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THE EFFECT OF A STUDENT MANUAL ON THE ATTITUDES
OF HIGH SCHOOL STUDENTS TOWARD
ENVIRONMENTAL PROTECTION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

by

David Lynn Howell, B.S., M.Ed.

* * * * * * *

The Ohio State University

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CHAPTER I

INTRODUCTION

The public in the United States recently became aware of the deterioration of their environment. Also, the public began to realize that pollution of air, land, and water was not only unhealthy, but to some extent unnecessary. In the past only a few scientists and conservationists had been concerned with man's management of the environment, but this concern quickly became a national obsession in the late 1960's and early 1970's.

The first emotional outcries gave way to environmental programs conducted by responsible groups of citizens, educators, and government officials. These groups not only studied the problems caused by pollution, but also investigated new problems which the alternative solutions to the existing problems might create. To complement these programs, educational information is needed to make the public aware of 1) environmental problems and 2) the responsibilities of governmental agencies, industries, and individual citizens in correcting and limiting environmental pollution. In the past, the "... educational curricula have not discussed man's relationship to his total environment in terms of energy flow, values, cultural, social, political, legal, and long-range quality impli-
Man's interrelationship with his environment has been of little concern in the school curriculum. Positive attitudes and concerns toward the protection of the environment have not been developed in students, thus creating gaps in the students' educational background.

These educational gaps have resulted in a nation of socio-ecologic illiterates committing an unending series of ecological atrocities with little thought of long-term effect. Furthermore, these gaps have contributed to an almost total lack of communication among society's present decision-makers and insufficient pressure from the public for broad environmental action programs.

Schoenfeld added that existing problems which limited the development of a successful national direction of environmental education for grades K - 12 included 1) lack of existing programs that focused on environmental education, 2) lack of well-conceived instructional material directed toward environmental education, 3) lack of the textbook orientation to environmental education, and 4) lack of concern by citizens for environmental education.

Due to the lack of environmental education programs it is understandable that people are wasteful with their natural resources since they are unaware of how limited these natural resources really are.

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2 Ibid.

3 Ibid.
are. An awareness of environmental problems is also lacking in many of the workers in occupations which deal directly with the protection of the environment. It was pointed out by members of the Advisory Council for The Environmental Studies Project that many workers in the larger wastewater treatment plants had a very poor attitude toward their occupation.

An environmental education course should be offered in the schools. Many students are concerned about the environmental situation, but are unable to see how they are a part of the problem or how they could help in finding solutions. The course in environmental protection would, therefore, have as one objective the improvement of attitudes of the students toward the protection of the environment. Also, training programs for individuals entering occupations relating to the protection of the environment should emphasize how these occupations are important to the protection of the environment. The training programs in the past have emphasized skill development with little emphasis on the development of favorable attitudes toward the protection of the environment.

The personnel of the Agricultural Education Curriculum Materials Service at The Ohio State University developed instructional materials to be used in training eleventh - and twelfth -

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4Thomas W. Cooper, Sewage Treatment Plant Coordinator, Columbus, Ohio, personal interview, August 27, 1971.

5The Environmental Studies Project, The Ohio Agricultural Education Curriculum Materials Service, Minutes of Meetings of the Advisory Council, meeting of June 28, 1971. (Mimeographed.)
grade high school students for employment in the areas of water treatment, wastewater treatment and air pollution. An introductory unit was included as a part of the training program to provide students with a knowledge of some of the existing environmental problems and their possible solutions as well as the impact that an individual could have on the environment. This introductory unit, *Introduction to Environmental Protection*, was a student manual that could also be used separately in other high school courses.

It was this student manual, *Introduction to Environmental Protection*, which was evaluated in terms of its effectiveness in developing students' attitudes toward the protection of the environment. Three groups of high school students participated in the study. Group one consisted of high school students enrolled in vocational environmental management courses for training in the occupations of water treatment operators, wastewater operators, and air pollution control inspectors. Group two consisted of high school students enrolled in vocational agriculture courses which included an instructional unit on the protection of the environment. The third group was high school students enrolled in science courses that included an instructional unit on the protection of the environment.

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Statement of the Problem

The major purpose of this study was to evaluate the effectiveness of the student manual, Introduction to Environmental Protection, as a student reference in terms of its influence in developing students' attitudes toward the protection of the environment. A comparison was made between students in classes using the student manual, Introduction to Environmental Protection, and students in classes not using the student manual for the course in environmental protection. This comparison between classes using and not using the student manual was made with the following groups of high school students: Those enrolled in vocational agriculture courses and those enrolled in science courses. A comparison was also made of vocational environmental management courses, all of whom received the student manual, with the vocational agriculture and science courses that received the student manual.

A subsidiary purpose was to investigate the relationships between other independent variables and the students' mean posttest attitude inventory scores. The relationships between the students' mean posttest attitude inventory scores and the following assigned independent variables were tested: 1) the number of professional environmental education courses completed by the instructor, 2) the time (weeks) devoted to teaching the environmental protection unit, 3) the number of films shown in teaching the environmental protection unit, and 4) the number of experiments instructors used in teaching.
the unit. The students' mean posttest attitude inventory scores were used as the dependent variable and its relationship was tested with that of the students' occupational choice.

Need for the Study

Pollution became a major concern of government and citizens in the United States in the late 1960's and early 1970's. The types of pollution most talked about included air pollution, noise pollution, water pollution, solid waste management, desecration of the landscape, and population problems. President Richard M. Nixon expressed this concern in his State of the Union Message in 1970 when he said: "The great question of the 70's is, Shall we surrender to our surroundings or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, to our land, to water?"^7

One approach to the problem of pollution is through education. The point was made in the June 28, 1971 minutes of The Environmental Studies Project Advisory Council that "A general environmental program should be offered to students in grades 11 - 12 for an appreciation of the pollution problem."^8 The purpose of such a course is to provide a

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^8The Environmental Studies Project, The Ohio Agricultural Education Curriculum Materials Service, Minutes of Meetings of the Advisory Council, meeting of June 28, 1971. (Mimeographed.)
rational basis for people to use in finding solutions to problems in the environmental area.

To insure the effectiveness of such a program an attempt should be made to evaluate the success of materials used in instruction. As Ridenour pointed out:

The effectiveness of educational materials in the teaching-learning process will be unknown until the materials have been tried in the classroom and evaluated in terms of whether or not they have brought about the behavioral changes in students that were specified in the educational objectives.  

However, students learn from many sources other than from educational materials in the classroom and educators must be aware of the learning which occurs outside the classroom. Knapp, in a discussion of environmental education, states that educators must be cognizant of the fact:

... that students also learn about the environment from sources outside the school. Television, printed materials, and family and friends influence environmental attitudes. Teachers should be familiar with the world of the student outside the classroom...  
Even though forces outside the school influence attitudes and values about the environment, Hess and Torney conclude that the 'public school appears to

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be the most important and effective instrument of political socialization in the U.S.\textsuperscript{11}

Urbanic\textsuperscript{12} suggested that a significant difference in student learning is not shown many times because the effect of extraneous variables is not measured. It is important, therefore, that in the evaluation of instructional materials that specific extraneous variables be considered and controlled. Using this rationale, this study was not limited to measuring the effect of the teaching materials on the students' attitudes. Other assigned independent variables which were investigated included the professional environmental education courses completed by the instructors, the time (weeks) devoted to teaching the unit, the number of films shown while teaching the environmental protection unit, the number of experiments instructors used in teaching the unit, and the students' choice of occupation.

A review of the literature indicated the need for the development of educational materials for the teaching of attitudes toward the protection of the environment. These positive attitudes toward the environment are not only needed by those entering occupations in the area of environmental management, but also by all students. The


literature also indicated a shortage of meaningful evaluation studies in the affective domain. Evaluation is going on daily in the classroom where teachers are alert to evidence of student interest, desirable attitudes, and character development. "What is missing is a systematic effort to collect evidence of growth in affective objectives which is in any way parallel to the very great and systematic efforts to evaluate cognitive achievement."\textsuperscript{13}

Knapp found that:

\textldots Few studies have examined the attitudes of elementary and high school students toward their environment. More studies have explored the attitudes of college students and adults, but knowledge of this population is of limited value in planning for environmental education in the public schools. Better attitude measurement instruments are critically needed for elementary and secondary school students.\textsuperscript{14}

It is apparent that a program is needed to improve attitudes of students toward the protection of the environment so that they can make better use of and protect our natural resources. An evaluation of such a program is necessary to ascertain its effectiveness in developing positive student attitudes. The purpose was to provide those students who would be working in the field of environmental protection a greater appreciation for the work which they would


\textsuperscript{14}Knapp, "Attitudes and Values in Environmental Education," p. 28.
be performing. Those students not entering this area of work also need to understand environmental problems and how they as individuals can have an influence on possible solutions. Today's high school students will soon be active voters helping to make decisions which effect the environment. They must be able to make responsible decisions that will effect many generations in the future.

Related Research

The development of environmental protection education programs

A review of available research showed that the type of environmental protection education needed in the United States today is not the same as that which had been offered in the past. Schoenfeld stated:

Environmental management is NOT simply contour plowing, whitetail deer management, and life cycles of plants. That is, it is not the narrow focus traditionally labeled conservation. Instead, environmental management is of the broadest scope in that it requires an understanding of man and his total relationship to his environment.15

This, then, changed environmental protection education from simply the study of nature to the study of the interrelationship of man with his environment.

Dana16 stated that programs in environmental education should

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equip people for satisfying lives in the "total environment." These programs are lacking in most school curriculums and where available are in the experimental stage, according to Dana. Both Schoenfeld and Dana are saying that the environmental protection education programs which are needed are new programs with a different emphasis and, therefore, require new teaching materials for their instruction.

Stapp\(^{17}\) described how new materials for teaching environmental protection could have their greatest effect. The greatest change in students can come through motivating the emotional concern of the students by affecting the students' attitudes.

.... For environmental education to achieve its greatest impact, it must: 1) provide factual information which will lead to understanding of the total biophysical environment; 2) develop a concern for environmental quality which will motivate citizens to work towards solutions to biophysical environment problems; and 3) inform citizens as to how they can play an effective role in achieving the goals derived from their attitudes.\(^{18}\)

From this one may conclude that a change in attitudes should be the objective of an educational program in environmental protection.

