoor classroom. These methods should be considered when planning the activities.

Another good strategy is to break the group into smaller units. With older children, this can be done without any outside help. With younger children, it may prove helpful to have a parent or other volunteer to help in working in the groups.

Children are conditioned that going outside means playtime or

recess. To prevent this, the teacher should take just a few moments to focus the students on the activity. Then take several short ten-to-fifteen-minute trips until the students realize that this is a learning experience.

Workshops -- The workshops available to all teachers in any state are Project WILD, Aquatic WILD, and Project Learning Tree. Many others are available locally but these three are offered in every state. The materials are free to any teacher who attends a state-sponsored workshop. These workshops are conducted by local volunteers, federal and state government agencies, and private organizations. Any nature center, wildlife officer, or forester will know how to put teachers in touch with a facilitator in that area. These workshops are free, last three to six hours, and provide materials needed to help teachers get started in using the outdoor laboratory. They are designed to be taken without any prior knowledge of outdoor teaching and will help most teachers feel comfortable in the new teaching environment.

Local nature centers and wildlife organizations often offer

training for teachers. These programs are localized and provide excellent information on the local environment. There are too many to mention in a model such as this, but are readily available to teachers who seek them out.

Some colleges and universities offer classes in nature and outdoor education. Many of these are in the evenings, weekends, and summers when teachers can attend. They are designed to help the teacher get their students outdoors and involved with the outdoor laboratory. Some are offered for academic credit and can be used for recertification or advanced degrees.

Pre-trip Activities -- Pre-trip activities could include many things for the teacher and the students. Bringing something indoors from nature is a way some teachers introduce the outdoor laboratory. This gives the students some thought as to what they may go out and see. It also get excited about going outside.

Two or three simple rules and a buddy system can save a much time later. Too many rules can complicate things and take the fun out of going outside for both the teacher and the students.

All activities should be simple, focused, and have a purpose for being in the outdoor laboratory. Some teachers prefer an informal type of outing, especially for the first trip with their students. This may be a walking trip around the school yard or to an open field or park. This type of activity is often used to familiarize the students to the outdoor laboratory early in the school year. It can also be used as an exploratory activity to introduce a new season.

Before going outside a teacher needs to decide how he or she would like to introduce the activity. Two schools of thought exists on how this should be done. One is to go out unannounced as a simple exploratory activity. The other is to prepare students and give a formal structure to the class. In either case, it is important that the teacher is focused, and therefore helping the student to focus.

Other Sites -- Exploring the neighborhood is essential to planning additional activities. Visits to vacant lots, wooded areas, or gardens may house microhabitats for class study. Other areas to visit include parks, sanctuaries, public utility lands, rivers, forests, or other outdoor areas within walking distance of the school. Pre-visits

to these sites will determine the suitability, based on learning objectives, distance, cost, and safety.

Integrating Activities

It is important to point out to the teacher that an outdoor experience is ideal for inquiry-based learning in any curricula, not just science. Social studies, language arts, spelling, reading, math, and science can be integrated into the outdoor classroom. Drama, creative writing, graphing, observation and problem solving are only a few of the skills that can be strengthened through the use of the outdoor laboratory. Teachers should let students know that learning does not just occur from a book inside a formal classroom.

How does a teacher find time? Extra time does not have to be included in the teaching schedule. The teacher should use what time is already available for that particular class. An outdoor activity could be used as an introduction to a new concept, day's lesson, or even a new chapter. Such activities could also be used as a culminating activity to a lesson. Teachers using thematic planning may want to include a trip outdoors at the beginning of each season.

Some teachers may want to set a regular time once or twice each week or month. Other teachers may want to be flexible, waiting for the right time or weather that would be advantageous to learning a particular concept.

These pre- and post-activities should be integrated into the schedule to mix indoor and outdoor activities. Teachers should start slowly at first. Spending ten-to-fifteen-minutes till the students learn what is expected. Eventually the time can be increased. A concept should be chosen to be presented in the class, then an activity can be located that will get the point across. Or a skill could be chosen (e.g., estimation) and an activity found that would improve its use.

Some activities may be informal, such as a neighborhood walk. This time could be used to study architecture, vegetation, wildlife, and local industry. Students could sit and listen to sounds. They could use the lawn to compare and contrast the plants growing there (or the animals living there).

Ongoing projects keep students involved and encourage them to anticipate outdoor activities. Adopting a tree, plot of land, lawn or

a portion of a community highway help the students establish ownership of the community in which they live. Here the skills learned in the classroom are used to solve everyday problems.

An observation station could be set up indoors or outdoors to facilitate regular investigations. These could be recorded in journals or reports. Information recorded could be evaluated and transferred to pictures or graphs to be shared with others.

The school yard is an ecological gold mine. Here are some suggestions for using it as an outdoor laboratory for any class:

1. Math - - Any activity that includes using graphs and charts. Students could measure the perimeter of the yard or find angles wherever they can. Record and report data.
2. Language arts - - Journals. Write stories about what is seen. Writing time - choose an object to describe; write a narrative about an old tree or something seen on the hike. Read a book outdoors. Take a hike to look for nouns. Reading about an activity, researching, and recording the results.
3. Art - - Interpretation. Draw what is seen. Draw the school yard in all seasons (ongoing art activity).
4. Technology - - Communicate with other districts.

Compare locations and habitats.

5. Science time - - Study clouds, soil, plants, and animals.

Step 4 -- Outdoor Laboratory

After the teacher has made the inventory, a few short trips could be made outside to introduce the students to special areas on the school site. For example, time could be spent developing the use of the bodies senses. Short five-to-ten-minute trips smelling, touching, hearing, and looking at items in nature are activities to do early in the outdoor laboratory. Other activities could involve: looking for colors, shapes, or textures on plants; looking for evidence of any animals living in the area; making a map of the major features of the school yard; or looking for things that are a part of nature but not living.

If a teacher would rather have a structured activity for the first trip, he or she should go through one or more of the activities in Project WILD or OBIS before going outside for the first activity.

