EFFECTS OF ENVIRONMENTAL CURRICULUM ON THE ENVIRONMENTAL ATTITUDES OF SEVENTH GRADERS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Educators have overlooked the value and importance of environmental education. Environmental educators have conceded that promoting respect for the environment, teaching values related to the environment and encouraging environmentally responsible behavior are essential parts of any environmental curriculum. Due to the continued degradation of vital ecosystems and habitats and the continued threat to the environmental balance, environmental education may be one of the most important areas of teaching. The need and concern about environmental problems is at a high level as indicated by the establishment of the Environmental Education Act (Doran, Guerin, & Sarnowski 1972).

According to Jaus, few studies have been conducted that investigate the effect of environmental education on elementary or middle school students' attitudes toward the environment (Jaus, 1982). "The enhancement of positive attitudes toward the environment is rather crucial today since citizens are being required to make decisions that will affect the quality of life presently and for generations," (Bethel, Ellis, & Barufaldi 1982). The benefits of middle school students receiving environmental education are far reaching.

Given that most attitudes are set and difficult to change by the time the students are in high school (Hewitt, 1997: Jaus, 1982), education regarding the environment should be a priority during the middle school years. According to Hewitt, a curriculum that teaches only facts and concepts may have a slight effect on the children's attitudes toward the environment, but actively involving them in their communities and in solving local environmental problems encourages them to become active at a more global level. The concern needs to be not only with the knowledge that students' gain from the curriculum but what effect that curriculum has on the students' attitudes. The protection of the environment is influenced by more than knowledge alone. According to Maloney, Ward and Braucht the solution to the problem does not lie in traditional technological approaches but rather in the alteration of human behavior. With the acquisition of knowledge, attitudes should change, allowing for a change in behavior. An environmental ethic can be instilled in our students by using a curriculum that both actively involves them in the learning process and provides them with the knowledge to make sound environmental decisions. This should foster not only a change in their attitudes but their behavior as well.

PURPOSE OF THE STUDY

The purpose of this study was to determine if a significant difference existed in the environmental attitudes of seventh grade students before of after participation in an environmental curriculum program.

According to a study conducted by Michael R. Cohen a relationship does exist between environmental information and environmental attitude. The group with more environmental information had different attitudes than the group with less environmental information (Cohen, 1973). Knapp proposes that instruction in environmental education take place in the elementary and/or middle schools years because many attitudes are established and fixed by the time students reach high school (Jaus, 1982). According to Maloney, Ward and Braucht the solution to our environmental problems do not lie in traditional technological approaches but rather in the alteration of human behavior.

HYPOTHESES

The following null hypothesis was tested:

- H_0 There is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.
- H_1 There is a significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.

SAMPLE FOR THE STUDY

These hypotheses were tested using a sample of seventh grade students from Union Public Schools in Tulsa, Oklahoma. As an existing cohort of

students, this sample provided the opportunity to evaluate attitudes under a controlled setting. The existing cohorts were students in seventh grade taught by two teachers, with the students divided into ten classes.

LIMITATIONS

Limitations of the study include:

1. Only seventh grade students will be used in the study.
2. Students attending the Tulsa Union 6^{th} & 7^{th} Grade Center will be used.
3. All participating students must be present for the test.
4. The instrument will measure attitude.
5. Ten classes of seventh grade students will be included in this study. Only those students whose parents permit them to participate will be analyzed.
6. The curriculum focuses on energy, fossil fuels, pollution control, waste reduction, recycling and problem solving.

ASSUMPTIONS

The following basic assumptions are being accepted:

1. The students will understand and follow all directions given and will honestly answer the test questions to the best of their ability.
2. Teachers of the subjects will not help them prepare in any way for the tests.
3. It is assumed the curriculum as presented follows the Priority Academic Students Skills (P.A.S.S.).

4. It is assumed that knowledge will have an affect on attitude (Cohen, 1972).

PROCEDURE

Ten classes of seventh grade students from Union Public Schools participated in this study. The treatment group consisted of five classes and the control group was comprised of the remaining five classes. The subjects were not randomly chosen, but were selected based on whose science class they attended. Treatment group one and control group one were both given the Children's Attitude Toward the Environment Scale (CATES) prior to the presentation of the curriculum. The CATES was administered to treatment group one and two, as well as control groups one and two approximately nine weeks after completion of the curriculum.

The environmental curriculum that was presented to the treatment groups came from the following sources: Earth Book for Kids, Prentice Hall Activity for Ecology, Earth's Natural Resources, Let's Reduce, Reuse and Recycle: Curriculum for Solid Waste Awareness and Science Is . . .. The environmental curriculum was presented the first two weeks of the third quarter during the 1997-1998 school year. The environmental curriculum was presented as part of the proposed science curriculum for Union Public Schools. The control group did not receive any instruction that was related to the environmental curriculum or aspects of the curriculum.

DEFINITION OF TERMS

The following terms are defined in their relation to the study:

1. Attitude - "the favorable or unfavorable response toward a statement, event or class of objects." (Burrus-Brammel, 1978).
2. Control group - those students not receiving the environmental curriculum.
3. Curriculum - the environmental curriculum that was presented to treatment group one and treatment group two.
4. Environmental curriculum - any information presented to the students regarding energy sources, pollution control, waste reduction, habitat conservation and/or problem solving in the form of activities, lecture, discussion or reading.
5. Environmental education - "an interdisciplinary approach for improving knowledge of the environment and the human relationship to it." (Tewksbury, Harris, 1982).
6. Participant - seventh grade students attending Union Public Schools.
7. Testing instrument - the Children's Attitude Toward the Environment Scale (CATES). (Musser & Malkus, 1994) .
8. Treatment group - those students receiving the environmental curriculum.
9. Value - "a guiding force that determines the choices people make in living their life." (Knapp, 1972).

CHAPTER II

REVIEW OF THE LITERATURE

With the establishment of the Environmental Education Act and many conferences held on the topic, came the establishment of the environmental education goals (Doran, Guerin, & Sarnowski, 1974). It is these goals that have affected environmental education.

The environmental education goals that were established by the Tbilisi Intergovernmental Conference on Environmental Education (Hungerford & Volk, 1989 -1990) in 1977 are as follows:

1. Awareness to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems and/or issues.
2. Sensitivity to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems and/or issues.
3. Attitudes to help social groups and individuals acquire a set of value and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection.
4. Skills to help social groups and individuals acquire skills for identifying and solving environmental problems and/or issues.

5. Participation to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems and/or issues.

Hungerford and Volk used these objectives when they defined an environmentally responsible citizen as a "person who has an awareness and sensitivity to the total environment and its allied problems and/or issues, a basic understanding of the environment and its allied problems and/or issues, feelings of concern for the environment and motivation for actively participating in environmental improvement and protection, skills for identifying and solving environmental problems and/or issues and active involvement at all levels in working toward resolution of environmental problems and/or issues" (Hungerford & Volk 1989-1990).

The Oklahoma Curriculum Committee, which was established by the Oklahoma Legislature, presented the original core curriculum to the Oklahoma State Board of Education in 1990. The State Board of Education initiated the curriculum in 1992, after it had been reviewed and revised, as was required by House Bill 1017. Oklahoma's Priority Academic Student Skills (P.A.S.S.) represent the basic knowledge and skills that all students should learn in elementary and secondary schools (P.A.S.S., 1993). The Priority Academic Student Skills form the basis of student achievement tests that are conducted in the fifth, eighth and eleventh grades. The P.A.S.S. objectives are used to design curriculum and guide educators.

In accordance with the P.A.S.S. objectives, the following skills are presented in the seventh grade:

1. Observing and Measuring - Observing is the first action taken by the learner to acquire new information about an object or an event. Opportunities for observation are developed through use of a variety of scientific tools. Measurement allows observations to be quantified.
2. Classifying - Classifying establishes order. Objects, organisms and events are classified based on similarities, differences and interrelationships.
3. Experimenting - Experimenting is the sequential method of discovering information. It requires making observation and measurements to test ideas against facts.
4. Interpreting - Interpreting is the process of making predictions and hypotheses using data collected in an investigation. With these skills students will develop conclusions.
5. Communicating - Communicating is the process of describing, recording and reporting experimental procedures and results to others. Communication may be oral or written and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations and mathematical equations.
6. Safety in classroom - Safety is an essential part of any science activity. Safety in the classroom and care of the environment is individual and group responsibilities.