Attitude development through instructional programs

Few studies had been conducted to evaluate instructional


programs from the standpoint of the affective domain. Krathwohl, Bloom, and Masia stated:

When we looked for evaluation material in the affective domain we found it usually in relation to some national educational research project or a sponsored local research project (for which a report had to be written). Only rarely did we find an effective evaluation technique used because a group of local teachers wanted to know whether students were developing in a particular way. It was evident that evaluation work for affective objectives was marginal and was done only when a very pressing question was raised by the faculty or when someone wished to do 'educational' research.\(^{19}\)

Jacob\(^{20}\) compiled the results of a number of evaluations on attainment of affective objectives in an effort to determine if attitudes of students were changed by college courses. He was specifically interested in determining the influence of various types of social science instruction upon students' value patterns. Jacob made a selective survey of programs of instruction to locate those programs thought to be important in affecting student values. Thirty institutions were visited to observe and evaluate courses and curricula. The findings of the study showed "... no specific curricular pattern of general education, no model syllabus for a basic social science course, no pedigree of instruction and no wizardry of instructional method which would be patented for its

\(^{19}\)Krathwohl, *Taxonomy of Educational Objectives*, p. 15.

impact on the values of students." The limitations of this study present some question as to the reliability of the results. Jacob stated that more complete, representative, and comparable data were needed which suggests that generalizations should not be made from the data to other populations.

A study of similar nature was completed by Hoover and Schutz which showed an attitude change as a result of an introductory education course. The study was an effort to alter attitudes by emphasizing recognition and evaluation of basic assumptions. Seventy-five college students were used in the study, all of whom were enrolled in their first professional education course. A semantic differential instrument was used with a one group pretest-posttest design. The results showed significant gains at the .05 level in ten of the thirteen concepts tested. The limitations of this study include the fact that randomization was not used in selecting the sample. The study did not include a control group and since the sample was limited to two classes of students enrolled in education, the data cannot be generalized to include all college students. The results of the study are in contrast with what Jacob found and strongly suggest the need for further study of the effect of educational programs on attitudes.

21 Jacob, Changing Values in College, p. 11.

A resource unit was developed by Herr23 as the nucleus of the instructional material used in an agriculture program in elementary schools in Pennsylvania. Tests were given to the students before and after the implementation of the program which included a semantic differential attitude test. Findings of the study showed that pupils taught by homeroom teachers using the resource unit had significantly higher adjusted mean scores for five of the eight attitude concepts when compared to pupils who were taught by the homeroom teacher who did not have a resource unit. Herr also found that students completing the agricultural program had significantly higher scores from pretest to posttest on the attitude concepts than the students who did not participate in the program.

A portion of the study, Evaluation of Man and Culture, by Gardner and associates24 was an investigation of feelings, attitudes, and values by use of a Values Test designed to determine if students changed their point of view during the time they were taking the course. The test used sixty-three statements to which the students responded on a five point scale ranging from "strongly agree" to


"strongly disagree." Changes in the attitudes of students were determined by comparing the pre- and posttest patterns.

While the "Man and Culture" course is not designed to teach attitudes toward specific social issues, aspects of the course are intended to encourage students to develop certain general "human" values and to adopt a "social science" posture toward data. Thus, students are not told what their attitudes toward minorities must be, for example, but they are encouraged to believe in concepts like "equality of opportunity" and to accept cautiously and critically the conclusions of social scientists regarding the causes of certain types of behavior by minority group members. The course, then, could be seen as encouraging certain types of general value positions.25

Comparisons were made in this study between the experimental and control groups from the pretest to the posttest. Chi-square was used as a method of analysis and showed the treatment groups to differ significantly on twenty-nine of the sixty-three statements from the test. Examination of the frequency distribution of the responses showed the direction of change was toward the position supported by the experimental group in twenty-eight of the twenty-nine statements that showed significant difference. The researchers concluded that:

Since legitimate questions were raised regarding the validity of the Values Test, one cannot conclude that the course alters the value system of those who study it. However, the magnitude of the difference between E [experimental] and C [control] classes on this measure again demonstrate the powerful effects of the course, even though the test may have measured cognitive rather than effective learning.26


Knapp states that a change in behavior precedes a change in attitudes. "This method suggests that direct involvement in action projects results in changes of attitudes. For example, if students become involved in cleaning up the refuse along a river, their attitudes may change from indifference toward the problem to a concern for preserving the scenic beauty along the river." 27

Marans, Driver, and Scott 28 did an evaluation of the Youth Conservation Corps which did involve students in action projects. The program of the Corps had the objectives of changing attitudes, knowledge, and behavior of the youth who participated. The program consisted of fifty residential and fourteen non-residential camps which ranged in duration from four to twelve weeks in length. In theory, the Corps members were to be exposed to a program which integrated the environmental education program with the work activities. However, in practice there were only a few cases where this integration was achieved. The findings of the study showed that most Corps members were greatly concerned about the environment on entering the program. This was shown in a pretest of the Corps members' attitudes toward problems of the nation, their attitudes toward environmental problems, and their choice of a career. At the completion of the program,


little change was found in the Corps members' attitudes concerning environmental problems or future career plans. This finding may be explained by the fact that many of these students were selected to participate in the Corps program because of their major concern for the environment. Since the members scored so high on the pretest, there was little room for further improvement on the posttest.

Asche\textsuperscript{29} conducted a study to develop an attitude scale based on fundamental environmental concepts and designed to measure attitudes of students toward the environment. Using the Kuder-Richardson formula to determine the internal consistency of the scale, Asche found the correlation coefficient to be .98. With the test-retest method a correlation coefficient of .66 was found, and the split-half method resulted in a correlation coefficient of .67.

A pretest-posttest control group design was used by Asche. Eighteen classes were randomly selected for the study and assigned at random to treatment and control groups within the areas of vocational and non-vocalional classes. Students were then randomly selected from each of the classes. The treatment consisted of an introductory unit in environmental education which was used for a period of seven days by the instructors. A pretest was given to all students before the unit was begun and they were again tested upon completion of the unit. No significant differences were found in gain

\textsuperscript{29}Wayne E. Asche, "The Development and Testing of an Environmental Attitude Scale" (unpublished Ph.D. dissertation, Purdue University, 1972).
scores between the experimental and control groups of either the vocational or the non-vocational courses.

Asche recommended that studies similar to his be conducted. He also suggested that projects for curriculum development in secondary schools use the Environmental Attitude Scale, which he developed, as an aid in determining student attitudes toward environmental concepts. He recommended, however, that a longer period of time be allowed between the pretest and the posttest.\(^{30}\)

**Summary**

A review of the literature indicates that research is needed to identify the attitudes of students toward their environment. The effectiveness of educational materials must also be evaluated to determine if they produce the desired behavioral changes in students as specified in the educational objectives. This then provides the rationale for evaluating the student manual, *Introduction to Environmental Protection*, using an attitude inventory.

Few investigators conducting evaluations of instructional materials have found significant differences in student learning as a result of the use of specific instructional materials. Brown stated that: "Instructional materials are evidently not powerful enough in themselves to produce a statistically detectable change in

More powerful experimental variables must, therefore, be found. Urbanic\textsuperscript{32} considered the number of professional education courses completed by the instructors when considering the students' success in achieving the course objectives as measured by the objective test scores. Urbanic found a significant relationship did exist. These findings provided the rationale for monitoring the number of professional environmental education courses completed by the instructors.

A second variable which was monitored was the time the instructor spent in teaching the unit. Since this variable was not controlled by the writer it was determined that it was necessary to learn if it did have an effect on the success of students in changing their attitudes toward the protection of the environment. Urbanic\textsuperscript{33} found the amount of time students spent in the classroom had a positive relationship to their objective test score.

A third variable was that of the number of films shown to the students in teaching the environmental protection unit. This variable was monitored because it was considered to be another possible tool in effecting student attitudes.


\textsuperscript{32}Urbanic, "Effectiveness of the Use of a Student Reference," p. 59.

\textsuperscript{33}Urbanic, "Effectiveness of the Use of a Student Reference," p. 62.
A fourth variable considered was that of the number of experiments instructors used in teaching the unit. Knapp\textsuperscript{34} stated that it was direct involvement in projects which required action on the part of the student which resulted in attitude changes. This then provided the rationale for including as a variable the number of experiments which instructors used in teaching the unit.

A fifth variable was that of the students' occupational choice. Urbanic's study provides some support for the inclusion of this variable when he states "... the results of the data indicated that previous horticulture related work experience may help to improve a student's performance in the subject matter relating to the type of job in which he is employed."\textsuperscript{35} The correlation found between related work experience and the student test score was .397, not significant, but Urbanic suggests it is high enough to warrant consideration.

**Hypotheses**

The following research hypotheses were developed for the study:

**Hypothesis 1.** Students taught environmental protection using the student manual, *Introduction to Environmental Protection*, will

\textsuperscript{34}Knapp, "Attitudes and Values in Environmental Education," p. 28.

\textsuperscript{35}Urbanic, "Effectiveness of the Use of a Student Reference," p. 61.
have significantly higher posttest attitude scores than students taught environmental protection without the use of the student manual. Hypothesis 2. There will be no differences in the posttest attitude inventory scores of students using the student manual, *Introduction to Environmental Protection*, who are enrolled in classes of vocational environmental management, vocational agriculture, and science.

Hypothesis 3. There is a positive relationship between students' posttest attitude inventory scores and the number of professional environmental education courses completed by the instructor.

Hypothesis 4. There is a positive relationship between students' posttest attitude inventory scores and the time devoted to teaching the environmental protection unit.

Hypothesis 5. There is a positive relationship between students' posttest attitude inventory scores and the number of films shown in teaching the environmental protection unit.

Hypothesis 6. There is a positive relationship between students' posttest attitude inventory scores and the number of experiments instructors used in teaching the environmental protection unit.

Hypothesis 7. Students choosing occupations in environmental management will have higher posttest attitude inventory scores than those students who choose other occupations.
Limitations of the Study

The writer recognized the following limitations in conducting this study:

1. The instructors included in the study were those who were teaching a unit in environmental protection during the fall of the school year. Teachers who were teaching a unit in the spring were not included in this study.

2. There was no training session for the instructors in which the intended use of the student manual, Introduction to Environmental Protection, could be demonstrated.

3. There was a short time period for the instructors to prepare their lesson plans after receiving the student manual, Introduction to Environmental Protection.

4. Few instructors had time to gather the laboratory materials needed for the student activities.

Definition of Terms

For a better understanding of this study, the underlined terms are defined as follows:

**Attitude:** An affective objective which emphasizes "... a feeling tone, an emotion, or a degree of acceptance or rejection."36

**Environmental Protection Unit:** A course unit designed to effect the attitudes of students toward the protection of the environment.

36Krathwohl, Taxonomy of Educational Objectives, p. 7.
The unit considers the environmental problems and how the student can help find possible solutions.

**Vocational Agriculture Course:** A course designed to prepare students to enter careers related to agriculture which may include a unit concerned with the protection of the environment.

**Science Course:** A general course offered to high school students which may include a unit concerned with the protection of the environment.