The proper sequence for conducting the first trip outdoor is variable, but would include the following steps:

1. Determine the purpose - - Keep the first trip short, simple, and focused.
2. Plan the activity - - Enlist the support of adult volunteers.
3. Pre-visit the area and walk through the activity.
4. Prepare the children, e.g., clothes, etiquette, behavior, and focus the children on the activity before going outdoors.
5. Do the activity.
6. Debrief the children - - Reflections.
7. Evaluate the results - - Follow-up.
8. Reexamine the goals in terms of evaluation results.

Relish the simple things such as colors, smells, and sounds. Build appreciation! No elaborate plans are necessary. Just remember to discuss what is seen and heard. Following are some comments from the participants:

-Take the kids out and let experience start teaching!

-Don't just go outdoors -- go outdoors and do something. Start small. Take class outside for a short activity to get across that the school site (outdoors) is for more than recess. The rest becomes curiosity and a spring board for the future. Seize the

moment!

-Be excited - If you aren't then how will they?

-Feel sun, wind, rain, etc. How do these affect plants? Insects? Animals? Enjoy 30-40 minutes outside. Try the same 3 weeks later, and note the changes.

Step 5 -- Debriefing/Post Activities

Immediately after any activity, time should be taken to debrief the students and reinforce the concepts presented. This may be done indoors, allowing students to make a connection with classroom work, or outdoors in a selected area to reflect on the previous activity. In either case debriefing is an important activity of the learning process. Debriefing allows the student to reflect and describe the outdoor experience. An easy way to involve students in this process is in the use of open-ended questions asked by the teacher.

Questions should be asked to see what the students did or did not learn. What insights did they gain about the group? Did everyone participate? How could everyone have been involved? How did the students react? How did they feel? As the teachers, what could be done to make a better learning experience?

If any living organisms were collected they should be cared for properly. Any animals collected should be fed, watered, placed in an appropriate cage or released back to the environment from which they were taken. Plants may be displayed in a terrarium for further observation or preserved for later use.

Step 6 -- Evaluation

Evaluation is another important component of the learning process. Feedback, formal or informal, provides vital information for further planning. Any evaluation must be based on the original purpose for doing the activity. It is usually easy to do because the students reactions are spontaneous and often indicated by the students expression or interest in the activity. Much of the evaluation will be done in the activity.

When the outdoor activity is an extension of the indoor curriculum, other traditional paper-and-pencil means of evaluation can be employed. Either way an honest appraisal of the activity will allow the teacher to assess the educational value, strength, or weakness, and provide suggestions for the next outdoor laboratory.

Outcomes

Following is a list of possible outcomes from the use of the outdoor laboratory:

1. Students learn by direct experience.
2. Students expand learning beyond the classroom to include the entire world (learning as a part of the community). Bridge the gap between the classroom and the outside world.
3. Students acquire outdoor interest and leisure activities.
4. Students develop a love for nature.
5. Students have an increased desire for knowledge.
6. Students participate in activities that support being caretakers and stewards of school yard resources.
7. Students discover learning occurs anytime, anywhere, indoors, outdoors, with or without textbooks.
8. Students become more excited about learning because it has become more relevant to everyday living.

One of the purposes of this model was to show that any teacher can use the outdoor laboratory. Teachers are highly creative

individuals; therefore, another purpose was to foster this creativity of teachers by suggesting ideas for broadening the scope of their instruction. This model only represents a diversity of ideals possible for activities in the outdoor laboratory. More possibilities will be revealed as the teacher digs deeper and networks with other teachers and resource personnel.

A final suggestion is to challenge teachers to discover new ideas for learning without leaving the school yard. Teaching in the nineties and into the year 2000 will demand more challenges for teachers to motivate students to learn. With a student's natural curiosity about the outdoors and nature, the outdoor laboratory will be a valuable source to help bridge the barriers between the school and the community in they live.

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APPENDIXES

APPENDIX A

SURVEY LETTERS

NATURE CENTER DIRECTOR LETTER

February 15, 1995

Dear Nature Center Director,

This is an invitation to participate in a doctoral study designed to examine perceptions of outdoor educators concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing outdoor laboratories for their school sites and communities. The primary purpose of this study is to develop a model that will help elementary school teachers use nature in the outdoors as a laboratory to enhance science learning.

Because of the limited number of outdoor educators selected, your assistance and response is essential for the success of this project. You are being asked to respond to the enclosed survey instrument or pass it on to the best qualified outdoor teacher at your facility. Completion of the survey will require approximately thirty minutes. The completed form should be returned in the self-addressed stamped envelope by February 28, 1995.

The findings of the research will be shared with the scientific community. However, the results will be reported only as group data and your name will not be associated with your responses. To maintain your confidentiality and anonymity all responses and information will be secured.

Your participation in the research study is strictly voluntary. Refusal to participate will involve no penalty or loss of benefits. Your returned completed questionnaire constitutes your consent to participate. We would appreciate your returning the questionnaire even if you are unable to respond to all items.

Thank you for your assistance. As an outdoor educator, you are uniquely qualified to ascertain the importance of having more classroom teachers involved in the use of the outdoors as a teaching laboratory. Your perceptions are highly valued.

Dr. Phyllis Huff/ Carleton Swafford
University of Tennessee
College of Education
309 Claxton Education Building
Knoxville, TN 37996-34000
(615) 974-3435
email: swafford@utkvx.utk.edu

COLLEGE PROFESSOR LETTER

February 15, 1995

Dear Professor,

This is an invitation to participate in a study designed to examine perceptions of outdoor educators concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing outdoor laboratories for their school sites and communities. The primary purpose of this study is to develop a model that will help elementary school teachers use nature in the outdoors as a laboratory to enhance science learning.

Because of the limited number of outdoor educators selected, your assistance and response is essential for the success of this project. You are being asked to respond to the enclosed survey instrument or pass it on to the best qualified outdoor teacher at your institution. Most importantly you are being asked to suggest names of exemplary elementary teachers who you feel are active in using the outdoor laboratory in their classroom. Completion of the survey will require approximately forty-five minutes. The survey should be returned in the self-addressed stamped envelope by February 28, 1995.

To maintain your confidentiality all responses and information will be secured. A code number has been assigned to be utilized by the researcher for follow-up purposes.