Union Public Schools, using the P.A.S.S. objectives for the state of Oklahoma has developed the following education goals that relate to

environmental science. These goals were taken from the Scope and Sequence (Union Public Schools, 1995). They include:

I. The student will observe, measure, classify, and experiment with physical science applications and interpret and communicate the results.

   1. Learn about energy sources.
   2. Trace the source of energy that runs common appliances everyday living.
   3. Compare and contrast different fossil fuels.
   4. Explain the steps in the formation of fossil fuels.
   5. Classify energy sources as either renewable or nonrenewable.
   6. Discuss the environmental effects of burning fossil fuels.
   7. Discuss alternative sources of energy.

These objectives led to the selection of the environmental curriculum that was presented to the treatment group. The experimenter chose the environmental curriculum that was presented.

"The enhancement of positive attitudes toward the environment is rather crucial today since citizens are being required to make decisions that will affect the quality of life presently and for generations to come" (Bethel, Ellis, & Barufaldi, 1982). Given that most attitudes are set and difficult to change by the time students are in high school (Hewitt, 1997; Jaus, 1982), education regarding the environment should be a priority during the middle school years.

Research has shown that the following methods have been successful in changing attitudes in some people (Knapp, 1972).

1. Verbal Reinforcement - Upon hearing a desirable attitude expressed by a student, the teacher agrees and praises that student
2. Counter-Attitudinal Role Playing - Students play the roles of persons holding different attitudes than their own. This causes the student to expand their perception of the issue.
3. Debates - Students gather information on both sides of an issue and then present the side that is selected.
4. Providing New Information - Some researchers have shown that new information has caused attitudes to change.
5. Introducing Anxiety or Fear Arousing Situations - In some cases fear arousal led to changes in attitude.
6. Understanding the Psychological Need for Holding a Particular Attitude - Understanding the need to have a particular attitude, an attempt can be made to alter the dependency.
7. Changing Certain Social Factors - For instance a person who is opposed to strip mining may change his attitude if legislation was passed to reclaim mined land.
8. Adult Models - Research had shown that adults could influence the attitudes of children. Bixler, Greenblatt and Washton showed that students' attitudes toward science are affected by their teachers attitude toward science.
9. Behavior Change Precedes Attitude Change - Direct involvement on the student's part in community environmental problems may change the student's attitude.

Educators need to understand these methods in changing attitudes and incorporate them into their classroom and environmental curriculum. Moyer states that educators must "not be interested in how much knowledge students gain from the curriculum, but how that curriculum affects their attitudes as well" (Moyer, 1977). It is this affective component of education that is more of a value to society than is the cognitive.

Borden and Schettino found that an increased concern about the environment does not lead to the seeking of knowledge nor does the acquisition of environmental facts result in increased affective reactions (Borden & Schettino, 1978). Also discovered, the level of affect was a more important determinant of current commitment than the level of knowledge that the subject possessed. These results contradict Roth and Hendee who argue that educators should teach facts and concepts about the environment and this knowledge will change their attitudes and then their behavior (Borden & Schettino, 1978). To develop the highest level of environmentally responsible action, educators must provide both affective and cognitive experiences for their students.

In a study conducted by Patricia Hewitt, games were used to promote student to student interaction. Games allow students to participate in an environment that is less threatening and reassures those students who are less willing to participate (Hewitt, 1997). In games, students become central to their own learning. In this study the games taught facts, influenced decisions and described the value of particular areas of interest such as habitat areas. While

only four of the six games played showed any significant changes in environmentally responsible behavior, those students who had scored low on environmentally responsible behavior increased their scores significantly. The scores of those boys increased more than for the girls. This was attributed to the competitiveness of boys. This study shows the importance of using games in instruction. Games can be used to actively involve students in their communities and make them a part of the problem solving process. Games also encourage students to cooperate with their peers.

In a study done by Jaus, elementary and middle school students received ten hours of instruction in environmental education. Jaus wanted to know if those students who had received the environmental instruction had more positive attitudes toward the environment than those students whom did not. This study was conducted using 53 students from two semi-departmentalized fifth grade classes. The classes were located in the same school district but in different buildings. The study found that the group of fifth graders who received the environmental instruction had a higher mean score that those who did not. This allowed the researchers to conclude that the students receiving the 10 hours of environmental instruction had more positive attitudes toward the environment than those students who did not. This study shows how significant environmental education is in the development of positive attitudes toward the environment (Jaus, 1982).

Asch and Shore did a study in which elementary students were exposed to an environmental education program, which was followed that summer and

the following school year by field trips and projects. Asch and Shore hypothesized that those students who were exposed to the environmental education program and the follow up field trips and projects would exhibit actual behavior that was helpful for the environment. This "conservational" behavior would not be present in those students who did not participate in the environmental education. Their study showed that those students who were exposed to the environmental curriculum did display more "conservational" behavior than those students who did not participate in the environmental curriculum. The group of students who did not receive the environmental curriculum showed more destructive behavior (Asch & Shore, 1975).

In this study destructive behavior was defined as it related to each setting. For behavior that was related to conservation of soil, destructive behavior included the furrowing in the same direction as the slope, planting only seeds and no windbreak. Destructive behavior related to the conservation of wildlife included destruction of food, destruction of homes and destruction of species. Putting unclean things into the water and lowering the water level were considered destructive behaviors in the conservation of water setting. Lastly conservation of forests considered destructive behavior as wasting valuable trees, harming trees and erecting shelters that retarded vegetation (Asch & Shore, 1975).

Conservational behaviors were also outlined. Conservation of soil behaviors comprised furrowing counter to slope, planting some plants and making a wind break. Behaviors related to conservation of wildlife included

observation of wildlife, conservation of food, conservation of homes and conservation of species. Behaviors associated with conservation of water involved removing waste from the water and constructing dams. Using dead wood for construction, marking the trail on dead trees and constructing shelters that did not retard vegetation were behaviors that were affiliated with conservation of forests (Asch & Shore, 1975).

Besides demonstrating that more actual conservational behavior was exhibited by those students who participated in the formal program of environmental education, the Asch and Shore study also revealed that the actual behavior could be guided in the desired direction (Asch & Shore, 1975).

This study as well as the study that was conducted by Jaus communicated the significance of presenting environmental curriculum to students. These studies imparted that those students who did participate in environmental curriculum had more positive attitudes toward the environment and displayed actual behavior that was more conservational than those students who did not take part in the environmental curriculum. Hewitt's research made note of the idea of presenting the knowledge of the environmental curriculum through the use of games. Through the use of games students interacted with their peers and became involved in their community through the decision making process.

In a study conducted by Sia, Hungerford and Tomera, called "Selected Predictors of Responsible Environmental Behavior: An Analysis," the concept of community involvement and participation was examined. Sia, Hungerford and

Tomera stated that the emphasis of environmental education has been aimed at the analysis of environmental problems and raising awareness instead of being concentrated on environmental problem solving and citizen participation (Sia, Hungerford & Tomera, 1985). They felt that it is these variables that are the most important and need heavy consideration when developing environmental curriculum. Hungerford (1983) has stated that "it is environmental problem solving that is either ignored by practitioners or perceived as something that can be achieved by awareness education" (Sia, Hungerford & Tomera, 1985).

The results of the Sia, Hungerford and Tomera study showed a demand for environmental curriculum developers to address both environmental problem solving and citizen participation. If the goal of environmental educators is to produce students who are more environmentally responsible and can utilize their environmental knowledge to solve problems, then it is even more important that problem solving and citizenship issues be addressed.

Ramsey and Hungerford conducted a study titled "The Effects Of Issue Investigation and Action Training on Environmental Behavior in Seventh Grade Students" (Ramsey & Hungerford, 1989). In this study students participated in a program titled "Investigating and Evaluating Environmental Issues: Skill Development Modules." Ramsey and Hungerford referred to this program as issue investigation and action training (IIAT). This program included six interdisciplinary modules that were completed in one semester. The IIAT Program exposes the students to environmental issues and taught them the skills they needed to analyze and investigate issues, process information and to

be an environmentally responsible citizen (Ramsey & Hungerford, 1989).

Ramsey and Hungerford concluded that issue investigation and action training did produce more environmentally responsible behavior in seventh grade students (Ramsey & Hungerford, 1989). Those students who participated in the study were also more prone to use corrective environmental behaviors than those students who did not participate in the study. The IIAT Program also promoted environmentally responsible behavior in eighth grade students as well as being adequate in a diverse group of school settings and with many middle school teachers.