**Introductory Course in Vocational Environmental Management:** A two year vocational course designed to prepare students for occupations in environmental management such as water treatment operators, wastewater treatment operators, and air pollution control inspectors. The environmental protection unit is used during the first semester of the training program as an introduction to environmental management.
CHAPTER II

DESIGN OF THE STUDY

This study was designed to assess the effectiveness of the student manual, *Introduction to Environmental Protection*, designed for use with a unit of instruction having the major objective of improving the attitudes of students toward the environment. The study was conducted in high schools with courses in the following areas: vocational environmental management, vocational agriculture, and science. Each of these courses included a unit in environmental protection as a part of the curriculum. It was the high school students enrolled in these three types of courses in the state of Ohio that comprise the target population of this study. Since it was impossible to assign students to levels of treatment, intact classes were randomly assigned to levels of treatment.

Population and Sample

The vocational environmental management courses were taught in two schools in Ohio during 1972-1973: Washington Park Horticulture Center in Cleveland and Montgomery Area Vocational Center in Clayton. The entire population of students enrolled in the vocational environmental management courses was used in this study.
A sampling procedure was used with the vocational agriculture and the science courses. The procedure of sampling was as follows. In identifying the target population of students enrolled in the vocational agriculture courses in the state of Ohio, letters were sent to all the instructors in the 321 vocational agriculture departments in the state asking if they taught an instructional unit concerned with the protection of the environment. Self-addressed postcards were enclosed for the benefit of the instructors (Appendix A). There were 193 or 60 percent of the instructors in the vocational agriculture departments who returned the postcards. Of those postcards returned, 144 instructors indicated that they would not be teaching an environmental protection unit in the fall of 1972; forty-nine instructors answered that they did plan to teach such a unit in the fall of 1972. It was from the affirmative replies that a frame was developed from which a random sample of twenty schools was selected.

There were two levels of treatment used in the experiment: 1) classes where instructors used the student manual, *Introduction to Environmental Protection*, and 2) classes where instructors did not use the student manual. Instructors in twenty schools, which had been randomly drawn using a table of random numbers, agreed to participate in the study thus representing the population of vocational agriculture classes (Appendix B). Seventeen of the classes (eight experimental and nine control) completed the experiment. Of those instructors using the student manual, one did not receive the materials
in the mail and one used a different class for the posttest than he had used for the pretest. In the control group, one instructor did not send in the posttests in time to be included in the analysis.

For the identification of the target population of students enrolled in science courses, the vocational agriculture instructors were asked to identify science instructors in their schools. Vocational agriculture instructors were sent 321 postcards to give to science instructors. Ninety-nine science instructors returned cards. Of the ninety-nine replies, fifty-two instructors answered that they were not teaching a unit in environmental protection: forty-seven instructors answered that they would be teaching an environmental protection unit in the fall of 1972. From those science instructors thus identified, sixteen instructors, which had been randomly drawn using a table of random numbers, agreed to participate in the study (Appendix B).

Again by randomization, eight of those classes were assigned to use the student manual, *Introduction to Environmental Protection*, and eight classes were assigned to the control group. Six of the classes using the student manual completed the experiment. One instructor dropped because of illness, another found the fall schedule to be too busy. All of the classes assigned to the control group completed the experiment.

Schools which had both a science class and a vocational agriculture class selected for the study received the same level of treatment. The level of treatment for a science class in a school
with a vocational agriculture class (both selected to participate in the study) was determined by the level of treatment which was randomly assigned to the vocational agriculture class. This happened in only one instance. All other science classes which were participating in the study had their treatment level randomly assigned.

A total of thirty-three classes completed the study and they varied in the amount of time devoted to the unit of instruction from a period of six weeks, one hour per day to ten weeks, four hours per day. The amount of teaching time was monitored to determine its relationship to the attitudes of students.

The agriculture and science instructors selected for the sample who did not wish to participate in the study were planning to teach the unit in the spring of the year, had already started their unit, or there was a change in the teaching staff during the summer. The sample was determined to be representative of vocational agriculture students in the state of Ohio and of science students from schools with vocational agriculture departments in the state of Ohio, all of whom were enrolled in classes with instructors planning to teach a unit on environmental protection during the fall of 1972.

Development of the Student Reference

The Ohio Agricultural Education Curriculum Materials Service has developed a wide variety of curriculum materials for vocational agriculture instructors. In June of 1971 the State Department of Education, Division of Vocational Education, requested that the Ohio
Agricultural Education Curriculum Materials Service prepare units of instruction for the training of high school students for occupations related to environmental protection.

In June, 1971, the writer began work on the Doctor of Philosophy Degree and also took a position as a research associate with the Ohio Agricultural Education Curriculum Materials Service at The Ohio State University. Along with two other research associates, the writer was given the responsibility of locating or developing student references to be used in preparing students for occupations in the area of environmental protection. Two of the resulting publications were *Introduction to Environmental Protection*¹ and *Occupational Opportunities in Environmental Management*.² The student manual, *Introduction to Environmental Protection*, was developed to help high school students understand the problems that man has created for his environment. By providing suggested laboratory experiments and field trips, it was hoped that the student would become involved to the point where he could decide if there was an occupation in the area of environmental protection that interested him. Another objective of the student manual was that by making the student aware


of environmental problems, he would develop a more favorable attitude toward the protection of the environment. If the student did select an occupation in environmental protection he would then be performing his job for more than just the money which he would receive. It was also hoped that a more favorable attitude could be developed in students with interests in other occupations through the use of this student manual and the suggested student activities.

The student manual included eight topics, each with suggested references to allow interested students to learn more about a particular topic. Two thousand copies of the reference were released for sale to interested instructors by the Ohio Agricultural Education Curriculum Materials Service in January, 1973.

The Design

There were two different designs used in this study. The design used with the vocational agriculture and science courses will be considered first. The design was a true experimental design using a modified form of the "Solomon Four-Group Design." The design used subgroups of intact classes of vocational agriculture and science students as the sampling unit and the experimental unit was randomly assigned to treatment levels. This is shown diagrammatically as follows:

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These symbols are defined as:

- \( X \) represents the exposure of a group to an experimental variable, the effects of which are to be measured.
- \( X_1 \) the student manual, *Introduction to Environmental Protection*.
- \( X_2 \) non-use of the student manual, *Introduction to Environmental Protection*.
- \( O \) refers to the process of measurement.
- \( O_1, O_4 \) pretest to determine attitudes of students before the treatment.
- \( O_2, O_3 \) posttest to determine attitudes of students as a result of treatments.
- \( R^1 \) indicates random assignment of intact classes to treatment levels.
- \( R \) indicates random assignment of students within intact classes to pretest-posttest and posttest-only subgroups.

A modification of the Solomon Four-Group Design was the use of random division of intact classes to provide two subgroups within each intact class. A non-relevant pretest and the true pretest were randomly assigned to the subgroups in each intact class.

One of the active independent variables was the type of instructional materials used. There were two levels of this factor: (\( X_1 \)) student manual, *Introduction to Environmental Protection*, and
(X^2) non-use of the student manual, *Introduction to Environmental Protection*. Another active independent variable was the pretest-posttest and posttest-only variable.

In addition to the two active independent variables, five assigned independent variables were measured to determine their relationship to the attitudes of students. These assigned independent variables were the number of professional environmental education courses completed by the instructor, the time (weeks) used to teach the unit, the number of films used, the number of experiments instructors used in teaching the unit, and the students' choice of occupation (environmental management, other, and undecided).

The dependent variable was the mean score on the posttest of subgroups within intact classes. The posttest consisted of an attitude inventory designed to measure the students' attitudes toward the protection of the environment. This posttest was given at the completion of the instructional unit with a suggested minimum class time of six weeks.

A quasi-experimental design was used for the vocational environmental management classes since the number of classes was insufficient to warrant more than one level of treatment. A "Separate-Sample Pretest-Posttest Design" was used. This is shown diagrammatically as follows:

\[ \text{Campbell and Stanley, Experimental and Quasi-Experimental Designs for Research, p. 40.} \]
These symbols are defined as:

\[ X_1 \] represents the student manual, *Introduction to Environmental Protection*, as a part of the course in vocational environmental management.

\[ O_1 \] represents the pretest to determine attitudes of students before the treatment.

\[ O_2 \] represents the posttest to determine attitudes of students as a result of treatments.

\[ R \] indicates random assignment of students to pretest-posttest and posttest-only subgroups within intact classes.

The treatment which all of the vocational environmental management classes received was \((X_1)\) the student manual, *Introduction to Environmental Protection*. The pretest-posttest and posttest-only independent variable was randomly assigned to subgroups within intact classes. The same five assigned independent variables measured with the true experimental design were also monitored with this design.

The dependent variable again was the mean score on the posttest of subgroups within intact classes. The same attitude inventory was used as with the vocational agriculture and science classes. This posttest was given at the completion of the instructional unit which for the vocational environmental management classes required ten weeks of four hours per day of class time.

**Data and Instrumentation**

The instrument used to quantify the dependent variable was a
Likert-type scale to measure students' attitudes toward environmental protection. The attitude inventory was developed by first writing fifty attitude statements and submitting them to a jury of ten persons composed of graduate students and faculty members in the Department of Agricultural Education at The Ohio State University. They were asked to rate each statement as being favorable or unfavorable toward the environment. Only those attitude statements which received 90 percent or better agreement among the jury were selected. This resulted in a reduction of the original fifty statements to thirty-six attitude statements, each identified as favorable or unfavorable toward the environment.

The attitude inventory was then field tested with four vocational environmental management classes totaling fifty-four high school students. The students were asked to rate their opinion on each attitude statement on the Likert-type scale. The responses were: SA -- strongly agree, A -- agree, U -- undecided, D -- disagree, SD -- strongly disagree.

After the field test, the data were coded and tests for item discrimination and reliability were made with the use of the 360 computer. The test for item discrimination was an inter-correlation Pearson product-moment in which each item was correlated with the student's total score. This allowed selection of the twenty items that had responses which were most highly correlated with total score. The range of correlation coefficients was .61 to .38. To test the reliability of the instrument, an internal consistency analysis
was made. The program used the method developed by Kuder and Richardson. All items in the attitude inventory and the total reliability of the test must be .30 or higher to be acceptable. The item analysis showed the twenty attitude statements to have .65 to .37 as coefficients of internal consistency. All of the items were, therefore, acceptable. The coefficient of internal consistency for the total test reliability was .87.