The findings of the research will be shared with the scientific community. However, the results will be reported only as group data and your name will not be associated with your responses.

Your participation in the research study is strictly voluntary. By responding we hope you will gain knowledge and benefit from your active participation. We would appreciate your returning the questionnaire even if you are unable to respond to all items.

Thank you for your assistance. As an outdoor educator, you are uniquely qualified to ascertain the importance of having more classroom teachers involved in the use of the outdoors as a teaching laboratory. Your perceptions are highly valued.

Dr. Phyllis Huff/ Carleton Swafford
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email: swafford@utkvx.utk.edu

INSERT TO COLLEGE PROFESSOR LETTER

Exemplary Elementary Teachers

You are being asked to suggest names of exemplary elementary teachers who are active in using the outdoor laboratory in their classroom. These teachers will then be sent the same questionnaire that you have just compleated. It is important to this study that we poll classroom teachers who are actively involved in outdoor teaching and learning.

Name _____ Grade(s)/Subject Taught
Address _____ _____
_____
_____ Phone (___) _____

Name _____ Grade(s)/Subject Taught
Address _____ _____
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Name _____ Grade(s)/Subject Taught
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Name _____ Grade(s)/Subject Taught
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Name _____ Grade(s)/Subject Taught
Address _____ _____
_____
_____ Phone (___) _____

CLASSROOM TEACHER LETTER

February 15, 1995

Dear Teacher,

You have been nominated by _____ as having expertise in and commitment to the use of the outdoor classroom. This is an invitation to participate in a study designed to examine perceptions of outdoor educators concerning the best methods, strategies, materials, and resources for elementary teachers to use in developing outdoor laboratories for their school sites and communities. The primary purpose of this study is to develop a model that will help elementary school teachers use nature in the outdoors as a laboratory to enhance science learning.

Because of the limited number of outdoor educators selected, your assistance and response is essential for the success of this project. You are being asked to respond to the enclosed survey instrument. Completion of the survey will require approximately thirty minutes. The survey should be returned in the self addressed stamped envelope by February 28, 1995.

To maintain your confidentiality all responses and information will be secured. A code number has been assigned to be utilized by the researcher for follow-up purposes.

The findings of the research will be shared with the scientific community. However, the results will be reported only as group data and your name will not be associated with your responses.

Your participation in the research study is strictly voluntary. By responding we hope you will gain knowledge and benefit from your active participation. We would appreciate your returning the questionnaire even if you are unable to respond to all items.

Thank you for your assistance. As an outdoor educator, you are uniquely qualified to ascertain the importance of having more classroom teachers involved in the use of the outdoors as a teaching laboratory. Your perceptions are highly valued.

Dr. Phyllis Huff/ Carleton Swafford
University of Tennessee
College of Education
309 Claxton Education Building
Knoxville, TN 37996-34000
(615) 974-3435
email: swafford@utkvx.utk.edu

APPENDIX B

SURVEY

Using The Outdoor Laboratory In Elementary School Science: A Survey of Outdoor Education Professionals

The purpose of this study is to develop a model to enable elementary school teachers to use the outdoors as a laboratory to enhance science learning.

This survey will identify what outdoor educators perceive are the best methods, strategies, materials, and resources for elementary teachers K-6 to use the school and community as an outdoor laboratory. The survey is divided into four categories:

Category I	Outdoor Teaching
Category II	Equipment
Category III	Instructional/Resources
Category IV	Activities

The Outdoor laboratory is any place in or around the school, its community or other outside setting (eg. a park, open field, stream, pond, or forest) conducive to studying nature.

Specific instructions for each category are provided in the survey. When you have completed the survey, please return it in the postage-paid envelope to:

Carleton Swafford
Outdoor Education
Southern College
P. O. Box 370
Collegedale, TN 37315

1. Which best describes your work? (*Mark all that apply.*)

___ Classroom teacher, Subject(s) taught _____
___ College professor, Subject(s) taught _____
___ Outdoor educator
___ School superintendent/supervisor
___ Coordinator/director
___ Other _____

2. What best describes the level at which you work? (*Mark all that apply.*)

___ Elementary
___ Middle
___ Secondary
___ College students
___ Adults (outside college)
___ Other _____

3. Which describes the highest level of your formal education? (*Mark one.*)

___ High school
___ College non-major
___ College, major_____ minor_____
___ Graduate school non-major
___ Graduate school, major _____
___ Other_____

4. How many years have you worked in outdoor education? (*Mark one.*)

___ 0 - 5
___ 6 - 10
___ 11 - 15
___ 16 - 20
___ 21 - 25
___ 25 +

5. Which of the following experiences were beneficial to you in your training. (*Mark all that apply.*)

___ 4H
___ Audubon or Natural History Clubs
___ Scouts
___ Other experiences (*List below.*)
___ Summer camp
___ Volunteer
___ Workshops
___ College courses, (*List* _____

6. Rank in order the following items as to why you think that elementary teachers would not use the outdoors as a learning laboratory: (1-7, with 1 being the main reason.)

___ classroom management
___ fear of the outdoors
___ knowledge of nature
___ lacking experience in the outdoors
___ not required in the curriculum
___ time in the teaching schedule
___ time to plan activities
___ Other experiences (*List below.*)

Category I - Outdoor Teaching

For the following questions circle the one response that reflects your personal feelings toward each of the following statements.