The studies conducted by Sia, Hungerford and Tomera and Ramsey and Hungerford showed us the importance of action training and citizenship. It is these variables that assist in producing environmentally responsible citizens.

Michael R. Cohen directed a study called "Environmental Information *Versus Environmental* Attitudes." This study looked at the effect that different amounts of environmental information would have on the environmental attitudes of two groups of high school students. Two groups of the students, the high environmental content group and the low environmental content group, were given an attitude survey. The scores on the attitude survey were then compared. Cohen concluded an association did exist between environmental information and environmental attitude (Cohen, 1973). This study showed that the group of students with more environmental information had different attitudes than the group with less environmental information. It was also shown that the group with more information was also more willing to declare their attitude (Cohen, 1973).

The study, "The Effect of the Sunship Earth Program on Knowledge and Attitude Development," which was conducted by Meg Keen, looked at the effect of this education program on ecological knowledge and environmental attitudes. In this program, participants spend five days in a "natural setting." The students participated in outdoor activities where they developed ecological concepts. They then applied these concepts to other situations. Students also spend time discussing environmental attitudes and the effect of these attitudes on the environment. The results showed that this program had no effect on the environmental attitudes and ecological knowledge of the fifth and sixth grade students who participated. The lack of effect was accredited to the short length of time, just five days, and the "lack of integration of the learning experiences with the school curriculum" (Keen, 1991).

In another study conducted in an outdoor setting, titled "The Effect of a Conservation Program on Schoolchildren's Attitudes toward the Environment," the author found that there was a difference in the environmental attitudes of those who had been to the outdoor location and those who had not (Ryan, 1991). The results also showed that those students who already were very active in outdoor activities chose the more "environmentally correct" answers. Ryan's study showed that having students participate in outdoor activities does have an effect on students' attitudes (Ryan, 1991).

While Cohen's study indicated there was a relationship between environmental information and environmental attitude, an investigation conducted by Burrus-Bammel contradicted his conclusions. Burrus-Bammel

found that attitudes were not correlated with knowledge (Burrus-Bammel, 1978). In this investigation the subjects spent a week at an environmental education youth camp. During this time the campers received lectures on the benefits of wood, water and recreation, participated in role-playing and took field trips that provided them with knowledge of the forest ecosystem and tours of wood product plants (Burrus-Bammel, 1978). A written test was given at the beginning of the study to ascertain the environmental attitudes of the campers and again at the end to establish if a change had occurred in the attitudes of the campers. A linear regression of the group scores showed that attitudes were not correlated with knowledge (Burrus-Bammel, 1978).

It has been implied that involvement in outdoor recreational activities leads to increased environmental concern. Dunlap and Hefferman analyzed this implication. Their data provided weak support for this inference. Of the 40 surveys that were conducted, 24 showed no positive association between involvement in outdoor recreation and environmental concern. Although they discovered that there was a "stronger association between involvement in appreciative activities and environmental concern than between involvement in consumptive activities and environmental concern" (Dunlap & Hefferman, 1975).

Shephard and Speelman designed an investigation which hypothesized that participation in an outdoor education program, which provided the child with direct experience with the environment, would produce positive attitude changes (Shephard and Speelman, 1985 - 1986). A lack of significant difference was found between the experimental and control groups. This suggested that

participation in the outdoor education program had no effect on the subjects' environmental attitudes. The researchers attributed the lack of change in the environmental attitudes to the length of the program. They suggested that further research be conducted that examined the length of time required to change attitudes. Keen attributed lack of significance in her study to the length of time variable as well. Perhaps the length of the environmental education program is as important as the content of the program and the techniques that are used to administer the information.

Knowing that attitudes become increasingly difficult to change as students reach high school age, educators often feel compelled to introduce environmental concepts and ideas at the middle school level. Studies have shown that participation in an environmental curriculum does have an effect on the attitudes of the participants. It has also been implied that using games, involvement in outdoor areas and the community has had an effect on the environmental attitudes of the participants. Armed with the methods introduced by Knapp designed to change attitudes and knowledge of environmental concepts, teacher preparation programs should prepare educators to influence the attitudes of their students toward the environment.

CHAPTER III

METHOD AND DESIGN

The purpose of this study was to determine if there would be a significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools. This chapter provides a description of the environmental curriculum and the methods used to evaluate the attitudes of the seventh graders. The design of this study and the participation of the subjects were approved by the Institutional Review Board (IRB) December 18, 1997. A copy of the IRB approval is included in Appendix D.

DESIGN OF THE STUDY

This study was a randomized Solomon Four-Group Design. The pre-test was administered to treatment group one and control group one prior to the presentation of the curriculum. The treatment began the following day. The post-test was administered to all groups approximately nine weeks upon completion of the environmental curriculum (see Table 1). Data were analyzed using an Analysis of Variance (ANOVA) with *post hoc* T-tests. The alpha selected for determination of significance was .05. The dependent variables

were the scores on the Children's Attitude Toward the Environment Scale developed by Musser and Malkus (see Appendix E). The independent variables were time and treatment. The subjects were students who attended Union Public Schools in Tulsa, Oklahoma.

TABLE 1

DATES OF PRE-TEST, POST-TEST AND TREATMENT

Group	Pre-Test January 5	Treatment January 6-20	Post-Test March 20
Treatment 1	n = 22	X	n = 22
Treatment 2		X	n = 18
Control 1	n = 18		n =1 8
Control 2			n = 22

DESCRIPTION OF THE TREATMENT

Earth Book for Kids, Prentice Hall Activity book for Ecology: Earth's Natural Resources, Let's Reduce and Recycle: Curriculum for Solid Waste Awareness and Science Is... served as resources in developing the environmental curriculum. The activities were chosen because they corresponded with the P.A.S.S. objectives, which were established by the state of Oklahoma. The environmental curriculum was presented as part of the proposed science curriculum for Union Public Schools. Teachers in the Union Public Schools have the freedom to choose which activities were used in planning the environmental unit. This freedom of choice means that every

science teacher in Union Public Schools has taught the environmental unit differently. Not all science teachers have taught the environmental unit by the close of the school year.

Treatment groups one and two were instructed in the environmental unit in addition to the regular science curriculum, which consists of earth, life and physical sciences. Treatment groups one and two were taught by the principal investigator. There were controls as to the information being presented in terms of standard delivery.

Control groups one and two received only the earth, life and physical science curriculum. Control groups one and two were taught by another member of the regular faculty at Tulsa Union 6th and 7th Grade Center. These students did not have daily contact with the principal investigator as the treatment groups did. Control groups one and two did not receive an environmental unit beyond the regular curriculum in physical, life and earth sciences. The lesson plans that were used in study are included in Appendix F.

DESCRIPTION OF THE ENVIRONMENTAL LESSONS

A variety of methods were used to introduce the environmental curriculum. These included hands-on cooperative group activities, reading and classroom discussions. These lessons were presented during the 55 minute class period. The following is a description of the activities, readings and discussions.

On January 6, a discussion of what energy is and where it might come from was held to introduce the environmental unit. The students mentioned ideas such as energy makes things work and it costs money. The students were not able to agree upon a definition. When asked where does it come from, ideas such as batteries, the sun, and water were mentioned. This discussion ended with the students identifying major energy sources coming from fossil fuels. The principal investigator noticed that the students knew what fossil fuels were and were able to list them.

"What is energy?" was read from Earth Book for Kids. Energy was defined as the capacity to do work or the ability to make things move. Kinetic energy and potential energy were discussed as well. Energy facts were also read. These included items such as more than half of the energy consumed in most homes is used for heating. After completion of the reading and the discussion, the students were given the activity "Energy Sources" from Prentice Hall Activity Book: Ecology.

In this activity a scene is presented which contained a variety of energy sources, some common and some not so common. The students were then told to identify the various energy sources. The students completed this activity in their cooperative groups. Upon completion of this activity a discussion was held as to what energy sources they were able to identify. These included the sun, water, wind and hydrothermal vents. This day was concluded with a reading from Prentice Hall Ecology. The students read about fossil fuels and their uses and what a renewable and nonrenewable resource was.

On January 7 the focus of the unit was shifted from energy to recycling. A discussion of the impact of recycling on energy was held at the beginning of the hour to tie in with the previous day's lesson. The students read about recycling and examples of recycling from the Earth Book for Kids. A survey of the students was taken to determine which families recycled and what products they recycled. The results of this survey were then posted in the hallway.