The attitude inventory was used both as a pretest and as a posttest (Appendix C). As a pretest, it was administered by the regular classroom instructor to one-half of the class by random assignment just before the environmental protection instructional unit was begun. The only directions which the instructor was to provide the students was that: "This is not a test, you [the students] are to read each statement carefully and circle: SA -- if you strongly agree, A -- if you agree, U -- if you are undecided, D -- if you disagree, SD -- if you strongly disagree. Remember, there are no right or wrong answers for these statements." (Appendix E). The students were not told about the experiment in any way. The posttest was given in the same manner when the environmental protection unit was completed, but this time to all of the students in the class (Appendix F). On the attitude inventory, the students were asked to

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5The formula used was based on Kuder and Richardson's equation 3 for scale reliability. Joyce Johnson and June McCabe, "Item Analysis," Data Center, College of Administrative Science, The Ohio State University. (Mimeographed.)
provide names and present choice of occupations (Appendix C).

In order to control the threat of testing to the internal validity of the study, two levels of equivalence (achieved by random assignment) were established within each class unit. This allowed separate pretest-posttest and posttest-only subgroups to be made within each intact class. The randomization of the assignment to separate pretest-posttest and posttest-only subgroups was accomplished by using two different attitude tests on the pretest. The two tests were alternated before sending them to the instructors. Both tests had the same cover page and consisted of twenty attitude statements, but one was concerned with environmental protection and the other was concerned with hunter safety. The students who received the environmental protection attitude inventory were in the pretest-posttest subgroup. By using this design, the effect of testing could be measured while half of the students in a class would not feel they were being treated differently by not receiving a pretest.

Additional data were collected from instructors to monitor the way in which the unit was taught. The instructors were asked their name, the number of professional environmental education courses completed, the number of films shown while teaching the unit, the number of weeks devoted to teaching the unit, and the number of experiments in which the students engaged (Appendix C).  

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Analysis

The analysis design for testing hypothesis 1 is indicated in Table 1. The unit of analysis was subgroups of intact classes, which were randomly assigned to the two treatment levels. A three-way analysis of variance (2 x 2 x 2) was used to test hypothesis 1. The independent variables were the type of class (2 levels), the treatment (2 levels) and whether pretest-posttest or posttest-only (2 levels). The dependent variable was subgroup scores within intact classes on the posttest attitude inventory.

TABLE 1
ANALYSIS DESIGN FOR HYPOTHESIS 1

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Vocational Classes (A₁)</th>
<th>Agricultural Classes (A₂)</th>
<th>Science Classes (A₃)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest (C₁)</td>
<td>No Pretest (C₂)</td>
<td>Pretest (C₁)</td>
</tr>
<tr>
<td>X₁</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Manual (B₁)</td>
<td>S₁</td>
<td>S₁</td>
<td>S₁₈</td>
</tr>
<tr>
<td></td>
<td>S₂</td>
<td>S₂</td>
<td>S₁₉</td>
</tr>
<tr>
<td></td>
<td>S₃</td>
<td>S₃</td>
<td>S₂₀</td>
</tr>
<tr>
<td></td>
<td>S₄</td>
<td>S₄</td>
<td>S₂₁</td>
</tr>
<tr>
<td></td>
<td>S₅</td>
<td>S₅</td>
<td>S₂₂</td>
</tr>
<tr>
<td></td>
<td>S₆</td>
<td>S₆</td>
<td>S₂₃</td>
</tr>
<tr>
<td></td>
<td>S₇</td>
<td>S₇</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S₈</td>
<td>S₈</td>
<td></td>
</tr>
<tr>
<td>X₂</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Instructional Materials (B₂)</td>
<td>S₉</td>
<td>S₉</td>
<td>S₂₄</td>
</tr>
<tr>
<td></td>
<td>S₁₀</td>
<td>S₁₀</td>
<td>S₂₅</td>
</tr>
<tr>
<td></td>
<td>S₁₁</td>
<td>S₁₁</td>
<td>S₂₆</td>
</tr>
<tr>
<td></td>
<td>S₁₂</td>
<td>S₁₂</td>
<td>S₂₇</td>
</tr>
<tr>
<td></td>
<td>S₁₃</td>
<td>S₁₃</td>
<td>S₂₈</td>
</tr>
<tr>
<td></td>
<td>S₁₄</td>
<td>S₁₄</td>
<td>S₂₉</td>
</tr>
<tr>
<td></td>
<td>S₁₅</td>
<td>S₁₅</td>
<td>S₃₀</td>
</tr>
<tr>
<td></td>
<td>S₁₆</td>
<td>S₁₆</td>
<td>S₃₁</td>
</tr>
<tr>
<td></td>
<td>S₁₇</td>
<td>S₁₇</td>
<td></td>
</tr>
</tbody>
</table>
In testing hypothesis 2, the unit of analysis was the mean posttest attitude inventory score of intact classes which received the experimental treatment. A one-way analysis of variance was used to compare mean posttest scores achieved by courses in vocational environmental management, vocational agriculture, and science. A two-way analysis of variance was used to compare pretest scores of vocational agriculture and science courses and the experimental and control groups. The posttest scores and the gain scores of students in this phase of the experiment were compared with similar analysis of the data yielded by the experimental phase of the project (hypothesis 1).

Product-moment correlation coefficients were calculated for testing the relationships in hypotheses 3, 4, 5, and 6. Chi square was used as a test for homogeneity in hypothesis 7. A post hoc procedure was used to locate the sources of rejection of the null hypothesis after the results of the chi square test were shown to be significant.
CHAPTER III

PRESENTATION AND DISCUSSION OF DATA

This study was designed to determine the effectiveness of a student manual, Introduction to Environmental Protection, in changing student attitudes toward the protection of the environment. Vocational agriculture instructors, vocational environmental management instructors, and science instructors in Ohio high schools taught a unit dealing with the protection of the environment. The experimental group of instructors used the student manual, Introduction to Environmental Protection, while the control group did not have the use of the student manual. Selected characteristics of instructors and students were investigated to determine their relationship to the dependent variable, the students' posttest attitude inventory scores. Each of the research hypotheses was stated in the omnibus null form for purposes of testing and all tests were run at the .05 level of significance.

Comparison of Control and Experimental Groups on Pretest

As stated in Chapter II, intact classes of science and vocational agriculture students were randomly assigned to experimental and control groups using a table of random numbers. A comparison was made to determine if random assignment of vocational agriculture
and science classes to experimental and control groups did result in an equivalence of the experimental and control groups on the pretest scores. The pretest scores represent one-half of the students from each class, vocational agriculture and science, who were selected at random to receive the pretest. A computer program for multivariate analysis of variance\(^1\) was used to determine if differences existed between the vocational agriculture and science classes and the experimental and control groups. Tables 2 and 3 present the means and standard deviations and Table 4 presents the analysis of variance data.

### TABLE 2

**PRETEST MEANS AND STANDARD DEVIATIONS BY CLASS AND TREATMENT**

<table>
<thead>
<tr>
<th>Class and Treatment</th>
<th>Vocational Agriculture</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>No. of Classes</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Means</td>
<td>72.58</td>
<td>73.44</td>
</tr>
<tr>
<td>SD's</td>
<td>4.17</td>
<td>3.25</td>
</tr>
</tbody>
</table>

The results obtained reveal that the vocational agriculture classes

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\(^1\)Multivariate Analysis of Variance, Distributed by Clyde Computing Service, Coconut Grove Station, Miami, Florida, adapted for The Ohio State University by David Poor and Lorne Rosenblood.
TABLE 3
PRETEST MEANS FOR CLASSES AND TREATMENTS

<table>
<thead>
<tr>
<th>Number of Classes</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Agriculture Classes</td>
<td>17</td>
</tr>
<tr>
<td>Science Classes</td>
<td>14</td>
</tr>
<tr>
<td>Experimental Treatment</td>
<td>14</td>
</tr>
<tr>
<td>Control Treatment</td>
<td>17</td>
</tr>
</tbody>
</table>

TABLE 4
TWO-WAY ANALYSIS OF VARIANCE: PRETEST SCORES COMPARING VOCATIONAL AGRICULTURE AND SCIENCE CLASSES AND EXPERIMENTAL AND CONTROL GROUPS

<table>
<thead>
<tr>
<th>Source</th>
<th>d.f.</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>1</td>
<td>5.13</td>
<td>5.13</td>
<td>0.38</td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>0.64</td>
<td>0.64</td>
<td>0.05</td>
</tr>
<tr>
<td>Class x Treatment</td>
<td>1</td>
<td>12.54</td>
<td>12.54</td>
<td>0.92</td>
</tr>
<tr>
<td>Error</td>
<td>27</td>
<td>369.79</td>
<td>13.70</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>388.09</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

did not differ from the science classes on the pretest and that the experimental classes did not differ from the control classes on the pretest in either the vocational agriculture classes or the science classes. It was concluded, therefore, that the random assignment of
intact classes to the experimental and control groups provided pre-experimental equivalence of the classes. The science and vocational agriculture classes did not, therefore, differ significantly in attitudes toward the protection of the environment at the start of the experiment. Nor did the experimental and control groups differ significantly at the start of the experiment.

Hypothesis 1

The Hypothesis: Students taught environmental protection using the student manual, *Introduction to Environmental Protection*, will have significantly higher posttest attitude scores than those students taught environmental protection without the use of the student manual.

A three-way analysis of variance was used to test the null hypothesis. The three independent variables were:

1. Type of class
   \[ A_1 \] Vocational Agriculture
   \[ A_2 \] Science

2. Level of treatment
   \[ B_1 \] Experimental -- using the student manual
   \[ B_2 \] Control -- non-use of student manual

3. Level of testing
   \[ C_1 \] Pretest-posttest
   \[ C_2 \] Posttest-only

The dependent variable was the mean class score on the environmental
attitude inventory. Complete data were available for seventeen vocational agriculture classes, eight of which had been randomly assigned to the experimental group and nine randomly assigned to the control group. Complete data were available for fourteen science classes, six of which had been randomly assigned to the experimental group and eight randomly assigned to the control group. Five instructors that originally agreed to participate in the study failed to complete the experiment. Those instructors failing to complete the experiment included two instructors from the experimental group and one from the control group of the vocational agriculture classes and two instructors from the experimental group of the science classes. Upon consulting with the instructors, it was determined that in no case did the mortality of these classes from the experiment occur as a result of the treatment.

The multivariate analysis of variance computer program was used to analyze the posttest attitude inventory scores. The means and standard deviations are reported in Tables 5 and 6 and the results of the three-way analysis of variance are reported in Table 7.