SA= Strongly Agree A= Agree U= Undecided D= Disagree SD= Strongly Disagree

1. An elementary school teacher is able to teach outdoors if he/she is willing to try a few simple activities.	SA	A	U	D	SD
2. It is not necessary for a teacher to have formal training in science to teach outdoors.	SA	A	U	D	SD
3. A child's appreciation and awareness for the environment should start in the early elementary grades.	SA	A	U	D	SD
4. An outdoor science activity can be a starting point to enrich the whole indoor curriculum.	SA	A	U	D	SD
5. A yearly trip to the local nature center or park should not be the only outdoor experience for a student.	SA	A	U	D	SD
6. Outdoor learning helps the student realize that learning can happen anytime, anywhere, with or without books.	SA	A	U	D	SD
7. Outdoor teaching does not have to involve a lot of equipment.	SA	A	U	D	SD
8. Outdoor learning should be integrated into the existing indoor curriculum.	SA	A	U	D	SD
9. Outdoor teaching does not require a lot of extra time for a teacher to prepare.	SA	A	U	D	SD
10. The teacher must plan an activity, not just go outside on a random walk.	SA	A	U	D	SD
11. The teacher should visit the outdoor area prior to taking the children outside.	SA	A	U	D	SD
12. A survey of the school yard resources would help the teacher decide which activities would work best.	SA	A	U	D	SD
13. Students may never change their attitudes about the outdoors until they see their teacher as a role model.	SA	A	U	D	SD
14. Teaching strategies used indoors often work outdoors too.	SA	A	U	D	SD
15. The best way for a teacher to start going outside with children is to make a decision to go out and try a few simple activities.	SA	A	U	D	SD

Category I (continued

16. Attending an outdoor workshop would be helpful in getting ideas for activities. (e.g., Project WILD.)	SA	A	U	D	SD
17. A teacher should collect some basic equipment before taking students outside.	SA	A	U	D	SD
18. Using an existing curriculum supplement like *Project Learning Tree* is an excellent way to get a teacher started.	SA	A	U	D	SD
19. A teacher who has control inside the classroom will be able to control the children outdoors also.	SA	A	U	D	SD

Please indicate which of the following *indoor teaching methods* are usable in the outdoor laboratory by circling the appropriate letter .

H=Highly Usable M=Moderately Usable L=Least Usable U= Undecided

20. Cooperative Learning	H	M	L	U
21. Debate	H	M	L	U
22. Demonstrations	H	M	L	U
23. Discovery Learning	H	M	L	U
24. Discussions/Questioning	H	M	L	U
25. Experiments	H	M	L	U
26. Lecture	H	M	L	U
27. Integrating Across the Curriculum	H	M	L	U
28. Inquiry	H	M	L	U
29. Problem Solving	H	M	L	U
30. Role-playing/Drama	H	M	L	U
31. Simulations	H	M	L	U
32. Storytelling	H	M	L	U
33. Visualization/Relaxation	H	M	L	U
34. Workbooks/Worksheets	H	M	L	U
35. Other (*List below.*)	H	M	L	U

Category II - Materials/Equipment

Below are listed some items that could be useful in outdoor teaching. Circle the corresponding letter to indicate the importance of the items being acquired by the classroom teacher for use in the outdoor laboratory.

H=Highly Usable M=Moderately Usable L=Least Usable U= Undecided

Student Equipment

36. Hand Lens	H	M	L	U
37. Binoculars	H	M	L	U
38. Notebook/Clipboard	H	M	L	U
39. Container (e.g., ziplock bag)	H	M	L	U
40. Aquatic Net	H	M	L	U
41. Garden Tool	H	M	L	U
42. Suggest _____	H	M	L	U

Teacher

43. Blindfold	H	M	L	U
44. Camera	H	M	L	U
45. Container	H	M	L	U
46. Day Pack/Shoulder Bag	H	M	L	U
47. Field guides (bird, rock, tree, etc.)	H	M	L	U
48. Garbage bags (for raincoats)	H	M	L	U
49. Knife	H	M	L	U
50. Microscope (field type)	H	M	L	U
51. Ruler	H	M	L	U
52. Soil Test Kits	H	M	L	U
53. String	H	M	L	U
54. Thermometers	H	M	L	U
55. Suggest _____	H	M	L	U

List any other materials that you would consider absolutely essential to a teacher who wanted to start using the outdoor classroom.

Category III - Instructional Materials/Resources

In your estimation which of the following national educational programs would be most useful to elementary school teachers. Read each item and then circle the level of usability. If you are unfamiliar with a program circle "*Unfamiliar*".

H-Highly Usable M-Moderately Usable L-Least Usable U- Unfamiliar

58. Audubon Adventures	H	M	L	U
59. Aquatic WILD	H	M	L	U
60. Class Project	H	M	L	U
61. Earth Keepers	H	M	L	U
62. Essence	H	M	L	U
63. Green Box	H	M	L	U
64. Living Lightly in City/Planet	H	M	L	U
65. NEED	H	M	L	U
66. OBIS	H	M	L	U
67. Project Learning Tree	H	M	L	U
68. Project WILD	H	M	L	U
69. REEP	H	M	L	U
70. Save Our Streams SOS	H	M	L	U
71. Sunship Earth	H	M	L	U

72. Other(s) _____

List up to five organizations in your state/province that provides materials for teachers to use in the outdoor laboratory.

_____

_____

_____

_____

_____

Category IV- Activities

Current education programs train teachers to use textbooks, computers, and media equipment, but not the outdoor laboratory. Therefore:

How do you suggest a teacher plan for the first trip outdoors?

How should teachers integrate outdoor activities into their daily schedule?

How would you encourage classroom teachers to use the outdoor laboratory?

List up to three examples of science activities that can be used anytime or anywhere by any teacher unfamiliar with the outdoor laboratory. Be sure to list the name, grade levels, and source of the activity. If this is an original activity that you have adapted from your own experience please enclose a copy of the instructions.

Activity Name _____ Grade Level(s) _____
Source of Information _____
Description

Activity Name _____ Grade Level(s) _____
Source of Information _____
Description

Activity Name _____ Grade Level(s) _____
Source of Information _____
Description

Comments

If you have any additional comments on the use of the outdoor laboratory in the elementary grades, please share them with us.

Comments:

If you have any additional teacher education materials that you feel would be useful in the preparation of the outdoor laboratory model please include them in the enclosed postage-paid envelope.

Thank you for completing this survey. Your responses will be valuable in developing a model for K -6 elementary teachers to use the outdoor laboratory.