In the reading it is mentioned that recycling a glass jar saves enough energy to light a 100-watt bulb for four hours. Using this information the students then calculated how many hours a 100-watt light bulb could run if they recycled 100 glass jars. The principal investigator challenged the students to recycle enough glass containers to light the school building for the entire school year. At the conclusion of the school year, the students had collected and recycled one third of the amount that was needed.

The students then worked in their cooperative groups to brainstorm other ways that recycling helps to save energy and ways in which they could encourage their families and friends to purchase recycled products. The students developed ideas that included reusing products, such as plastic tubs and clothing, in addition to recycling ideas.

On January 8 the students were able to use their creativity to design a paper trash sculpture. Using paper towel and toilet tissue rolls, egg cartons, junk mail, hangers, plastic tubs and lids, paper plates, pizza boxes and other paper trash items that were collected, the students turned trash into a work of art. The students designed these working in their cooperative groups. When the

sculpture was completed the students presented it to the class. Several of the sculptures were placed downstairs in the display cases for visitors to see.

The students took home with them, that evening, an activity titled "Packaging Scavenger Hunt." Working with a parent, the student was instructed to find items with no wrapping, one wrapping, two wrappings and three or more wrappings. The results of the packaging scavenger hunt were to be reported to the class the next day.

On January 9 the students were once again allowed to use their creativity. The hour began with the results of the packaging scavenger hunt. A discussion was then led by the students as to how much energy could be saved if the amount of packaging could be reduced on some items. The students agreed that some items, such as meat, might need more packaging than others but they also agreed that many items were over packaged. This discussion led into the activity.

The students were to redesign a package that they felt was over packaged. It was agreed by the students that reducing the packaging by even one layer could save energy. The students drew the new package design and then presented their new package to the class. Before they left class they were told they would need to bring to class on Monday a copy of a recent energy bill.

Home energy use was discussed on January 12. Using the recent energy bills the students were asked to bring with them, they completed the activity titled "Home Energy Use."

In this activity the students identified the type of energy (gas, oil, electric) and determined if it was a renewable or nonrenewable resource. The students then read information regarding how much energy was used and how the cost was calculated. The kilowatt was introduced as the unit that is used to measure energy. The students then worked in their cooperative groups to calculate how much energy was used and what it cost.

When this activity was completed the students read "Be A Meter Reader" and were instructed on how to read their electric meter. The students then developed a chart to record their electric meter readings for 3 days. Starting on Monday evening the students were to read their electric meters for 3 days, record the readings and then bring this data to school to share with the class on Thursday.

January 13 was devoted to water and water pollution. The students recognized that water was an energy source but they had a difficult time with brainstorming ways in which water could become polluted. They were able to identify actions such as throwing objects into the water as polluting but did not identify fertilizer runoff, laundry soap or acid rain as possibilities of sources of water pollution. They knew that acid rain was harmful to plants, but did not identify acid rain as a possible pollutant to the water supply. The reading discussed facts about water, where water comes from and the steps that are involved in the water treatment process. After reading the students were asked to "Chart a flush."

In "Chart a flush" the students were to keep track of the number of times they flushed a toilet each day, both at school and home. The activity asks the student to record the number of flushes for two weeks. The first week is used to create an awareness for the student on how much water was used. In the second week, the student should be more aware of how much water was used and the amount would hopefully decrease. This activity could not be completed in the time allotted for the environmental unit so the principal investigator asked the students to record the number of flushes in one day. It was brought to their attention that six gallons of water is used each time the toilet is flushed. At the end of the day the student calculated how much water they had used just to flush the toilet. Using this number the student calculated how much water would have been used for the entire week. The students were instructed to have calculated the number of gallons of water used to flush the toilet for discussion the following day.

In addition to "Charting a Flush," the principal investigator led the students in an activity entitled "Phosphate Problems." This activity introduces phosphates and the impact that detergents have on our water supply. The students were instructed to put different amounts of laundry soap in plastic two liter bottles. Each table was given a different brand of laundry detergent. The students then shook the bottles for two minutes. After shaking the bottles, the students measured the amount of suds that was produced. The students then allowed the bottles to set for ten minutes. The student then measured the height of the suds. This measurement was repeated again ten minutes later. They recorded

all the data in a data table. The data for each type of laundry detergent was then put on the board so everyone could see. The data for the different detergents was then compared. This activity allowed the student to see the amount of suds that was produced from a measured amount of laundry detergent and which type of laundry detergent had suds that lasted longer. The harmful effects of phosphate on fish and water were then discussed. The students then checked the back of the detergent boxes to discover that none of the detergents that we used contained phosphates.

The three types of pollution were discussed on January 14. The students read about the three types of pollution. The class was then divided into three groups. Each group was given a pollution type. The group was then responsible for brainstorming ways to reduce the amount of pollution. These ideas were then presented in to the class in addition to a brief summary of the type of pollution.

The students completed their discussion of ways to prevent pollution on January 15. In addition to this the students also reported on the status of their electric meters. The students were able to determine the amount of energy that was used each day. As a class, comparisons were made between the amount of energy used for one story and two story houses. The students enjoyed being meter readers. They suggested that the class should do this activity in the beginning of school (summer), the middle of school (winter) and toward the end of school (spring) and then compare the results. The principal investigator feels that this activity made the students more conscious of the amount of energy that

is required to run a house. The student was also able to determine that by turning off the lights when they do not need to be on can save electricity. The students realized that those minutes of electricity saved a day can add up to hours by the end of the week.

January 16 was the final day of the environmental curriculum unit. The students began with a overview of what was discovered over the last eight days. From these ideas and concepts the students developed their own environmental coat of arms. The students chose a shape to use as their coat of arms and divided it into three sections. In the first section the student drew something in the environment they care about. In the second section the student drew something that posed a threat to the thing they cared about. In the third section the student drew something that can be done to protect the thing they care about. At the bottom of their environmental coat of arms the student developed a motto. When these were completed they were presented to the class and then displayed in the hall. Lastly the students read about making earth day every day.

Interesting environmental facts were introduced throughout this unit. These facts came from a variety of other sources. These included Newton's Apple , Science Is... and Let's Reduce, Reuse and Recycle . These were introduced when the principal investigator felt appropriate. These were used to spark the subjects interest in the topic for the day and for closing out the days activities. The facts were either written on the board, read aloud by a student or read aloud by the principal investigator.

DESCRIPTION OF THE SUBJECTS

Ten classes of seventh graders from Union Public Schools participated in this study. These ten classes were taught by the principal investigator and one other faculty member. The treatment groups consisted of five classes. Treatment group one incorporated three classes (n=22) while two classes made up treatment group two (n=18). The control groups involved five classes. Control group one was composed of three classes (n=18) with control group two including two classes (n=20). The subjects were randomly assigned teams at the beginning of the school year. The students were then selected based upon whose science class they were attending. Only those students who returned a signed parent and student permission slip were allowed to participate in this study.

The majority of the subjects are from middle to high-class income families with two parents in the home. The majority of the subjects were Caucasian. The subjects had an existing awareness of the environment. The degree of awareness is assumed to be minimal.

DESCRIPTION OF THE ASSESSMENT TOOL

Lynn M. Musser and Amy J. Malkus developed the Children's Attitude Toward the Environment Scale (CATES). This scale is used to provide a general measure of environmental attitudes as well as evaluating environmental education programs and examining the development of pro-environmental

attitudes. In the development of the scale three guidelines were used. First, the scale was designed to be developmentally appropriate for children approximately eight to twelve years old (Musser & Malkus, 1994). Second, the CATES is high both on test-retest reliability and internal consistency because it was developed using psychometric principles. Using the procedures for developing a Likert scale were also employed so that summing across items to create one attitude score was justified (Musser & Malkus, 1994). According to Musser and Malkus the test-retest reliability was .68, $p < .0001$. Cronbach's alpha, which assesses internal-consistency reliability, was .80 (Musser & Malkus, 1994). Third, the CATES was easy and quick to carry out, score and interpret. The test was estimated to take twenty minutes when given to fourth and fifth grade students. The test was administered to seventh grade students and took less than twenty minutes to complete.

The CATES had several advantages over other attitude scales. It used the "language of school-age children in a format that they could easily understand" (Musser & Malkus, 1994). Since it is easy and quick to administer, it provides the tester with one attitude score. The CATES also has good test-retest reliability and internal consistency.