The analysis of the data failed to reveal a significant difference in the second order interaction of the three variables: classes, treatment, and testing. Of the first order interactions, it

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2 Multivariate Analysis of Variance, Distributed by Clyde Computing Service, Coconut Grove Station, Miami, Florida, adapted for The Ohio State University by David Poor and Lorne Rosenblood.
### TABLE 5

**MEANS AND STANDARD DEVIATIONS OF POSTEST SCORES**

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>No Pretest</td>
</tr>
<tr>
<td>Agriculture:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Classes</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Means</td>
<td>72.69</td>
<td>71.57</td>
</tr>
<tr>
<td>SD's</td>
<td>4.98</td>
<td>3.99</td>
</tr>
<tr>
<td>Science:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Classes</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Means</td>
<td>77.43</td>
<td>74.99</td>
</tr>
<tr>
<td>SD's</td>
<td>3.57</td>
<td>3.23</td>
</tr>
</tbody>
</table>

was the interaction of factor A (class) and factor B (treatment) which was significant at the .05 level. In plotting this interaction as shown in Figure 1, it was found that the interaction was disordinal and that the significance is at the $B_1$ level (experimental treatment) between the agriculture and science classes. Therefore, the students in the science classes which used the student manual, *Introduction to Environmental Protection*, had a more favorable attitude toward the

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environment as measured by the posttest attitude inventory than did the students in the vocational agriculture classes which used the same student manual.

<table>
<thead>
<tr>
<th>Variable and Level</th>
<th>Number of Classes</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Agriculture Classes</td>
<td>17</td>
<td>72.82</td>
</tr>
<tr>
<td>Experimental</td>
<td>8</td>
<td>72.13</td>
</tr>
<tr>
<td>Control</td>
<td>9</td>
<td>73.43</td>
</tr>
<tr>
<td>Pretest</td>
<td>17</td>
<td>73.47</td>
</tr>
<tr>
<td>No Pretest</td>
<td>17</td>
<td>72.17</td>
</tr>
<tr>
<td>Science Classes</td>
<td>14</td>
<td>74.62</td>
</tr>
<tr>
<td>Experimental</td>
<td>6</td>
<td>76.21</td>
</tr>
<tr>
<td>Control</td>
<td>8</td>
<td>73.42</td>
</tr>
<tr>
<td>Pretest</td>
<td>14</td>
<td>74.91</td>
</tr>
<tr>
<td>No Pretest</td>
<td>14</td>
<td>74.32</td>
</tr>
<tr>
<td>Experimental Treatment</td>
<td>14</td>
<td>74.16</td>
</tr>
<tr>
<td>Pretest</td>
<td>14</td>
<td>74.72</td>
</tr>
<tr>
<td>No Pretest</td>
<td>14</td>
<td>73.04</td>
</tr>
<tr>
<td>Control Treatment</td>
<td>17</td>
<td>73.42</td>
</tr>
<tr>
<td>Pretest</td>
<td>17</td>
<td>73.62</td>
</tr>
<tr>
<td>No Pretest</td>
<td>17</td>
<td>73.23</td>
</tr>
<tr>
<td>Pretest</td>
<td>31</td>
<td>74.12</td>
</tr>
<tr>
<td>No Pretest</td>
<td>31</td>
<td>73.14</td>
</tr>
</tbody>
</table>
The pretest attitude inventory mean scores showed the students in the science classes had a more favorable attitude toward the environment than the students in the vocational agriculture classes, but not to the point of being significantly higher. Therefore, the students in the science classes using the student manual, *Introduction to Environmental Protection*, were able to improve their attitudes toward the environment to a greater extent than were the students in the vocational agriculture classes.

**TABLE 7**

THREE-WAY ANALYSIS OF VARIANCE: POSTTEST SCORE ON ATTITUDE INVENTORY

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>1</td>
<td>49.51</td>
<td>49.51</td>
<td>3.81</td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>4.34</td>
<td>4.34</td>
<td>0.33</td>
</tr>
<tr>
<td>Testing</td>
<td>1</td>
<td>14.86</td>
<td>14.86</td>
<td>1.14</td>
</tr>
<tr>
<td>Treatment x Class</td>
<td>1</td>
<td>63.52</td>
<td>63.52</td>
<td>4.89a</td>
</tr>
<tr>
<td>Treatment x Testing</td>
<td>1</td>
<td>1.96</td>
<td>1.96</td>
<td>0.15</td>
</tr>
<tr>
<td>Class x Testing</td>
<td>1</td>
<td>6.08</td>
<td>6.08</td>
<td>0.47</td>
</tr>
<tr>
<td>Treatment x Class x Testing</td>
<td>1</td>
<td>12.14</td>
<td>12.14</td>
<td>0.93</td>
</tr>
<tr>
<td>Error</td>
<td>54</td>
<td>701.99</td>
<td>13.00</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>854.40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( a_p < .05 \)
No significant difference was found as a result of the main effects of factor A (class), factor B (treatment), or factor C (testing). The factor A effect did, however, approach significance with an F value of 3.81 which is explained by the interaction between the type of class and the level of treatment where the science classes scored higher than the vocational agriculture classes for the experimental treatment level. The main effect of factor B (level of treatment) which was of primary concern in this study, was not found to be significant and, therefore, the null hypothesis could not be rejected. The findings fail to support the research hypothesis that students
taught environmental protection using the student manual, *Introduction to Environmental Protection*, will have significantly higher posttest attitude inventory scores than those students taught environmental protection without the use of the student manual. Students tend to achieve similar posttest attitude inventory scores regardless of the use of the student manual, *Introduction to Environmental Protection*, or the nonuse of the student manual. This was true for the vocational agriculture classes and for the science classes.

**TABLE 8**

**MEAN SCORES OF VOCATIONAL AGRICULTURE CLASSES AND SCIENCE CLASSES**

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Classes</td>
<td>Pretest</td>
<td>Posttest</td>
<td>Pretest</td>
</tr>
<tr>
<td>Vocational Agriculture</td>
<td>17</td>
<td>72.58</td>
<td>72.27</td>
<td>73.44</td>
</tr>
<tr>
<td>Science</td>
<td>14</td>
<td>74.83</td>
<td>76.10</td>
<td>73.12</td>
</tr>
</tbody>
</table>

In looking at the gain scores of vocational agriculture classes and science classes it can be seen that the science classes which received the student manual, *Introduction to Environmental Protection*, made the greatest gain. On a scale of a possible 100, the science classes using the student manual had a mean score of 74.83 on the pretest and 76.10 on the posttest for a gain of 2.73 in the direction of more positive attitudes toward the environment. In contrast, the
vocational agriculture classes had a mean score of 72.58 on the pre-test and 72.27 on the posttest for a loss of -.31 in positive attitudes toward the environment (Table 8).

Hypothesis 2

The Hypothesis: There will be no difference in the posttest attitude inventory scores of students using the student manual, Introduction to Environmental Protection, who are enrolled in classes of vocational environmental management, vocational agriculture, and science.

| TABLE 9 |
| MEANS AND STANDARD DEVIATIONS BY CLASS OF PRETEST SCORES |

<table>
<thead>
<tr>
<th>Type of Class</th>
<th>Environmental Management</th>
<th>Vocational Agriculture</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Classes</td>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Means</td>
<td>76.81</td>
<td>72.58</td>
<td>74.83</td>
</tr>
<tr>
<td>SD's</td>
<td>4.67</td>
<td>4.16</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Since the vocational environmental management classes did not have a control group for comparison purposes, a one-way analysis of variance was used to determine if the three groups that received the experimental treatment differed significantly on the pretest and the
posttest. The BMD -- Biomedical Computer Program was used to calculate the analysis of variance.\(^4\) Table 9 presents the means and standard deviations of the pretest scores and Table 10 presents the analysis of variance data. The results obtained, as indicated in Table 10, reveal that the three groups did not differ significantly on the pretest at the .05 level.

### TABLE 10

**ONE-WAY ANALYSIS OF VARIANCE: PRETEST SCORES COMPARING ENVIRONMENTAL MANAGEMENT, VOCATIONAL AGRICULTURE AND SCIENCE CLASSES**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of Classes</td>
<td>2</td>
<td>35.99</td>
<td>18.00</td>
<td>1.29</td>
</tr>
<tr>
<td>Error</td>
<td>13</td>
<td>181.36</td>
<td>13.95</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>217.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11 presents the means and standard deviations of the posttest scores and Table 12 presents the analysis of variance data. The results obtained, as indicated in Table 12, reveal that the three groups did not differ significantly on the posttest at the .05 level. It was concluded, therefore, that since the vocational environmental

management, vocational agriculture, and science classes that used the student manual, *Introduction to Environmental Protection*, did not differ significantly on the pretest or posttest attitude inventory scores, the classes could be considered collectively. The students in the vocational environmental management classes held much the same attitudes toward the environment as did the students in vocational agriculture and science classes on the pretest and on the posttest. This, then, suggests that what was learned in comparing the classes which used the student manual, *Introduction to Environmental Protection*, with those classes that did not receive the student manual could be applied to the vocational environmental management classes. The findings of hypothesis 1 suggest that if the vocational environmental management classes used the same materials as the vocational agriculture and science classes used who were in the control group, then posttest attitude inventory scores for the vocational environmental management classes would not have differed significantly from the findings of the vocational environmental management experimental group which used the student manual.

**TABLE 11**

MEANS AND STANDARD DEVIATIONS BY CLASS OF POSTTEST SCORES

<table>
<thead>
<tr>
<th>Type of Class</th>
<th>Environmental Management</th>
<th>Vocational Agriculture</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Classes</td>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Means</td>
<td>77.56</td>
<td>72.27</td>
<td>76.10</td>
</tr>
<tr>
<td>SD's</td>
<td>6.82</td>
<td>4.27</td>
<td>3.25</td>
</tr>
</tbody>
</table>
TABLE 12

ONE-WAY ANALYSIS OF VARIANCE: POSTTEST SCORES COMPARING ENVIRONMENTAL MANAGEMENT, VOCATIONAL AGRICULTURE AND SCIENCE CLASSES

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of Classes</td>
<td>2</td>
<td>73.40</td>
<td>36.70</td>
<td>2.10</td>
</tr>
<tr>
<td>Error</td>
<td>13</td>
<td>227.17</td>
<td>17.47</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>300.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 13

MEANS AND STANDARD DEVIATIONS FOR VOCATIONAL ENVIRONMENTAL MANAGEMENT STUDENTS POSTTEST SCORES

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>No Pretest</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Students</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Means</td>
<td>75.54</td>
<td>81.14</td>
</tr>
<tr>
<td>SD's</td>
<td>7.32</td>
<td>7.74</td>
</tr>
</tbody>
</table>

The analysis of the separate-sample pretest-posttest design for the vocational environmental management classes consisted of a one-way analysis of variance to determine the effect of testing as shown in Table 13 and Table 14. The results obtained, as indicated in Table 14, reveal that the students who received the pretest did not differ significantly on posttest attitude inventory scores from those
students who were not pretested.