Return the completed survey form in the postage-paid envelope to:

Carleton Swafford
Outdoor Education
Southern College
P. O. Box 370
Collegedale, TN 37315

APPENDIX C

RESPONDENT DEMOGRAPHICS

Demographics of Survey Respondents

Question 1 - Other Occupations

College Administrator
Computer Coordinator
Curriculum Writer
District K-12 Supervisor
Environmental Educator
Environmental Education Club Sponsor
Executive Director of Private Non-profit Center
Junior Naturalists Club Sponsor
Lecturer
Naturalists
Nature Center Director
Principal
Sanctuary Director
Science Resource
Special Education
State Park Ranger
Volunteer at a Nature Center

Demographics of Survey Respondents - continued

Question 2 - Other Teaching Levels

Pre-school (4)
Family Groups (3)
Special Needs (2)
Teachers (2)
Intercity children (2)

Demographics of Survey Respondents - continued

Question 3 - Major Fields of Study

32 - Science
- Biology (9)
- Natural Resources (5)
- Environmental Studies (4)
- Environmental Sciences (3)
- Ecology (2)
- Environmental Biology (2)
- Fisheries and Wildlife (2)
- Forestry (2)
- Zoology (1)

48 - Education
- Education (15)
- Environmental Education (13)
- Science Education (6)
- Curriculum and Instruction (4)
- Special Education (3)
- Administration (3)
- Early Childhood (2)
- Christian Education (1)
- Information Education (1)
- Outdoor Education (1)

2 - Geography
2 - Museum Studies
1 - Health and Experiential Learning
1 - Liberal Arts
1 - MBA

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87 - Total Responses

Demographics of Survey Respondents - continued

Question 5 - Other Experiences and College Courses

Experiences

11 - Professional

Workshops/Conferences (4)
Environmental Clubs/Groups (3)
Role Models (2)
School Clubs (2)
Teaching Science (2)

59 - Personal

Farming (10)
Fishing (6)
Hands-on Training/Internships (5)
Camping (5)
Hunting (5)
Visiting Aquariums, Nature Centers, Parks, and Zoos (5)
Hiking (3)
Backpacking (2)
Birdwatching (2)
Climbing (2)
Family Outings (2)
Hobbies (2)
Outdoor Recreation (2)
Travel (2)
Wilderness Trip Leader (2)
First Aid (1)
Personal Interest (1)
Raised on a Game Farm (1)
Skiing (1)

Demographics of Survey Respondents - continued

Question 5 - continued - College Courses Useful In Training

5 - Field Classes
4 - Biology
2 - Ecology
2 - Educational Methods
2 - Zoology
1 - Forestry
1 - Wildlife

APPENDIX D

NATIONAL EDUCATIONAL PROGRAMS

Natural Science for Youth Foundation (1990)

AUDUBON ADVENTURES

The National Audubon Society has enjoyed a long tradition as a national leader in conservation and environmental education. Several million children learned about the natural world through their participation in the former Junior Audubon Clubs during the course of several earlier decades. The Society is now proud to present an updated and timely education program for young people, which is available through the efforts of the more than 500 Audubon Chapters throughout the United States.

Audubon Adventures, the youth education program of the National Audubon Society, is for elementary school classes, and other groups of children in grades 3-6. Developed and written by professional educators with a special interest in environmental education, **Audubon Adventures** is issued on a bimonthly basis and the subscription period coincides with the school year. An enrolled class receives **Audubon Adventures** newspaper for children (up to 32 copies per subscription), the companion Leader's Guide of background information and activity ideas for the teacher, as well as student membership cards and decals. The class is issued a certificate of participation, suitable for framing and hanging. Each April, Adventures classes celebrate Audubon month with a poster and activity guide provided through membership in the program.

Audubon Adventures covers a wide range of topics, with a mix of conceptually oriented as well as more specific reading matter. The timely, relevant feature stories and activities are suitable for both short range and long term in-depth and cross-curricular studies.

Some of the subjects that have been covered in **Audubon Adventures** include: Hawks, Owls, Animal Tracks, Wetlands, Ducks, Animals That Use Cavities, The Nesting Season, Constellations, Conifers, The Bald Eagle, The Wild Turkey, Fruits, Nature's Harvest, Mollusks, Tropical Rainforests.

Currently, 300,000 children in 11,000 classrooms are participating in this exciting program. Most important is the focus with minority children. More than 50,000 minority children are enrolled through a special effort in the major cities.

For information on this exciting program contact: Registrar, Audubon Adventures, National Audubon Society, 613 Riversville Road, Greenwich, CT 06831.

NATIONAL WILDLIFE FEDERATION

Besides being a staunch protector of the environment, and publishing **National Wildlife** and **International Wildlife** magazines, the National Wildlife Federation offers many educational materials for use in teaching children about the natural world.

NatureScope is a series of 15 volumes, each with a different nature study focus. Designed for elementary students, each volume contains dozens of "ready-to-go" ideas and activities, both indoor and outdoor, including "Copycat" pages of puzzles, mazes, etc.

Each volume costs $6.00, although a special "6-pack" is available for only $30.00, and the entire 16 volume library may be purchased for only $79.00. (See address below)

National Wildlife also publishes **Ranger Rick** (for elementary students) and **Your Big Backyard** (for preschoolers) monthly magazines. Both contain beautifully illustrated stories and articles for youngsters.

Ranger Rick costs $14.00/year, which includes membership card and sticker, and discounts on books and records. **Your Big Backyard** runs $10.00/year, and includes a parent/teacher letter suggesting ways to teach young people using the magazine.

National Wildlife Federation's CLASS Project (Conservation Learning Activities for Science and Social Studies) was developed to enhance existing middle school Science and Social Studies curricula. The investigations are centered around six content areas: energy use, environmental issues, forest watershed management, hazardous substances, wetlands, and wildlife habitat. Materials enclosed in the CLASS Project three-ring binder include: illustrations, student worksheets, teacher transparency worksheets, and six color posters. The CLASS Project encourages educators to teach environmental education by integrating the investigations into existing desciplines.

CLASS Project has just been reprinted and is available now. The materials can be obtained by including a check for $8.00 plus $3.25 postage and handling with your order. Send your order directly to: School Programs, The National Wildlife Federation, 8925 Leesburg Pike, Vienna, VA 22184-0001.

In addition to these, National Wildlife also offers a number of educational books learning kits, and videos. For more information, or to order any of the above merchandise, contact: National Wildlife Federation, 1400 Sixteenth, NW, Washington, D.C., 20036-2266, (800) 432-6564.