Selection of the items to be used on the scale began after an extensive review of environmental literature. The statements on the scale were based on the view that attitudes have three components: belief, affect, and behavioral intentions (Fishbein & Ajzen, 1975; Musser & Malkus, 1994). The scale contains eight belief statements, nine affective statements and eight behavior statements.

Three of the twenty-five items are related to recycling, eight to conservation, six to animal rights/animal protection, four to nature appreciation and four to pollution.

The format of the Children's Attitude Toward the Environment Scale was based on that which was used for the Perceived Competence Scale for Children (PCSC; Harter, 1982; Musser & Malkus, 1994). The CATES describes two different groups of children as does the Perceived Competence Scale for Children. For example, one item reads "Some children turn the lights off when they leave a room, but other children leave the lights on." When the scale was administered the students were instructed to choose which of the two groups they were most like. Under each statement were two boxes, one small and one large. The students were directed to mark the larger box if they are a lot like the children described in the statement or the smaller box if they were only a little *like the children in the* statement. The ease with which the CATES was administered and scored, the high test-retest reliability and internal consistency along with the fact that it is easy for the students to understand and does not take them long to complete makes it a sound choice for use in this study.

HYPOTHESES TESTED

The following null hypothesis was tested:

- H_0 There is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.
- H_1 There is a significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.

COLLECTION OF DATA

The Children's Attitude Toward the Environment scale was given to treatment group one and control group one on January 5, 1998. The scales were collected and scored according to the directions. The scores were then recorded. For the next two weeks, the treatment groups participated in the environmental curriculum. On March 20, the CATES was given to treatment groups one and two as well as control groups one and two. The scales were collected and scored and the scores were then recorded. The CATES in scored by summing the values of the checked boxes. The maximum score possible is 100. The minimum score possible is 25.

STATISTICAL ANALYSIS

As stated previously, the design used in this study was a randomized Solomon-Four Group Design. Control group one and treatment group one took the pre-test on January 5, 1998. Control groups one and two as well as

treatment groups one and two took the post-test on March 20, 1998. The dependent variable was the scores on the Children's Attitude Toward the Environment Scale. The independent variables were time and treatment.

The statistical technique used was the Analysis of Variance. Within-group and between-group differences were evaluated for the dependent variable with a follow up T-test. Alpha was established at .05 level of significance.

All statistical procedures were conducted using the Statistical Package for the Social Sciences (SPSS, 1990). Data were entered manually into the IBM 3270 mainframe computer at Oklahoma State University and analyzed using SPSS procedures. The OSU Computer Center provided computer access and software for this project.

CHAPTER IV

RESULTS

The purpose of this study was to determine if a significant difference existed in the environmental attitudes of seventh grade students before or after participation in an environmental curriculum program. The Children's Attitude Toward the Environment Scale (CATES) was used to measure the attitudes of the seventh grade students (see Appendix G). As outlined in Chapter III a pre-test and post-test were given.

The null hypothesis tested in this study was:

- H_0 There is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.
- H_1 There is a significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.

The study was a randomized Solomon Four-Group design. The pre-test was administered to treatment group one and control group one in January. Nine weeks following the completion of the Environmental Curriculum unit, the post-test was given to all groups. The scales were collected, scored and the

scores recorded. The data were then analyzed using the OSU Computer Center and the Statistical Package for the Social Sciences (SPSS, 1990). An analysis of variance with *post hoc* T-tests at a .05 level of significance were used.

The dependent variables were the scores on the Children's Attitude Toward the Environment Scale. The independent variables were time and treatment. The subjects were students who attended Union Public Schools in Tulsa, Oklahoma.

An analysis of variance determined that there was no significant difference on environmental attitudes of seventh grade students as measured by the Children's Attitude Toward the Environment Scale between treatment group one (n=22) and control group one (n=18) prior to the presentation of the environmental curriculum. (see Table 2).

TABLE 2

ANALYSIS OF VARIANCE BETWEEN THE TREATMENT GROUPS AND THE CONTROL GROUPS

Source	D.F.	Sum of Squares	F Ratio	F Probability
Between Groups	1	95.82	1.1048	.2998
Within Groups	38	3295.78		
Total	39	3391.60		

The probability of F shows that no significant difference existed between treatment group one and control group one on the Children's Attitude Toward the Environment Survey. Since treatment group one (n=22) and control group one

(n=18) were shown to be similar, the principal investigator proceeded with the Solomon-Four Group design as outlined in Chapter III.

Nine weeks after completion of the environmental curriculum, all four groups were administered the Children's Attitude Toward the Environment Scale as a post-test. A significant difference is shown to exist between or within the four groups on the post-test results (see Table 3). As a result of this difference on the post-test, H_o is rejected.

TABLE 3

ANALYSIS OF VARIANCE FOR ALL GROUPS

Source	D.F.	Sum of Squares	F Ratio	F Probability
Between Groups	3	1225.58	5.2027	.0026*
Within Groups	74	5810.64		
Total	77	7036.22		

*p<.05

A significant difference is found to exist between or within the four groups on the post-test results. Due to this significant difference the H_o which states there is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools is rejected.

To determine where these differences occurred several *post hoc* T-tests were conducted. Table four outlines the results for the *post hoc* T-tests for control group one (n=18) and treatment group one (n=22) (see Table 4).

TABLE 4

T-TESTS FOR INDEPENDENT SAMPLES FOR CONTROL GROUP ONE AND TREATMENT GROUP ONE

Group	N	Mean	SD	T	P
Control 1	18	63.17	8.9	-1.05	.302
Treatment 1	22	65.64	5.98		

df = 38

Table 4 shows that no significant difference existed between control group one and treatment group one. The mean for control group one was 63.17. The mean for treatment group one was 65.64. These means are close in range. Both control group one and treatment group one took the pre-test in January.

Table 5 presents the results of the *post hoc* T-tests for control group one (n=18) and control group two (n=22). Control group one took the pre-test. Control group two did not. (see Table 5).

Table 5 shows that no significant difference exists between control group one and control group two on the post-test. These two groups scored similarly on the post-test. As a result of this post-test, the two control groups were shown to be similar on the CATES.

TABLE 5

T-TESTS POST-TEST FOR INDEPENDENT SAMPLES FOR CONTROL GROUP ONE AND CONTROL GROUP TWO

Group	N	Mean	SD	T	P
Control 1	18	63.17	8.9	-1.11	.273
Control 2	22	66.65	10.24		

df = 36

Data for control group one (n=18) and treatment group two (n=18) are presented in Table 6. A significant difference is shown to exist between these two groups on the post-test. (See Table 6). Control group one took the pre-test. Treatment group two did not take the pre-test.

TABLE 6

T-TESTS POST-TEST FOR INDEPENDENT SAMPLES FOR CONTROL GROUP ONE AND TREATMENT GROUP TWO

Group	N	Mean	SD	T	P
Control 1	18	63.17	8.9	-3.47	.001*
Treatment 2	18	74.17	10.06		

df=34 *p<.05

Table 6 shows a significant difference existed between control group one and treatment group two on the post -test. Treatment group two had a mean score of 74.17, while control group one had a mean score of 63.17.

Table 7 presents the results of the *post hoc* T-tests for treatment group one (n=22) and control group two (n=22). Treatment group one took the pre-test, while control group two did not (see Table 7).

TABLE 7

T-TESTS POST-TEST FOR INDEPENDENT SAMPLES FOR TREATMENT GROUP ONE AND CONTROL GROUP TWO

Group	N	Mean	SD	T	P
Treatment 1	22	65.64	5.98	-.4	.694
Control 2	22	66.65	10.24		

df=40

Table 7 shows that no significant difference existed between treatment group one and control group two on the post-test. The mean scores of 65.64 and 66.65 are similar (see Table 7).

Treatment group one (n=22) and treatment group two (n=18) are compared in Table 8. Treatment group one took the pre-test. Treatment group two did not take the pre-test. A significant difference is shown to exist between these two groups on the post-test (see Table 8).

Table 8 shows a significant difference does exist between treatment group one and treatment group two on the post-test. Treatment group one, who received the pre-test, had a mean score of 65.64. Treatment group two, who did not receive a pre-test, had a mean score of 74.17. The difference between the

mean scores is 8.53. Treatment group two had a significantly higher mean score than did treatment group one.