**TABLE 14**

**ONE-WAY ANALYSIS OF VARIANCE: POSTTEST SCORES COMPARING STUDENTS WHO RECEIVED PRETEST WITH THOSE WHO DID NOT**

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Testing</td>
<td>1</td>
<td>211.72</td>
<td>211.72</td>
<td>3.72</td>
</tr>
<tr>
<td>Error</td>
<td>25</td>
<td>1422.94</td>
<td>56.92</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>1634.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p > .05

Since the vocational environmental management classes were not found to score significantly different from the vocational agriculture and science classes on the posttest attitude inventory, their posttest scores were considered collectively in determining the relationships of the variables in hypotheses 3 through 6.

**Hypothesis 3**

_The Hypothesis:_ There is a positive relationship between the students' posttest attitude inventory scores and the number of professional environmental education courses completed by the instructor.

_The calculated correlation coefficient for the number of professional environmental education courses completed by the_
instructor and the class mean posttest attitude inventory scores was .34 and was significant at the .05 level (Table 15). The null hypothesis was rejected. The data, therefore, support the research hypothesis that there is a positive relationship between the students' posttest attitude inventory scores and the number of professional environmental education courses completed by the instructor. A correlation coefficient of .34 indicates a significant positive relationship, but only moderate. The number of courses completed by the instructors ranged from zero to four, with a mean number of .76 courses taken per instructor (Figure 2).

TABLE 15
CORRELATION MATRIX: CLASS MEAN POSTTEST SCORE AND INSTRUCTIONAL VARIABLES
(n = 33)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Courses Completed by Instructor</td>
<td>1.000</td>
<td>0.173</td>
<td>0.105</td>
<td>0.049</td>
<td>0.342&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2. Time Used in Teaching Unit</td>
<td>1.000</td>
<td>-0.036</td>
<td>0.192</td>
<td>0.147</td>
<td></td>
</tr>
<tr>
<td>3. Number of Films Shown</td>
<td>1.000</td>
<td>0.050</td>
<td>0.015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Number of Experiments</td>
<td>1.000</td>
<td>0.194</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Posttest Score</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup><sub>p < .05</sub>
Hypothesis 4

The Hypothesis: There is a positive relationship between students' posttest attitude inventory scores and the time devoted to teaching the environmental protection unit.
The calculated correlation coefficient for the time (weeks) devoted to teaching the environmental protection unit and the class mean posttest attitude inventory scores was .15 which is not significant at the .05 level (Table 15). The null hypothesis was not rejected. It can be concluded then that the variation in time used in teaching the
environmental protection unit did not relate closely to the mean post-test attitude inventory scores of the students. The range in time which instructors used in teaching the course was from two to fourteen weeks with the mean time period of six and one-third weeks (Figure 3).

Hypothesis 5

FIGURE 4

MEAN CLASS POSTTEST SCORE AND NUMBER OF FILMS SHOWN
The Hypothesis: There is a positive relationship between the students' posttest attitude inventory scores and the number of films shown in teaching the environmental protection unit.

A correlation coefficient of .015 is reported in Table 15. This indicates no relationship exists between the number of films shown to classes and the class mean posttest attitude inventory score. The null hypothesis was not rejected. The number of films which were used in teaching the unit ranged from zero to nine with a mean of three films per class (Figure 4).

Hypothesis 6

The Hypothesis: There is a positive relationship between students' posttest attitude inventory scores and the number of experiments instructors used in teaching the environmental protection unit.

The reported correlation coefficient in Table 15 is .19 for this variable. Since this correlation coefficient is not significant at the .05 level the null hypothesis was not rejected. The number of experiments which instructors used in teaching their environmental protection unit ranged from zero to thirty-six with a mean of 4.6 experiments per class (Figure 5).
The Hypothesis: Students' choosing occupations in environmental management will score higher on the posttest attitude inventory than those students who choose other occupations.
Chi square was used to test for homogeneity between the post-test attitude inventory scores of students and their occupational choice. The occupational choice categories included environmental management, occupations other than environmental management, and undecided on occupational choice. The posttest attitude inventory scores were divided into four groups as nearly equal in size as possible. Since there were a number of tied scores which did not allow equal sized groups, the groups do not correspond to the quartiles of the distribution of scores on the posttest. Group one is the lowest group of scores and group four is the highest group of scores (Table 16). The chi square test resulted in a value of 42.35 which is significant at the .05 level. The null hypothesis was rejected.

The data show that 71 percent of the students indicating an environmental management occupation choice had posttest attitude inventory scores in groups three and four. The table also shows that the students who were undecided in their occupational choice had 68 percent of their scores in groups one and two, the low scores on the posttest attitude inventory.

The post hoc procedure followed was that suggested by Marascuilo for use with the binomial case. The procedure is the analog to Scheffe's theorem which is employed to locate the possible sources of rejection of the null hypothesis. The analysis indicated the following for Group One:

---

### TABLE 16

RELATIONSHIP BETWEEN STUDENTS' OCCUPATIONAL CHOICE AND THEIR SCORE ON THE POSTTEST

<table>
<thead>
<tr>
<th>Occupational Choice</th>
<th>Group</th>
<th>One (41-68)</th>
<th>Two (69-74)</th>
<th>Three (75-79)</th>
<th>Four (80-98)</th>
<th>Number Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Management</td>
<td>Number Cases</td>
<td>10</td>
<td>16</td>
<td>25</td>
<td>39</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>11.1%</td>
<td>17.8%</td>
<td>27.8%</td>
<td>43.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Other Occupations</td>
<td>Number Cases</td>
<td>127</td>
<td>134</td>
<td>106</td>
<td>106</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>27%</td>
<td>28.5%</td>
<td>22.5%</td>
<td>22.1%</td>
<td>100%</td>
</tr>
<tr>
<td>Undecided</td>
<td>Number Cases</td>
<td>43</td>
<td>55</td>
<td>27</td>
<td>18</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>30.1%</td>
<td>38.5%</td>
<td>18.9%</td>
<td>12.6%</td>
<td>100%</td>
</tr>
<tr>
<td>Number Cases</td>
<td>180</td>
<td>205</td>
<td>158</td>
<td>161</td>
<td>704</td>
<td></td>
</tr>
</tbody>
</table>

chi square = 42.35; d.f. = 6; p<.05

Environmental Management vs Other Occupations

11.1% vs 27.0%

Environmental Management vs Undecided

11.1% vs 30.1%

The percentage of students who had chosen an occupation in environmental management was significantly less than the percentage of students who had decided on an occupation in another area or the students who...
were undecided on an occupation. The post hoc analysis indicated the following for Group Two:

Environmental Management vs Undecided

17.8% 38.5%

The percentage of students who had decided on an occupation in environmental management was significantly less than the group of students who were undecided as to an occupation. No significant difference was found in Group Three. The post hoc analysis indicated the following for Group Four:

Environmental Management vs Other Occupations

43.3% 22.1%

Environmental Management vs Undecided

43.3% 12.6%

Other Occupations vs Undecided

22.1% 12.6%

This group is composed of the highest scores on the posttest attitude inventory and significant differences were found at all levels of occupational choice. The percentage of students who chose the environmental management occupations was significantly higher than the students who chose other occupations and those who were undecided. Those students who had decided on an occupation other than one in environmental management had a significantly higher percentage of their scores in Groups Four than did those students who were undecided on their occupation.

To investigate if the findings hold when the vocational
environmental management students are not included, chi square was run a second time using just the vocational agriculture and science students to see if similar significance was found. The chi square was again found to be significant and the post hoc procedure revealed the significance to be in the same places as when the vocational environmental management classes were included in the analysis.
CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The Problem

The major purpose of this study was to determine if the use of a student manual, Introduction to Environmental Protection, aided vocational agriculture and science students in formulating positive attitudes toward the protection of the environment to a greater degree than students taught environmental protection without the use of the student manual. This comparison between classes using the student manual, Introduction to Environmental Protection, and classes that did not use the student manual was made with the following groups of high school students: those enrolled in courses in vocational agriculture and those enrolled in courses in science. Students enrolled in vocational environmental management courses were also included in the study; however, all students in these classes used the student manual.

A subsidiary purpose was to investigate the relationships between other assigned independent variables and the class mean post-test attitude inventory scores. The following assigned independent variables were tested: 1) the number of professional environmental education courses completed by the instructor, 2) the time (weeks) devoted to teaching the environmental protection unit, 3) the number
of films shown in teaching the environmental protection unit, and
4) the number of experiments instructors used in teaching the unit.
Also investigated was the relationship between students' posttest
attitude inventory scores and their occupational choice.

Hypotheses

Hypothesis 1. Students taught environmental protection using
the student manual, *Introduction to Environmental Protection*, will
have significantly higher posttest attitude inventory scores than
students taught environmental protection without the use of the
student manual.

Hypothesis 2. There will be no differences in the posttest
attitude inventory scores of students using the student manual,
*Introduction to Environmental Protection*, who are enrolled in classes
of vocational environmental management, vocational agriculture, and
science.

Hypothesis 3. There is a positive relationship between
students' posttest attitude inventory scores and the number of
professional environmental education courses completed by the
instructor.

Hypothesis 4. There is a positive relationship between
students' posttest attitude inventory scores and the time devoted to
teaching the environmental protection unit.

Hypothesis 5. There is a positive relationship between
students' posttest attitude inventory scores and the number of
films shown in teaching the environmental protection unit.

**Hypothesis 6.** There is a positive relationship between students' posttest attitude inventory scores and the number of experiments instructors used in teaching the environmental protection unit.

**Hypothesis 7.** Students choosing occupations in environmental management will have higher posttest attitude inventory scores than those students who choose other occupations.

**Procedure**

The levels of treatment were randomly assigned to randomly selected intact classes of vocational agriculture and science students. The experimentally accessible population of vocational agriculture students was located from the vocational agriculture instructors in Ohio who had identified themselves as teaching units in environmental protection. The experimentally accessible population of science students was located from the science instructors who had identified themselves as teaching units in environmental protection. From this accessible population of students in vocational agriculture and science courses, a stratified random sample was drawn of thirty-six classes (twenty vocational agriculture classes and sixteen science classes) for the study. The design for this part of the study was a modified "Solomon Four-Group Design." The modification included the division of the intact classes into pretest-posttest and posttest-only subgroups for each treatment level. A six-weeks time period was recommended for
the instructors to use in teaching the unit.

The vocational environmental management classes were not randomly selected since the total population was used and they received only one treatment level. The intact classes were randomly divided into pretest-posttest and posttest-only subgroups, however. The design used with the vocational environmental management classes was the "Separate-Sample Pretest-Posttest Design." A period of ten weeks, four hours per day, was used by these classes to cover the unit.

The analysis techniques included analysis of variance, Pearson product-moment correlation coefficient, and chi square. A .05 level of significance was used in testing null hypotheses.