SUNSHIP EARTH/EARTHKEEPERS

Sunship Earth and **Earthkeepers** are programs that were developed by the Institute for Earth Education. Both are offered to be used as part of a complete environmental education program, not as supplements to existing school curriculum.

Sunship Earth, a five day program for upper elementary students, focuses on key ecological concepts by setting up a "Sunship Study Station", in which the students are given passports to be stamped as they move through different stations. The book **Sunship Earth** not only describes the workings of the program, but the underlying philosophy used in the preparation of Earth Education materials. It sells for $13.50 plus shipping and handling. A complete Sunship Study Station Program Package, including duplication masters and teacher briefing sheet and cue cards runs $250, plus shipping.

Earthkeepers is a two and a half to three day program for learners who are 10-12 years old. The learners must earn special keys that open real locks on boxes that contain secret meanings about "E.M.", a mysterious, unseen character who shares the marvels and wonders of the earth. Two of the four keys must be earned back at school, and the ultimate goal of Earthkeepers is for students to gain understanding about how life functions ecologically on earth, and how they are both a part of our environmental problems and their solutions. The cost for the **Earthkeepers** book is $11.45.

Both books, plus more information on new Earth Education programs and publications may be obtained by writing: The Institute for Earth Education, Box 288, Warrenville, IL 60555.

ESSENCE

The **ESSENCE** materials, formerly known as "Environmental Studies", were developed in the early seventies by joint sponsorship of the American Geological Institute and the National Science Foundation. **ESSENCE** deals mostly with attitudes towards learning, classroom environment, teacher-student trust, and student freedom in determining learning directions.

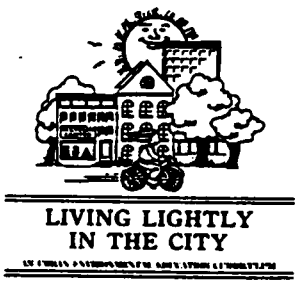
The **ESSENCE** materials consist of several compilations of brightly illustrated cards with suggested actions that leave much to the student's imagination and creativity. For example, one card's action states "Go outside and find joy in your environment." Many of the actions involve some type of expression on the part of the student, such as drawing or acting out their experience. The activities were designed to be "transdisciplinary," i.e. allowing the students to decide which direction to take the assignments, and "trans-grade level," used with students from elementary school through college.

According to Addison-Wesley Publishing Company, **ESSENCE** has been out of print for several years. Additional information may be gained by contacting: ESSENTIA, Evergreen State College, Olympia, WA 98505, (206) 866-6784.

THE GREEN BOX

The **Green Box** contains an "open access curriculum" for environmental education, emphasizing humanistic principles of learning, with the goal of nurturing children to become "environmentally healthy adults". Toward this objective, **Green Box** constructs a curriculum system for grades K-8, geared to the processes of learning as well as to the content. One hundred seventy-eight illustrated and durable activity cards, provide doing, thinking, and showing experiences that employ school and classroom settings, environmental sites in the community, and outdoor wilderness environments. Students are encouraged to open the box themselves and cycle through the sequence of Do, Think, and Show activities on their own, in small groups (six-packs), or as a class. The fall of 1989 will see 40 new activities addded to the program dealing with global issues.

The Green Box is available for $80.00 plus postage. A sample of activities costs only $3.00. For ordering, or more information, contact: Humboldt County Office of Education, Environmental Education Program, 901 Myrtle Ave., Eureka, CA 95501, (707) 445-7082.



LIVING LIGHTLY IN THE CITY /ON THE PLANET

"Living Lightly in the City", Volumes I and II, were inspired by urban children and written for students in both suburban and urban communities. These two volumes contain a variety of activity ideas and resource materials to help urban children bridge the gap between the world of nature and their own urban centered environment. Volume I is geared towards grades K-3, and concentrates on stimulating primary grade children to explore their surroundings, through exciting activities. Volume II focuses on grades 4-6, and covers a broad range of topics to help teachers infuse environmental studies into the existing curriculum.

"Living Lightly on the Planet" Volumes I and II, were designed to inform and motivate Jr. and Sr. high students. Both volumes contain activities that were created to be used in existing science and social studies classes. Volume I, for grades 7-9, concentrates on understanding of global issues, such as population concerns and land issues. Volume II, for grades 10-12, emphasizes applying knowledge of environmental problems with responsible human actions and person lifestyles.

Each of the four volumes comes in a three-ring binder, and contains not only lesson plans, but student worksheets and transparencies as well. The volumes cost $17.00/each, plus $2.00 shipping. To order, or for more information, contact: Schlitz Audubon Center, 1111 E. Brown Deer Rd., Milwaukee, WI 53217, (414) 352-2880.

OBIS (Outdoor Biology Instructional Strategies)

The University of California at Berkeley developed **OBIS** as a quick and easy supplement for a science program. The activities are geared for ages 10-15, although most can be modified for higher and lower levels, and one packet is designed for 8-11 year olds. All can be accomplished with common, everyday items, and in almost any outdoor setting.

The **OBIS** program is presented as a series of packets (each in a plastic carrying pouch), with each packet containing 6-9 activities geared towards a specific theme (such as forests, or wintertime, etc.), and a leader's guide. The activities are printed on separate folders, and are consistently formatted with background information, materials and preparation, action, follow-up questions, and suggestions for further study.

Each of the 26 packets costs $17.75, or all 97 activities can be purchased for $212.80. A special introductory sampler may be purchased for $6.00. For more information and ordering, contact: Delta Education, Inc., P.O. Box M, Nashua, NH 03061, (800) 258-1302.

PROJECT LEARNING TREE

Project Learning Tree is a interdisciplinary, supplementary program designed to provide students with opportunities to explore the existence of renewable and non-renewable resources, and human dependence on them. The activities can be used as a basis for a course of study, or used as supplements to existing curriculum.

Each of the two volumes of Project Learning Tree (one for grades K-6, another for 7-12) contains over 80 activities, organized around a Curriculum Framework of seven key principles, starting with Environmental Awareness, and culminating with lifestyles, with the goal of making students aware of their own personal choices and actions towards environmetnal resources. Both volumes contain extensive bibliographies and resource lists, as well as several indexes for ease in finding activities and a glossary of terms.