TABLE 8

T-TESTS POST-TEST FOR INDEPENDENT SAMPLES FOR TREATMENT GROUP ONE AND TREATMENT GROUP TWO

Group	N	Mean	SD	T	P
Treatment 1	22	65.64	5.98	-3.33	.002*
Treatment 2	18	74.17	10.06		

df=38 *p<.05

Neither control group two (n=22) nor treatment group two (n=18) took the pre-test. Table 9 shows the *post hoc* T-tests for these groups (see Table 9).

TABLE 9

T-TESTS POST-TEST FOR INDEPENDENT SAMPLES FOR CONTROL GROUP TWO AND TREATMENT GROUP TWO

Group	N	Mean	SD	T	P
Control 2	22	66.65	10.24	-2.28	.029*
Treatment 2	18	74.17	10.06		

df = 36 *p<.05

Table 9 shows that a significant difference exists between control group two and treatment group two. Neither control group two nor treatment group two took the pre-test on January 5, 1998. The two groups that took the post-test only were found to be different from each other.

In addition to comparison between groups, the principal investigator investigated the possible differences within groups. The control one and treatment one groups were compared on pre-test and post-test scores. This comparison is shown in Table 10 and Table 11.

TABLE 10

T-TESTS FOR PAIRED SAMPLES OF CONTROL GROUP ONE

Variable	N	Mean	SD	T	P
Pre-test	18	61.89	6.8	-1.48	.157
Post-test	18	63.17	8.9		

Table 10 shows that no significant difference exists on the pre-test and post-test scores of control group one (n=18). This would indicate that control group one did not change in their attitudes during the time of the study as measured by the CATES. Neither of the control groups was exposed to any environmental concepts or ideas as a part of their traditional curriculum. Upon completion of the post test, the individual members of the control groups held similar environmental attitudes as they did when the study started.

The pre-test and post-test scores were also compared for treatment group one. No significant difference is shown to exist between these scores (see Table 11).

TABLE 11

T-TESTS FOR PAIRED SAMPLES OF TREATMENT GROUP ONE

Variable	N	Mean	SD	T	P
Pre-test	22	65.00	10.91	-.03	.766
Post-test	22	63.63	5.98		

Table 11 shows no significant difference exists between the pre-test and post-test scores for treatment group one. The findings shown in Table 11 are the same as those shown in Table 4, demonstrating no significant difference between pre-test and post-test scores for treatment group one. The environmental attitudes of treatment group one are the same as they were prior to the presentation of the curriculum.

The analysis of variance (ANOVA) (see Table 3) showed a significant difference existed between or within the groups on the post-test results. Tables 6, 8 and 9 showed that treatment group two differed from all the other groups on the post-test results. As a result of these differences shown in treatment group two, the null hypothesis (H_o) was rejected. The null hypothesis stated there is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.

Since the null hypothesis was rejected based upon the demonstrated differences in treatment group two, the alternative hypothesis (H_1) could not be rejected. The alternative hypothesis stated there is a significant difference in the

environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public School.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

This study was conducted to determine if a significant difference existed in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools. The measurements taken evaluated the environmental attitudes of seventh graders. The instrument used to evaluate the attitudes of the participants was the Children's Attitude Toward the Environment Scale (see Appendix G) which was developed by Musser and Malkus.

Other studies have shown that exposure to an environmental curriculum program does indeed have an affect on the environmental attitudes of the participants. Jaus has shown that just ten hours of environmental education was enough to produce a higher mean score than those who did not receive the environmental education. Asch and Shore have also shown that exposure to an environmental education program as well as field trips will produce students who display more conservational behavior than those students who do not participate in the environmental education program.

Presentation of the environmental curriculum is also an important aspect. Patricia Hewitt conducted a study in which games were used to promote student interaction. The games taught facts, influenced decisions and described the value of a particular area of interest such as habitat areas. Four of the six games that were used caused a significant change in the environmentally responsible behavior of the participants.

Subjects in this study were seventh graders who attended the Union Public Schools. They were chosen to participate in this study as members of intact groups. These groups were selected based upon willing participation of the teacher and the parents. This study consisted of a pre-test and a post-test. The environmental curriculum was presented to the treatment groups after the pre-test was given. The post-test was given nine weeks after the completion of the environmental curriculum. The Children's Attitude Toward the Environment Scale was used to measure the attitudes of the participants. It was administered to control group one and treatment group one.

The environmental curriculum that was presented corresponded both with the P.A.S.S. objectives, established by the Oklahoma State Department of Education, and the scope and sequence objectives established by Union Public Schools. The environmental curriculum was presented over a time period of nine days. Activities were chosen from Earth Book for Kids, Prentice Hall Activity Book for Ecology: Earth's Natural Resources, Let's Reduce and Recycle: Curriculum for Solid Waste Awareness and Science Is... .

The following null hypothesis was tested:

- H_0 There is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.
- H_1 There is a significant difference in the environmental attitude of seventh grade students before or after participating in an environmental curriculum in Union Public Schools.

TABLE 12

SIGNIFICANCE AND NONSIGNIFICANCE OF THE PRE-TEST AND POST-TEST RESULTS FOR THE CATES

Group	Pre-test January 5	Treatment January 6-20	Post-test March 20
Treatment 1	N	X	N
Treatment 2		X	S
Control 1	N		N
Control 2			N

N means not significant at alpha = .05
S means significant at alpha = .05

It is the decision of the principal investigator to reject the null hypothesis, which stated there is no significant difference in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools. The null hypothesis is rejected due to the difference shown in treatment group two. The analysis of variance showed a significant difference between and within groups (see Table 3). Tables 6, 8 and

9 showed that treatment group two differed from all other groups on the post-test results (see Table 6, Table 8, Table 9).

CONCLUSIONS

The results of this study indicated:

1. The environmental curriculum did not change the attitudes of treatment group one. The results showed no significance difference on the pre-test and post-test scores of treatment group one (see Table 11).
2. The environmental attitudes of treatment group one are the same as they were prior to the presentation of the environmental curriculum.
3. The differences found with treatment group 2 can not definitively be attributed to participation in the environmental curriculum unit. Treatment group 2 did not establish baseline scores since they did not take the pre-test.
4. There was no significant difference found in treatment group one and control group one at the pre-test. Treatment group one and control group one were identical in environmental attitudes at the beginning of this study.
5. At the conclusion of this study no significant difference was found between treatment group one and control group one on the post-test. Both groups remained unchanged.
6. Treatment group two was shown to be significantly different. The means of treatment group two were significantly higher than any other group. (see Figure 1).

7. The lack of a significant difference between treatment group one and control group one at the post-test showed there was no increase in knowledge or change in attitude due to the pre-test, commonly known as the "history effect."

Mean Scores on CATES Post-Test

Figure 1

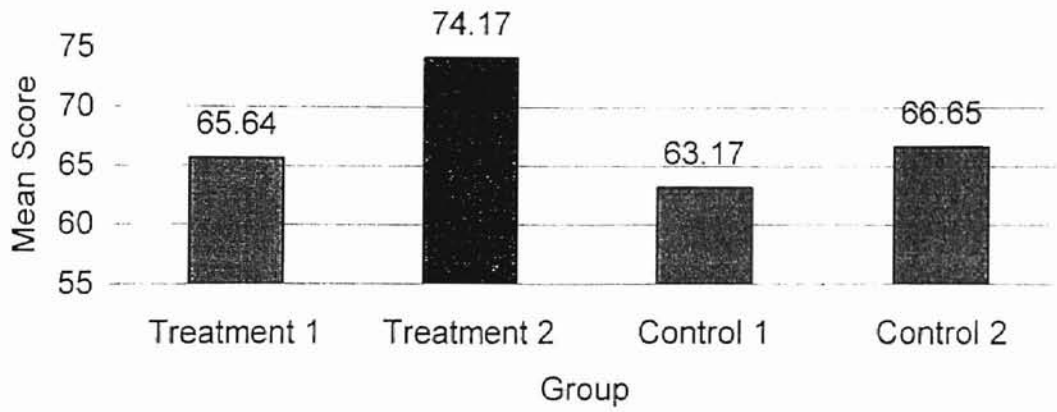

Figure 1 shows the means of the post-test on the Children's Attitude Toward the Environment Scale for all groups. The mean of treatment group two is significantly higher than the means of treatment group one, control group one and control group two. This significant difference can not be definitively attributed to the environmental curriculum because no base line scores were collected for treatment group two. Treatment group two did not take the pre-test.