The attitude inventory developed for use in this study was designed to measure the attitudes of students toward the protection of the environment. The attitude inventory was developed by first writing fifty attitude statements and submitting them to a jury of ten persons composed of graduate students and faculty members in the Department of Agricultural Education of The Ohio State University. They were asked to rate each statement as being favorable or unfavorable toward the environment. Only those attitude statements that received 90 percent or higher agreement among the jury were selected. This resulted in thirty-six attitude statements which were then field tested with four vocational environmental management classes totaling fifty-four high school students. The students rated their opinion of each attitude statement on the Likert rating scale. The responses were: SA -- strongly agree, A -- agree, U -- undecided, D -- disagree,
and SD -- strongly disagree. The test for item discrimination was an intercorrelation Pearson product-moment which allowed the selection of twenty items that had responses which were most highly correlated with the total score. The range of the correlations was .61 to .38. To test the reliability of the instrument, an internal consistency analysis by Kuder and Richardson was used. The twenty attitude statements had a reliability range of .65 to .37 with a total test reliability of .87.

Summary of Findings

The results of testing hypothesis number one, the major research hypothesis for the study, show that there was no significant difference in posttest attitude inventory scores between students using the student manual, Introduction to Environmental Protection, and students not using the student manual. Therefore, the null hypothesis could not be rejected. Significance was found, however, in the first order interaction between type of class and treatment. Of the classes using the student manual, the science classes had a higher posttest attitude inventory score than did the vocational agriculture classes. The science and vocational agriculture classes which did not use the student manual scored about the same on the posttest attitude inventory.

For the second hypothesis, the vocational environmental management, vocational agriculture, and science classes which used the student manual were not found to differ significantly on the mean
posttest attitude inventory scores. The null hypothesis was not rejected. The vocational environmental management course did not have a control group, and did not differ significantly in the mean pretest or posttest attitude inventory scores from that of the vocational agriculture and science classes which used the student manual. The mean posttest score of the vocational environmental management classes was closest to the mean posttest score of the science classes.

Hypotheses 3 through 6 were developed to test the relationship between various other independent variables and the students' posttest attitude inventory scores. A positive but moderate relationship ($r = .34$) was found to exist between the students' posttest attitude inventory scores and the number of professional environmental education courses taken by the instructor. The analysis further revealed that there were no significant relationships between posttest attitude inventory scores and the time (weeks) used to teach the environmental protection unit, the number of films shown in teaching the environmental protection unit, and the number of experiments instructors used in teaching the environmental protection unit.

In hypothesis 7, students indicating an occupational choice in environmental management tended to score higher on the posttest attitude inventory than did those students who had other occupational choices or were undecided on an occupational choice. Of the students who chose environmental management occupations, 11 percent had posttest scores in the lowest group of scores on the posttest. In contrast, 27 percent
of the students choosing other occupations and 30 percent of the students who were undecided on an occupation had scores in the lowest group. Forty-three percent of the students who chose environmental management occupations had posttest attitude inventory scores in the highest group of scores on the posttest. In contrast, only 22 percent of the students choosing other occupations and 13 percent of the students who were undecided on an occupation had scores in this highest group.

Conclusions

The writer concludes the following concerning the use of the student manual, *Introduction to Environmental Protection*, in instructional units on environmental protection in vocational agriculture courses, science courses, and vocational environmental management courses in the high schools in Ohio.

1. The use of the student manual, *Introduction to Environmental Protection*, will not result in significant differences in student attitudes when compared with students taught environmental protection without the use of the student manual. Students in science classes using the student manual are likely to achieve higher attitude scores than students in vocational agriculture classes using the student manual.

2. Students enrolled in vocational environmental management courses who use the student manual, *Introduction to Environmental Protection*, will not receive significantly different posttest attitude
inventory scores than students enrolled in vocational agriculture or science courses.

3. There is a positive relationship between the number of professional environmental education courses completed by the instructor and the students' posttest attitude inventory scores. There is no relationship between students' posttest attitude inventory scores and the time (weeks) used to teach the environmental protection unit, the number of films shown in teaching the environmental protection unit, and the number of experiments instructors used in teaching the environmental protection unit.

4. Students who chose occupations in environmental management tend to score higher on a posttest attitude inventory than students who chose other occupations or students who are undecided about an occupational choice.

Recommendations

Based on the findings of this study and the experience of the writer in teaching, developing curriculum materials, and having made this study, the following recommendations are presented:

1. It was noted in this study that some of the vocational environmental management, vocational agriculture, and science instructors who were given the student manual, Introduction to Environmental Protection, made little use of the films or experiments in teaching their unit on environmental protection. Since the experiments and films were included in the student manual as an
important part of the learning activities for the student, it is recommended that this study be repeated and include a workshop of at least two days during the early part of the summer. This workshop would provide instructors an opportunity to review the student manual, *Introduction to Environmental Protection*, and receive instruction on how to use the student manual, as well as giving the instructors an opportunity to ask questions about the use of the manual. An opportunity would be provided for the instructors to perform a number of the experiments which are provided as student activities in the student manual. This would provide familiarity with the procedures to follow as well as knowledge of the equipment needed. The previewing of the recommended films to be used with the student manual would be helpful to instructors in evaluating their usefulness in teaching the environmental protection unit. By providing the workshop in the early part of the summer, the teachers would have time to gather the necessary materials which are needed for the suggested student activities.

2. This study considered only the development of student attitudes as a basis for the evaluation of the student manual, *Introduction to Environmental Protection*. In determining the full value of this student manual and whether the publication should be continued, consideration must be given to the cognitive learning by the student as well as the assistance the manual provides the student in making a choice of an environmental management occupation. Both the cognitive learning and the effect on the student in making a career choice could
be used as other dependent variables along with the attitude inventory for a complete evaluation of the student manual, *Introduction to Environmental Protection.*
May 19, 1972

TO: Teachers of Vocational Agriculture

FROM: Harlan E. Ridenour, Director; David Howell, Research Associate; Ohio Agricultural Education Curriculum Materials Service

SUBJECT: Environmental Protection Inventory

The Ohio Agricultural Education Curriculum Materials Service is interested in determining attitudes of 11th grade students toward the protection of our environment as a result of studying an environmental protection unit. We wish to identify agriculture and science teachers who are planning to teach an 11th grade environmental protection unit next fall. This unit consists of the identification of environmental problems and their possible solutions. Of those teaching an environmental unit, a sample will be asked to assist us in evaluating student attitudes toward the protection of the environment.

An environmental attitude inventory has been developed consisting of 20 questions relating to the environment. Approximately 20 minutes will be required to administer the environmental attitude inventory at the start of the unit and again upon completion of the unit.

Please complete the Agriculture Card enclosed and return it as soon as possible. We would appreciate it if you would give the second card to a science teacher in your school if he is teaching an 11th grade environmental protection unit as part of his program. Further details and a request for assistance will be mailed to a sample of selected schools as soon as possible.

Your assistance in locating where environmental protection units are taught will be greatly appreciated.

HER/DR: mce

Enclosures
POSTCARDS

Agriculture

I (will) (will not) be teaching an environmental protection unit this fall.

Name of course ____________________________________________

Name of instructor __________________________________________

School _____________________________________________________

Science

I (will) (will not) be teaching an environmental protection unit this fall.

Name of course ____________________________________________

Name of instructor __________________________________________

School _____________________________________________________
APPENDIX B
August 11, 1972

TO: Teachers of Vocational Agriculture

FROM: Harlan E. Ridenour, Director
       David Howell, Research Associate
       Ohio Agricultural Education Curriculum Materials Service

SUBJECT: Environmental Protection Attitude Inventory

We want to thank you for returning the postcard to the Agricultural Education Curriculum Materials Service indicating that you will be teaching a unit on environmental protection. Our next step is to identify teachers who are willing to participate in the study to determine attitudes of students toward the protection of our environment as a result of studying the unit, "Introduction to Environmental Protection," prepared by the Curriculum Materials Service. We wish to invite you to be a participant in this study.

By agreeing to participate in using the unit and evaluating student attitudes, sufficient copies of the unit, "Introduction to Environmental Protection," will be sent for your use at no charge. Also, you will receive an environmental attitude inventory of 20 statements for your students. Approximately 20 minutes will be required to administer the environmental attitude inventory at the start of the unit and again upon completion of the unit. A detailed explanation will be included with the materials. The materials will be mailed on September 11 to allow time for the teacher to become acquainted with them and to obtain answers to any questions which may arise. In order to develop a schedule to control outside variables we are asking that the pretest be given and the unit started on October 2 with completion and final testing 6-10 weeks later.

Enclosed is a card to indicate whether or not you are willing to participate. Also enclosed is the table of contents for the unit and a sample from the section, "Lakes and Rivers."

HER/DH:slh

Enclosures
August 11, 1972

TO: Teachers of Science

FROM: Eugene Knight, Supervisor, Environmental Education, Ohio Department of Education
       David Howell, Research Associate, Ohio Agricultural Education Curriculum Materials Service

SUBJECT: Environmental Protection Attitude Inventory

We want to thank you for returning the postcard to the Agricultural Education Curriculum Materials Service indicating that you will be teaching a unit on environmental protection. Our next step is to identify teachers who are willing to participate in the study to determine attitudes of students toward the protection of our environment as a result of studying the unit, "Introduction to Environmental Protection," prepared by the Curriculum Materials Service. We wish to invite you to be a participant in this study.

By agreeing to participate in using the unit and evaluating student attitudes, sufficient copies of the unit, "Introduction to Environmental Protection," will be sent for your use at no charge. Also, you will receive an environmental attitude inventory of 20 statements for your students. Approximately 20 minutes will be required to administer the environmental attitude inventory at the start of the unit and again upon completion of the unit. A detailed explanation will be included with the materials. The materials will be mailed on September 11 to allow time for the teacher to become acquainted with them and to obtain answers to any questions which may arise. In order to develop a schedule to control outside variables we are asking that the pretest be given and the unit started on October 2 with completion and final testing 6-10 weeks later.

Enclosed is a card to indicate whether or not you are willing to participate. Also enclosed is the table of contents and a sample of the section, "Lakes and Rivers."

EK/DH:slh

Enclosures
THE OHIO STATE UNIVERSITY

August 11, 1972

TO: Teachers of Vocational Agriculture

FROM: Harlan E. Ridenour, Director
       David Howell, Research Associate
       Ohio Agricultural Education Curriculum Materials Service

SUBJECT: Environmental Protection Attitude Inventory

We want to thank you for returning the postcard to the Agricultural Education Curriculum Materials Service indicating that you will be teaching a unit on environmental protection. Our next step is to identify teachers who are willing to participate in the study to determine attitudes of students toward the protection of our environment as a result of studying an environmental protection unit. We wish to invite you to be a participant in this study.