Project Learning Tree books are free of charge, but must be obtained by attending a training workshop, usually through a staie-sponsored program. For more information, contact: The American Forest Institute, 1619 Massachusetts Ave., N.W., Washington, D.C. 20036, (202) 463-2468.

PROJECT WILD
(Wildlife in Learning Design)

Developed as a joint venture of the Western Association of Fish and Wildlife Agencies (WAPAWA) and the Western Regional Environmental Education Council (WREEC), Project WILD is an interdisciplinary, supplementary environmental and conservation education program for educators of kindergarten through high school age young people. WILD was designed for easy integration into school subject and skill areas, and each activity may be used individually, or in conjunction with others. In addition, each activity fits into a well defined conceptual framework designed to take the learner from awareness and appreciation of wildlife to responsible human actions.

Each of the two original volumes (elementary and secondary) offers more than eighty activities, while the newer Aquatic WILD (for grades K-12) contains forty, plus ways to modify eighty of the original WILD activities to emphasize animals that live in association with a water environment. All three books contain an elaborate cross referencing index, allowing teachers to easily find appropriate activities. The activities are each consistently laid out with a standard format.

There is no cost for Project WILD materials, but they must be obtained by attending a training session. The sessions and materials are state sponsored, usually through a fish and wildlife or department of natural resources agency. For more information, contact: Project WILD, Salina Star Route, Boulder, CO 80302, (303) 444-2390.

REEP

The **Regional Environmental Education Program (REEP)**, administered by the Schuylkill Center for Environmental Education in Philadelphia, is a kindergarten through grade 12 environmental education curriculum written by teachers, for teachers. It has been endorsed by the PA Department of Education as meeting the state's mandate for environmental education.

More than 200 teachers in PA and NJ have been extensively involved in developing and piloting the units. Each grade level unit focuses on one ecological concept (cycles, adaptations, communities or energy), with concepts being first introduced in the elementary grades, and then repeated in more depth at higher levels for continuity across the curriculum.

Although REEP contains activities from Project WILD, Project Learning Tree and OBIS, among others, it differs from the above in that it is a curriculum, with a definite scope and sequence, rather than a collection of activities. Sequential learning within each unit involves experiences in the awareness, concept building, lifestyle analysis and personal action components of worksheets, teacher resource pages, unit evaluation, glossary and bibliography. Each lesson provides a list of concepts, objectives, time, site and materials needed. Although classroom-focused, one lesson in each unit involves an outdoor experience.

Since the REEP curriculum utilizes a conceptual approach to teaching/learning, it may be implemented anywhere. A variety of effective instructional techniques is employed, including simulations, creative dramatics, storytelling, role playing, puppetry, guided imagery, and firsthand outdoor experiences, among others.

For more information, contact Nancy Christie, Schuylkill Center, 8480 Hagy's Mill Road, Philadelphia, PA 19128, (215) 482-7300.

APPENDIX E

STATE ENVIRONMENTAL EDUCATION COORDINATORS

Getting Started, A Guide to Bringing Environmental Education Into Your Classroom (1994)

State Environmental Education Coordinators

Alabama
Kay Atchison
Science Specialist
Alabama Department of Education
50 N. Ripley Street
Gordon Persons Building
Montgomery, AL 36130
(205) 242-8082

Alaska
Peggy Cowan
Science Specialist
Alaska Department of Education
801 West 10th Avenue
Suite 200
Juneau, AK 99801
(907) 465-2826

Arizona
Kristina Allen
Environmental Education Specialist
Arizona Department of Education
1535 W. Jefferson
Phoenix, AZ 85007
(602) 542-3052

Arkansas
Bill Fulton
Science and Environmental
Education Specialist
Arkansas Department of Education
4 State Capitol Mall
Little Rock, AR 72207
(501) 682-4471

California
Bill Andrews
Education Programs Consultant
California Department of Education
721 Capitol Mall
P.O. Box 944272
Sacramento, CA 95814
(916) 657-5374

Colorado
Don Hollums
Conservation/Environmental
Education Services
Colorado Department of Education
State Office Building
201 East Colfax
Denver, CO 80203
(303) 866-6787

Connecticut
Diane Joy
Assistant Director
Connecticut Department
of Environmental Protection
165 Capitol Avenue, Room 108
Hartford, CT 06106
(203) 566-8108

Delaware
John C. Cairns
State Supervisor of Science
& Environmental Education
Delaware Department
of Public Instruction
P.O. Box 1402
Dover, DE 19903
(302) 739-3742

District of Columbia
Dorothy Barton
Environmental Education Coordinator
Mathematics & Science Resource Center
Backus Jr. High School
South Dakota Ave & Hamilton St. N.E.
Washington, D.C. 20017
(202) 576-7449

State Environmental Education Coordinators - continued

Florida
Kate Muldoon
Research Associate
Office Environmental Education
Florida Education Center
325 West Gaines, Room 224C
Tallahasee, FL 32399-0400
(904) 487-7900

Georgia
Bob Moore
School Support Team Member
Georgia Department of Education
1766 Twin Towers East
Atlanta, GA 30304
(301) 891-1341

Hawaii
Colleen Murakami
Environmental Education Specialist
Hawaii State Department of Education
Environmental Education Office
189 Lunalilo Home Road
2nd Floor
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(808) 396-2572

Idaho
Richard Kay
Consultant
Science and Environmental Education
Idaho Department of Education
650 W. State Street
Boise, ID 83720
(208) 334-2281

Illinois
Gwen Pollock
State Science Coordinator
Illinois State Board of Education
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Office of School Assistance
Department of Education
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State Environmental Education Coordinators - continued

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St. Thomas, VI 00802
(809) 774-3320

APPENDIX F

BOOKS

Books Useful In The Outdoor Laboratory

Hug A Tree and Other Things to Do Outdoors with Young Children
Robert E. Rockwell, Elizabeth A. Sherwood, and Robert A. Williams. 1983. Gryphon House, Inc. Mt. Rainer, Maryland.

Nature Scope
National Wildlife Federation. 1412 Sixteenth Street, Washington D.C. 20036. (800) 822-9919.