RECOMMENDATIONS FOR FURTHER STUDY

This study was conducted to determine if a significant difference

exists in the environmental attitudes of seventh grade students before or after participating in an environmental curriculum in Union Public Schools. While the results suggest that the environmental attitudes of seventh grade students are not affected by participation in an environmental curriculum, they do provide the principal investigator with recommendations for further study. Perhaps it is the length of the environmental curriculum unit that would elicit the maximum effect on the attitudes of the participants. The studies that were conducted by Jaus, Asch and Shore and Ramsey and Hungerford were lengthy programs lasting longer than the 9 days that were spent presenting the environmental curriculum of this study. Conducting a study which examines the length of time spent presenting the environmental curriculum would be worth investigating.

The principal investigator felt as though there was not adequate time to cover all the environmental concepts she has hoped to. The scope and sequence, as they are written, do not put enough emphasis on teaching environmental concepts.

It is also possible that the presentation of the environmental curriculum was such that it did not hold the interest of the participants. Patricia Hewitt conducted a study in which an environmental curriculum program was presented using games. Those students who participated in the games showed more environmentally responsible behavior. Even though the environmental curriculum that was presented in this study was done using hands-on methods maybe the information should be presented using a combination of games, hands-on methods, community involvement and field trips.

The principal investigator also recommends conducting the study in a different manner. It is suggested that the pre-test be given and then waiting six weeks before presenting the environmental curriculum. A lack of significance could then not be attributed to the history effect. The environmental curriculum would then be presented six weeks following the pre-test and the post-test be given six weeks after the environmental curriculum.

It is also recommended that the Union Public Schools scope and sequence objectives be rewritten to include more environmental concepts. The scope and sequence as it stands includes environmental concepts related to energy and fossil fuels. Environmental concepts that relate to the land, air and water as well as to plant and animal habitats need to be included. These scope and sequence objectives should also include local community environmental problems such as Ozone Alert Days.

The principal investigator could have underestimated the amount of environmental knowledge that the subjects possessed prior to the start of this study. The participants could already have had a deep understanding of the environmental concepts that were presented in this study. This would explain why no significant difference was found with treatment group one. This would not explain why treatment group two had significant scores. Treatment group two was shown to be significantly different from the other groups. The participants that composed treatment group two were from an Advanced science class. It is possible that the intellectual ability of these students is what caused their scores to be so significantly different.

While the results of this study did not prove to be statistically significant, they did prove to be significant to the principal investigator. It was learned from this study that the scope and sequence objectives for Union Public Schools need more attention. If educators for Union Public Schools are taking it upon themselves to produce more environmentally responsible citizens, then the principal investigator recommends that the scope and sequence be rewritten to include a broader range of environmental science concepts. The scope and sequence also needs to include community involvement and field trips in the objectives. "A Review of Classroom Methodologies for Environmental Education" written by Gerald Lewis, examined the many ways that environmental curriculum is presented. The results of his study concluded that a combined indoor/outdoor strategy produces significantly higher achievement than presenting either an indoor or an outdoor program alone (Lewis, 1981). Lewis suggests that educators use the classroom to prepare the students' for the outdoor experience and then provide the students with the outdoor experience. Upon returning to the classroom a discussion of the concepts seen should occur. This study demonstrated the importance of outdoor experiences in the environmental education process.

Educational institutions who are concerned about environmental education can refer to these guiding principles (Stapp, 1978). They are as follows:

1. Environmental education consider the environment in its totality.
2. Environmental education should be a continuous life long process.

3. Environmental education should be taught using an interdisciplinary approach.
4. Environmental education should emphasis active participation in preventing and solving environment problems.
5. Environmental education should examine major environmental issues from a world point of view.
6. Environmental education should focus on current and future environmental situations.
7. Environmental education should examine growth and development from an environmental perspective.
8. Environmental education should promote interrelationships of people and the environment.
9. Environmental education should promote the value and necessity of local, national, and international cooperation in the solution of environmental problems.
10. Environmental education should focus on the learners' own community.
11. Environmental education should seek support from the media.
12. Environmental education should also emphasize environmental sensitivity, acquisition of environmental knowledge, values education, development of problem solving skills, the inquiry process, community experiences, decision making skills, critical thinking, teacher education programs and the complexity of environmental issues.

Environmental curriculum is an important and significant component of any school curriculum. Educators need to give great care to the environmental concepts that are developed and taught. Even if the students, to whom the environmental curriculum is presented, have a existing knowledge it can always be reinforced. Perhaps these students could be used to teach younger students or conduct a presentation for the community. It is these students who will be responsible for the future of planet Earth so educators must take great care and concern to plan an environmental curriculum that will meet the needs of these students.

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APPENDICES

APPENDIX A

TEACHER CONSENT FORM

Teacher Consent Form

"As a 7th grade science teacher in the Union Public School system, I, _____ hereby authorize or direct Jennifer Lane Spielmann or associates or assistants of her choosing, to perform the following treatment as a portion of her master's thesis at Oklahoma State University."

This is done as part of a study entitled "The Effects Of An Environmental Curriculum Program On Environmental Attitudes in 7th Graders."

The intent of this study is to test the effectiveness of the environmental science curriculum in an aggregate manner and not to compare their effectiveness with classes. This study will attempt to discover what effect environmental curriculum has on the environmental attitudes of 7th graders. The above said teacher will administer the children's attitudes toward the environment scale approximately nine weeks into the third quarter of the 97-98 school year. This is the extent to which the students will participate. To ensure confidentiality, all test materials will be destroyed after the data is gathered and the subjects will be randomly assigned numbers. The interest of this study is only in group data and individual students will not be identified.

"I understand that my participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

I may contact Jennifer Spielmann at 459-4734. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078: telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____

Teacher Signature: _____

I certify that I have personally explained all elements of this form to the teacher before requesting that she sign it.

Project Director: _____

APPENDIX B

STUDENT ASSENT FORMS

Assent Form

"_____, I hereby authorize or direct Jennifer Lane Spielmann or associates or assistants of her choosing, to perform the following treatment as a portion of her master's thesis at Oklahoma State University."

This is done as part of a study entitled "The Effects Of An Environmental Curriculum Program On Environmental Attitudes in 7th Graders."

The intent of this study is to test the effectiveness of the environmental science curriculum. This study will attempt to discover what effect environmental curriculum has on the environmental attitudes of 7th graders. The student will be given the children's attitudes toward the environment scale approximately nine weeks into the 3rd quarter of the 97-98 school year. This is the extent to which the student will participate. To ensure confidentiality, all test materials will be destroyed after the data is gathered and the subjects will be randomly assigned numbers. The interest of this study is only in group data and individual students will not be identified.

"I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

I may contact Jennifer Spielmann at 459-4734. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078: telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____

Student Signature: _____

I certify that I have personally explained all elements of this form to the students before requesting that they sign it.

Project Director: _____

Assent Form

"_____, I hereby authorize or direct Jennifer Lane Spielmann or associates or assistants of her choosing, to perform the following treatment as a portion of her master's thesis at Oklahoma State University."

This is done as part of a study entitled "The Effects Of An Environmental Curriculum Program On Environmental Attitudes in 7th Graders."

The intent of this study is to test the effectiveness of the environmental science curriculum. This study will attempt to discover what effect environmental curriculum has on the environmental attitudes of 7th graders. The student will be presented the environmental curriculum and will then be given the children's attitudes toward the environment scale approximately nine weeks following presentation of the curriculum. This is the extent to which the student will participate. To ensure confidentiality, all test materials will be destroyed after the data is gathered and the subjects will be randomly assigned numbers. The interest of this study is only in group data and individual students will not be identified.

"I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

I may contact Jennifer Spielmann at 459-4734. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078: telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____

Student Signature: _____

I certify that I have personally explained all elements of this form to the students before requesting that they sign it.

Project Director: _____

APPENDIX C

PARENT CONSENT FORMS

Consent Form

"As the parent of _____, I hereby authorize or direct Jennifer Lane Spielmann or associates or assistants of her choosing, to perform the following treatment as a portion of her master's thesis at Oklahoma State University."

This is done as part of a study entitled "The Effects Of An Environmental Curriculum Program On Environmental Attitudes in 7th Graders."

The intent of this study is to test the effectiveness of the environmental science curriculum. This study will attempt to discover what effect environmental curriculum has on the environmental attitudes of 7th graders. The student will be given the children's attitudes toward the environment scale approximately nine weeks into the 3rd quarter of the 97-98 school year. This is the extent to which the student will participate. To ensure confidentiality, all test materials will be destroyed after the data is gathered and the subjects will be randomly assigned numbers. The interest of this study is only in group data and individual students will not be identified.