By agreeing to participate in evaluating student attitudes you will be sent an environmental attitude inventory of 20 statements for each of your students. Approximately 20 minutes will be required to administer the environmental attitude inventory at the start of the unit and again upon completion of the unit. A detailed explanation will be included with the materials. The materials will be mailed on September 11 to allow time for the teacher to become acquainted with them and to obtain answers to any questions which may arise. In order to develop a schedule to control outside variables we are asking that the pretest be given and the unit started on October 2 with completion and final testing 6-10 weeks later.

Enclosed is a card to indicate whether or not you are willing to participate. Your assistance will be greatly appreciated.

HER/DH: slh

Enclosure
August 11, 1972

TO: Teachers of Science

FROM: Eugene Knight, Supervisor, Environmental Education,
Ohio Department of Education
David Howell, Research Associate, Ohio Agricultural
Education Curriculum Materials Service

SUBJECT: Environmental Protection Attitude Inventory

We want to thank you for returning the postcard to the
Agricultural Education Curriculum Materials Service indicating that
you will be teaching a unit on environmental protection. Our next
step is to identify teachers who are willing to participate in the
study to determine attitudes of students toward the protection of
our environment as a result of studying an environmental protection
unit. We wish to invite you to be a participant in this study.

By agreeing to participate in evaluating student attitudes
you will be sent an environmental attitude inventory of 20 statements
for each of your students. Approximately 20 minutes will be required
to administer the environmental attitude inventory at the start of
the unit and again upon completion of the unit. A detailed explana­
tion will be included with the materials. The materials will be
mailed on September 11 to allow time for the teacher to become
acquainted with them and to obtain answers to any questions which
may arise. In order to develop a schedule to control outside
variables we are asking that the pretest be given and the unit
started on October 2 with the completion and final testing 6-10 weeks
later.

Enclosed is a card to indicate whether or not you are willing
to participate. Your assistance will be greatly appreciated.

EK/DH:slh

Enclosure
TO: Teachers of Environmental Management

FROM: Harlan E. Ridenour, Director
David Howell, Research Associate
Ohio Agricultural Education Curriculum Materials Service

SUBJECT: Environmental Protection Attitude Inventory

The unit, "Introduction to Environmental Protection," is about to be completed. Copies will be sent to you as fast as we get them from the printer. We would like your help in an evaluation of the unit when you use it this fall. The evaluation is to determine attitudes of students toward the protection of our environment as a result of studying the unit, "Introduction to Environmental Protection."

For the evaluation you will be sent an environmental attitude inventory of 20 statements for each of your students. Approximately 20 minutes will be required to administer the environmental attitude inventory at the start and again upon completion of the unit. A detailed explanation will be included with the materials. If possible, the starting time for teaching the unit will be September 5 with completion and final testing at the end of the semester.

Enclosed is a card to indicate the number of materials you will need. Your assistance will be greatly appreciated.

HER/DH:slh

Enclosure
NAME OF INSTRUCTOR ____________________________________________________________

SCHOOL _______________________________________________________________________

_____ YES, I agree to use the instructional materials for a period of 6-10 weeks beginning October 2 and administer the attitude inventory as a pretest and posttest.

_____ NO, I do not wish to participate in the study.

IF YES, how many students do you have in your class?

______________________________________________________________________________

NAME OF INSTRUCTOR ____________________________________________________________

SCHOOL _______________________________________________________________________

_____ YES, I agree to administer a pretest and posttest attitude survey in connection with my environmental protection unit which will be taught for a period of 6-10 weeks beginning October 2.

_____ NO, I do not wish to participate in your study.

IF YES, how many students do you have in your class?

______________________________________________________________________________
POSTCARD FOR ENVIRONMENTAL MANAGEMENT

Name of Instructor ________________________________

School _________________________________________

Number of students _______________________________
Attitude Inventory on Environmental Issues

PART I  Personal Data Form

1. Name ____________________________
   (Last) (First)

2. What occupation are you presently planning to enter as a career?
   ____________________________

PART II

This is not a test, there are no right or wrong answers.
Answer all questions according to your personal opinion using the following directions. Place a circle ( 0 ) around the letters which most accurately indicate your opinion of each statement.

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

Read each statement carefully, and yet do not spend too much time with any statement before checking each one.

EXAMPLE:

SA A U D(SD) It is safe to walk in bare feet in an archery range.

(this indicates strong disagreement with the statement)
SA -- Strongly Agree   A -- Agree   U -- Undecided   D -- Disagree
SD -- Strongly Disagree

SA  A  U  D  SD  1. I am willing to pay more to buy an item if the extra money will be used to reduce pollution.

SA  A  U  D  SD  2. The protection of our natural environment should be the concern of everyone.

SA  A  U  D  SD  3. Science will develop replacements for our supply if our natural resources are exhausted.

SA  A  U  D  SD  4. The need for electricity is more important than the pollution problems caused in producing electricity.

SA  A  U  D  SD  5. Farmers must not be allowed to use practices which can result in soil erosion.

SA  A  U  D  SD  6. Sufficient roads must be built to meet the demands made by more cars.

SA  A  U  D  SD  7. A person has the right to make any amount of noise he wishes.

SA  A  U  D  SD  8. It is up to people and not society to determine the family size.

SA  A  U  D  SD  9. Each person has the right to drive to work instead of using public transportation.

SA  A  U  D  SD  10. Our water supply is unlimited.

SA  A  U  D  SD  11. I want my garbage picked up by the city but I do not care what they do with it after that.

SA  A  U  D  SD  12. We need stronger laws against pollution to protect our environment.

SA  A  U  D  SD  13. Education can influence people to protect the natural environment.

SA  A  U  D  SD  14. A person can find good opportunities to start as a garbage collector and work his way into a supervisory position.
SA -- Strongly Agree  A -- Agree  U -- Undecided  D -- Disagree
SD -- Strongly Disagree

SA  A  U  D  SD  15. Industry must be forced to protect our environment even if it means that things will cost more.

SA  A  U  D  SD  16. Education can influence people to discipline themselves in order to protect future generations.

SA  A  U  D  SD  17. My throwing a can along the highway does not hurt anything.

SA  A  U  D  SD  18. A job working in a water treatment plant is very important to the health of that city.

SA  A  U  D  SD  19. The job of an air pollution control officer is very important for the protection of our environment.

SA  A  U  D  SD  20. Using returnable bottles is not important for the protection of our environment.
DIRECTIONS FOR TEACHING THE UNIT: "INTRODUCTION TO ENVIRONMENTAL PROTECTION"

This unit is written to allow teachers to select areas of interest to the students as well as experiments to actively involve the students. Suggested movies and references are added for additional insights into our environment and the problems which we are creating. It is hoped that as much of this material is covered as possible and that the students carry out experiments of interest to them.

A catalog of water test kits is available from:

Hach Chemical Company
Box 907
Ames, Iowa 50010
PRETEST DIRECTIONS

Do not tell the students that they are participating in an experiment. Say only that: "This is an attitude inventory for which there are no right or wrong answers, individuals do and should differ in their opinions on matters such as these." Any questions by students should be answered personally by the instructor with the individual student to prevent the students knowing that there are two different attitude inventories. Check over all test to make sure that the students have filled out all information that is asked for.

Only half of the students will receive the real attitude inventory, the others receive an attitude inventory on hunter safety. The two types of inventories have been alternated in your packet to provide random distribution.

The posttest will be sent to you by the 6th of November. Good luck and thanks for your help. Call if you have questions. Enclosed is a self-addressed stamped envelop for returning the pretest.

David L. Howell
2120 Fyffe Road
Room 254, Agricultural Administration Building
The Ohio State University
Columbus, Ohio 43210
APPENDIX F
TO BE ADMINISTERED 6 - 10 WEEKS AFTER THE PRETEST. IT IS NOT NECESSARY THAT THE UNIT BE COMPLETED FIRST.

POSTTEST DIRECTIONS

Do not tell the students that they are participating in an experiment. Say only that: "This is an attitude inventory for which there are no right or wrong answers, individuals do and should differ in their opinions on matters such as these." Any questions by students should be answered personally by the instructor with the individual student. Check over all tests to make sure that the students have filled out all information that is asked for. If they are unsure of their occupational interest ask them if it is in some area of environmental protection (yes or no).

All of the students will receive the same attitude inventory this time and there should not be any discussion concerning differences or similarities of the pretest and the posttest.

Be sure that you complete the record of events sheet, noting on the back any additional information of interest or problems encountered. Call collect if you have questions (614-263-8550). Enclosed is a self-addressed stamped envelop for returning the posttest as soon as it is completed together with your record of events sheet. Be sure to include the dates of the pretest and the posttest.

Thank you for your help!

David L. Howell
2120 Fyffe Road
Room 254 Agricultural Administration Building
The Ohio State University
Columbus, Ohio 43210
RECORD OF EVENTS

1. Name of Instructor ____________________________

2. Date pretest was given: October ____________________________

3. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   |---|---|---|---|---|---|---|---|---|---|
   Number of units covered: ____________________________
   Number of experiments used: ____________________________
   Number of movies shown: ____________________________

4. What are the titles of the units that were used?
   1. ____________________________
   2. ____________________________
   3. ____________________________
   4. ____________________________
   5. ____________________________
   6. ____________________________
   7. ____________________________
   8. ____________________________
   9. ____________________________
   10. ____________________________

5. Date posttest was given: ____________________________

6. What are the titles of the university courses in environmental education which were taken by the instructor in the last four (4) years?
   1. ____________________________
   2. ____________________________
   3. ____________________________
   4. ____________________________
December 11, 1972

TO: Participating Teacher

FROM: David L. Howell, Research Associate, Agricultural Education Curriculum Materials Service, The Ohio State University

SUBJECT: Environmental Attitude Inventory

I want to thank you very much for your assistance in this research process. It is only when teachers such as yourselves are willing to assist in such a project that a real evaluation can be made of curriculum materials. In this case certain schools were asked to use the manual, "Introduction to Environmental Protection," while other schools were asked to continue with their own materials. A comparison was made to determine which source of instruction had the greatest effect on the attitudes of the students. In the case of our environment it is deemed important to improve the attitudes of people and for this reason only an attitude instrument was used. Thirty-six schools were used in the study, including vocational agriculture, science and environmental management classes.

Additional copies of the student reference: "Introduction to Environmental Protection," ($2.00) and "Occupational Opportunities in Environmental Management," ($1.25) are available from the Agricultural Education Curriculum Materials Service, Room 201, 2120 Fyffe Road, Columbus, Ohio 43210.

Thanks again for your help and good luck in the New Year.

Enclosures
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