Nature With Children of All Ages.
Edith Sisson, 1982. Englewood Cliffs, New Jersey.

Project WET
Available only through a six hour teacher workshop. Culbertson Hall, Montana State University, Bozeman, Montana 59717-0057. Call (406) 994-5392 for the name of the Project WET Coordinator in your state.

Sharing the Joy of Nature, 1989.
Listening to Nature, 1987.
Sharing Nature with Children, 1979.
Joseph Bharat Cornell. Ananda Publications. Nevada City, California.

Ten-Minute Field Trips: Using the School Grounds for Environmental Studies.
Helen Ross Russell. 1991. National Science Teachers Association. Arlington, Virginia

APPENDIX G

NATIONAL ENVIRONMENTAL ORGANIZATIONS

Getting Started, A Guide to Bringing Environmental Education Into Your Classroom (1994)

National Environmental Organizations

American Oceans Campaign
725 Arizona Avenue, Suite 102
Santa Monica, CA 90401
(310) 576-6162

Adopt A Stream Foundation
P.O. Box 5558
Everett, WA 98201
(206) 388-3313

Carrying Capacity Network
1325 G Street NW, Suite 1003
Washington, DC 20005
(202) 879-3045

The Center for Economic Conversion
222 View Street
Mountain View, CA 94041-1344
(415) 968-8798
Fax (415) 968-1126

The Center for Marine Conservation
1725 DeSales Street, NW, Suite 500
Washington, DC 20036
(202) 429-5609

The Conservation Fund
1800 North Kent Street
Suite 1120
Arlington, VA 22209
(703) 525-6300

The Cousteau Society
870 Greenbrier Circle
Suite 402
Chesapeake, VA 23320
(804) 523-9335

Environmental Defense Fund
257 Park Avenue South
New York, NY 10010
(212) 505-2100

The Environmental Exchange
1718 Connecticut Ave. NW
Suite 600
Washington, DC 20009
(202) 387-2182

Global Tomorrow Coalition
1325 G Street, NW
Suite 915
Washington, DC 20005-3104
(202) 628-4016

Global Releaf
Director of Education
P.O. Box 2000
Washington, DC 20013
(202) 667-3300

Izaak Walton League of America
1401 Wilson Boulevard
Level B
Arlington, VA 22209-2318
(703) 528-1818

Keep America Beautiful Inc.
Mill River Plaza
9 West Broad Street
Stamford, CT 06902
(203) 323-8987

League of Conservation Voters
1707 L Street, NW
Suite 550
Washington, DC 20036
(202) 785-8683

National Audubon Society
700 Broadway
New York, NY 10003
(212) 979-3000

The National Geographic Society
1145 17th Street, NW
Washington, DC 20036
(202) 857-7000

National Environmental Organizations - continued

The National Institute for Urban Wildlife
10921 Trotting Ridge Way
Columbia, MD 21044
(410) 995-1119

National Parks and Conservation Association
1776 Massachusetts Avenue
Washington, DC 20036
(202) 223-6722

National Toxics Campaign
29 Temple Place
5th Floor
Boston, MA 02111
(617) 482-1477

National Wildlife Federation
1400 Sixteenth Street, NW
Washington, DC 20036-2266
(703) 797-6800

The Nature Conservancy
1815 North Lynn Street
Arlington, VA 22209
(703) 841- 5300

North American Association for Environmental Education
1255 23rd Street NW
Washington, DC 20037
(202) 467-8753
Membership and Publications:
P.O. Box 400
Troy, OH 45373
(513) 676-2514

Population-Environment Balance
1325 G Street, NW
Suite 1003
Washington, DC 20005-3104
(202) 879-3000

Project Eco-School
881 Alma Real Drive
Suite 300
Pacific Palisades, CA 90272
(310) 454-4585

Renew America
1400 Sixteenth Street, NW
Suite 710
Washington, DC 20036
(202) 232-2252

The Sierra Club
730 Polk Street
San Francisco, CA 94109
(415) 923-5660

Soil Conservation Society of America
7515 NE Ankeny Road
Ankeny, IA 50021
(515) 289-2331

World Resources Institute
1709 New York Avenue, NW
Washington, DC 20006
(202) 662-3085

Worldwatch Institute
1776 Massachusettes Avenue, NW
Washington, DC 20036
(202) 452-1999

The World Wildlife Fund
1250 Twenty-Fourth Street, NW
Washington, DC 20037
(202) 293-4800

Zero Population Growth
1400 16th Street, NW
Suite 320
Washington, DC 20036
(202) 332-2200

VITA

Carleton Lee Swafford was born on June 8, 1953 in Chattanooga, Tennessee. He attended elementary school in Hamilton County, Tennessee and graduated from Collegedale Academy in Collegedale, Tennessee in 1971. He received his Bachelor of Arts degree in Biology from Southern College in Collegedale, Tennessee in May, 1975.

He began teaching high school biology in Knoxville, Tennessee. During this time he completed his Master of Science degree in Science Education from the University of Tennessee Knoxville in August, 1978. He left Knoxville and returned to Collegedale to teach seventh and eighth grade at A. W. Spalding School. His teaching experiences there included life science, earth science, physical science, photography, and social studies. Other school duties included vice-principal (two years), science fair coordinator, and outdoor education director.

He has had various experiences in the outdoors, including positions as nature director at summer camps in Florida, Georgia, and Tennessee; teacher/counselor at Land Between The Lakes Youth

Station, Golden Pond, Kentucky; group leader at Wesley Woods Environmental School, Townsend, Tennessee; and as a naturalist at summer camps in Texas and California.

He entered The University of Tennessee, Knoxville to pursue the Doctor of Philosophy degree in the fall of 1992. He coordinated the off-campus science methods classes two semesters at Morristown and Maryville, Tennessee and he assisted the coordinator of the Regional Tennessee Junior Science and Humanities Symposium for three years. He also served two years as an elementary teaching supervisor while at The University of Tennessee.

His major field of study was Elementary/Middle Science education with collaterals in Environmental Science and Teacher Education. He received the Doctor of Philosophy degree in December of 1995.