"I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

I may contact Jennifer Spielmann at 459-4734. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078: telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____

Parent Signature: _____

I certify that I have personally explained all elements of this form to the students before requesting that they sign it.

Project Director: _____

Consent Form

"As the parent of _____, I hereby authorize or direct Jennifer Lane Spielmann or associates or assistants of her choosing, to perform the following treatment as a portion of her master's thesis at Oklahoma State University."

This is done as part of a study entitled "The Effects Of An Environmental Curriculum Program On Environmental Attitudes in 7th Graders."

The intent of this study is to test the effectiveness of the environmental science curriculum. This study will attempt to discover what effect environmental curriculum has on the environmental attitudes of 7th graders. The student will be presented the environmental curriculum and will then be given the children's attitudes toward the environment scale approximately nine weeks following presentation of the curriculum. This is the extent to which the student will participate. To ensure confidentiality, all test materials will be destroyed after the data is gathered and the subjects will be randomly assigned numbers. The interest of this study is only in group data and individual students will not be identified.

"I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

I may contact Jennifer Spielmann at 459-4734. I may also contact Gay Clarkson, IRB Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078: telephone number (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____

Parent Signature: _____

I certify that I have personally explained all elements of this form to the students before requesting that they sign it.

Project Director: _____

APPENDIX D

IRB APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 12-18-97 **IRB #ED-98-046**

Proposal Title: THE EFFECTS OF ENVIRONMENTAL CURRICULUM ON THE ATTITUDES OF SEVENTH GRADERS

Principal Investigator(s): Lowell Caneday, Jennifer Spielmann

Reviewed and Processed as: Expedited with Special Population

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

==========

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature

Chair of Institutional Review Board

Date: December 22, 1997

Cc: Jennifer Spielmann

APPENDIX E

THE CHILDRENS ATTITUDE TOWARD THE ENVIRONMENT SCALE

Children's Attitudes Toward the Environment Scale

1. Some kids like to leave water running when they brush their teeth. *but* Other kids always turn the water off while brushing their teeth.

2. Some kids use both sides of the paper when they draw or write. *but* Other kids use only one side of the paper when they draw or write.

3. Some kids think we should throw away things when we're done with them. *but* Other kids think we should recycle things.

4. Some kids think dams on rivers are bad because they hurt plants and animals. *but* Other kids think dams on rivers are good because they prevent floods.

5. Some kids like to bring home plants or bugs they find outside. *but* Other kids like to look at plants or bugs outside but they never bring them home.

6. Some kids don't like to make bird feeders or bird houses. *but* Other kids like to make bird feeders or bird houses.

7. Some kids think outdoor lights should be turned off at night because they use electricity. *but* Other kids think outdoor lights should be left on at night because they keep us safer.

8. Some kids think people are more important than animals. *but* Other kids think people and animals are equally important.

9. Some kids are concerned about the rain forest. *but* Other kids aren't concerned about the rain forest.

10. Some kids think we should build more landfills to hold our garbage. *but* Other kids think we should find other ways to deal with our garbage.

11. Some kids like visiting national parks. *but* Other kids don't like to go to national parks.

12. Some kids don't worry about animals becoming extinct. *but* Other kids worry about animals becoming extinct.

13. Some kids throw things away when they are done with them. *but* Other kids reuse things or give them to other people to use.

14. Some kids think we should use chemicals and fertilizers in our gardens. *but* Other kids think we shouldn't use chemicals and fertilizers in our gardens.

15. Some kids pick up trash and throw it away. *but* Other kids don't like to pick up smelly trash.

16. Some kids don't sort their trash. *but* Other kids sort their trash and recycle it.

17. Some kids like to live where there are lots of plants and animals. *but* Other kids like to live where there are lots of people.

18. Some kids touch or catch wild animals. *but* Other kids never touch or catch animals they find outside.

19. Some kids don't like to carpool because they don't like being crowded in the car. *but* Other kids like to carpool even if it is a little crowded.

20. Some kids are excited about solar energy. *but* Other kids don't care about solar energy.

21. Some kids believe people should be able to live wherever they want. *but* Other kids believe that people should be careful not to destroy animals' homes.

22. Some kids worry about air pollution. *but* Other kids don't worry about air pollution.

23. Some kids think we should be able to hunt all wild animals. *but* Other kids think that animals need protection.

24. Some kids turn off the lights when they leave. *but* Other kids leave the lights on.

25. Some kids get their parents to drive them places they want to go. *but* Other kids ride their bikes or walk when they can.

APPENDIX F

ENVIRONMENTAL CURRICULUM UNIT LESSON PLANS

Date	Activity	Reading	P.A.S.S. Objectives	Union Public Schools Objectives
January 6	Prentice Hall Activity Book p. 13	Earth Book for Kids p. 56-57 Prentice Hall p.11-18	1, 3, 4, 5, 6	1, 5
January 7	Earth Book for Kids p.19	Earth Book for Kids p.13-18	4, 5, 6	1
January 8	Earth Book for Kids p. 26, 27		2, 4, 5, 6	1
January 9	Earth Book for Kids p. 28		2, 4, 5, 6	1
January 12	Prentice Hall Activity Book p. 9 Earth Book for Kids p. 60	Earth Book for Kids p. 60	1, 2, 4, 5, 6	1, 2
January 13	Earth Book for Kids p. 86, 88	Earth Book for Kids p. 68-70, 72-76	1, 2, 3, 4, 5, 6	
January 14		Prentice Hall p 66-86	2, 4, 5, 6	6
January 15	Earth Book for Kids p. 60		1, 2, 4, 5, 6	1, 2
January 16	Earth Book for Kids p.65	Earth Book for Kids p. 138-139	2, 4, 5, 6	

APPENDIX G

TREATMENT GROUP ONE PRE-TEST & POST-TEST SCORES

PRE-TEST AND POST-TEST SCORES ON THE CATES
FO R TREATMENT GROUP ONE

Participant Identification	Pre-test Score	Post-test Score
39	68	62
40	66	52
41	66	69
42	63	68
43	68	58
44	70	72
45	68	66
46	73	79
47	44	63
48	72	73
49	58	62
50	68	68
51	76	65
52	52	61
53	51	60
54	79	71
55	63	65
56	35	63
57	76	74
58	70	62
59	70	64
60	74	67

APPENDIX H
TREATMENT GROUP TWO POST-TEST SCORES

POST-TEST SCORES ON THE CATES
FOR TREATMENT GROUP TWO

Participant Identification	Post-test Score
61	82
62	92
63	83
64	60
65	79
66	73
67	64
68	62
69	72
70	53
71	89
72	68
73	75
74	81
75	76
76	79
77	73
78	74

APPENDIX I

CONTROL GROUP ONE PRE-TEST AND POST-TEST SCORES

PRE-TEST AND POST-TEST SCORES ON THE CATES
FOR CONTROL GROUP ONE

Participant Identification	Pre-test Score	Post-test Score
1	46	43
2	57	55
3	71	80
4	62	61
5	66	68
6	60	61
7	55	53
8	65	67
9	70	67
10	51	55
11	61	62
12	67	71
13	69	76
14	68	69
15	66	65
16	64	66
17	58	64
18	58	54

APPENDIX J

CONTROL GROUP TWO POST-TEST SCORES

POST-TEST SCORES ON THE CATES FOR
CONTROL GROUP TWO

Participant Identification	Post-test Score
19	63
20	51
21	64
22	55
23	59
24	68
25	59
26	71
27	71
28	75
29	64
30	85
31	51
32	58
33	62
34	80
35	73
36	88
37	69
38	67

VITA

Jennifer Lane Spielmann

Candidate for the Degree of

Master of Science

Thesis: EFFECTS OF ENVIRONMENTAL CURRICULUM ON THE ENVIRONMENTAL ATTITUDES OF SEVENTH GRADERS

Major Field: Environmental Science

Biographical:

Personal Data: Born in Tulsa, Oklahoma, on February 4, 1971, the daughter of Richard Ray and Sally Lane.

Education: Graduated from Bishop Kelley, Tulsa, Oklahoma in May 1989; received Bachelor of Science in Education from the University of Oklahoma in May 1994. Completed requirements for Master of Science degree in July 1998.

Experience: Science teacher, Union Public Schools (1994 – present).

Professional Memberships: National Science Teachers Association, Oklahoma Science Teachers Association.