ENVIRONMENTAL EDUCATION
INSTRUCTIONAL UNIT FOR
JUNIOR HIGH SCHOOL GRADES

An Action Learning Project

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by

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ABSTRACT

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The purpose of this project was:

1. ...to develop a unit of instructional materials related to environmental education.
2. ...to construct or select activities that are especially appropriate for junior high school-age students.
3. ...to include a wide variety of learning experiences in the program, including laboratory exercises and outdoor activities which could provide students with first-hand experiences in issues related to their environment.
4. ...to employ a wide range of instructional media such as motion pictures, filmstrips, cassette tapes, and other audio-visual instructional aids.
5. ...to implement the program as a six-week course of study.

The activities developed in this project were designed to be used by an eighth grade class of students enrolled in the Westby (Wisconsin) Area School District. The unit of materials contains 27 individual learning activities and involves a six-week period of instruction. The program focuses on issues related to environmental deterioration. Air, land, and water pollution problems are the major topics of concern.

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CHAPTER 1

INTRODUCTION

Background

During the late sixties many Americans began to show an increased concern for the impact modern man has had on his surroundings. Problems of air, land and water pollution had already reached a critical state in many parts of the country. The devastating effect of man's interaction with nature, his wasteful practices and misuse of natural resources became issues that could no longer be ignored.

A national Earth Day on April 22, 1970 brought the issues of environmental deterioration sharply into focus. Many concerned citizens rose up in angry protest and demanded that some constructive action be taken to resolve our serious environmental problems. During that same year, our federal government made an official response to the public concerns by passing the Environmental Education Act of 1970. This action, in effect, gave birth to the concept of environmental education.

The Environmental Education Act was based on the contention that there was a need to establish a nation-wide system of environmental education. It was believed that education was a key factor in our efforts toward finding some practical solutions to our environmental problems. The process was designed to develop a new awareness among our citizens concerning the serious environmental problems that were facing us as a nation. The goal was to make Americans better informed and more sensitive to the issues of environmental deterioration. The

act demonstrated a special concern for the school-age children of the nation and implied that the public schools should assume a major responsibility for the process of environmental education.

Under the terms of the Environmental Education Act, the individual states were encouraged to develop master plans for environmental education. These guidelines could then be used by schools in their efforts to devise effective programs of environmental studies as a part of the normal school curriculum. Wisconsin was one of the many states that took an interest in such an effort. The following description outlines the major objectives of the Wisconsin State Plan for Environmental Education.

> Environmental education is a process of learning about man's inter-relationship with natural and man-made surroundings, developing skills and values for resource conservation, resolving resource use conflicts, maintaining a productive and healthy environment, and fostering motivation to apply skills and attitudes to assure our survival and to improve the quality of life. Environmental education includes all subjects because each offers insight into solving complex environmental problems, and it includes all grades because fostering positive values or attitudes requires time.
> (Kellner, 1970, p. 6)

Statement of the Problem

This paper describes the author's attempt to develop a series of environmental education learning activities. The activities and exercises developed in this project were designed primarily to be used by an eighth grade class of students as a part of the topics dealt with in a junior high school science course. The activities will be used for the first time during the 1979-80 school year in the Westby School District. The project consists of 27 individual learning experiences. A

set of learning objectives and the activities are included in the Appendix to this paper.

Purpose

The purpose of this action-learning project was:

1. ...to develop a unit of instructional materials related to environmental education.
2. ...to construct or select activities that are especially appropriate for junior high school-age students.
3. ...to include a wide variety of learning experiences in the program, including laboratory exercises and outdoor activities which could provide students with first-hand experiences in issues related to their environment.
4. ...to employ a wide range of instructional media such as motion pictures, filmstrips, cassette tapes, and other audio-visual instructional aids.
5. ...to implement the program as a six-week course of study.

Need for Project

Modern man has been able to make many profound changes in his environment. In this respect, he is unique among all creatures. Obviously, these environmental changes have not always been constructive or for the betterment of life on this planet. The serious problems we are facing today give evidence of the devastating effect man has had upon his surroundings. The present condition of our land areas, the quality of our air and fresh water supplies, and the diminishing reserves of our mineral

wealth serve as a constant reminder as to how our surroundings have been abused and nature's gifts have been misused.

Modern man has the intelligence and the ability to meet the crisis situation we are facing in terms of our environmental problems; but if a change for the better is to be made and solutions found for our multitude of problems, it can be accomplished only through a process of educating our citizens, young and old. To solve these problems, we need to re-educate ourselves about our responsibilities to nature. We need to change our attitudes, gain some new insight, and do away with some of our old habits and wasteful practices.

Education seems to be the key ingredient to finding solutions to the great problems we have created in our environment. People must be made fully aware of the possible consequences if we are to continue our past practices. In this process of education and making people aware, it would seem that our schools have a most important role to play. Educating our youth concerning issues related to our environment should be of the highest priority. For, if lasting change is to be effected and better environmental circumstances provided for future generations, we must reach and make an impression on those among us who will play a most active role in that future.

The author finds in his research and experience as a teacher that there is a limited amount of environmental education materials available for school-age children. Textbooks and other commercial publications often do not give an adequate amount of information concerning this topic. It appears that most of the printed materials dealing with this subject are geared toward the adult reader. In view of this, the author

was prompted to develop a series of learning activities especially designed for instructing junior high school students. An attempt was made to provide a great variety of learning experiences in an effort to stimulate an interest on the part of the learner. The activities were designed to incorporate a wide range of educational media. The exercises also included learning experiences which may take place both outside of as well as within the classroom.

The author feels that environmental education is an area that has been sorely neglected in many of our nation's schools. It is hoped that the set of learning activities included in this project will help make some small contribution in this area. If an awareness on the part of our youth can be created and in the process they can be made more knowledgeable concerning environmental problems and issues, this project has served a useful purpose and thus may prove to be a constructive venture.

CHAPTER 2

REVIEW OF LITERATURE

Environmental education really became a popular topic of concern in this country when Congress passed the Environmental Education Act of 1970. This action reflected the federal government's concern regarding the serious environmental issues of our times. A primary concern in this congressional action was to promote a nation-wide system of environmental education. The importance of environmental education is referred to in part of this act.

> Environmental education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it and the concern and responsible action necessary to assure our survival and to improve the quality of life. (HEW, 1971, p. 1)

The Environmental Education Act offered a challenge to public education. It encouraged the nation's schools to accept a part of the responsibility for providing for the nation-wide system of environmental education. Many educators were stimulated by this challenge and as a result new programs of environmental studies were developed for our schools, as evidenced by a recent study conducted by John F. Disinger. In 1976 he made a survey of the existing environmental education programs which were in operation throughout the country and found there were at least 207 individual environmental education programs being offered in public schools across the nation. (Disinger, 1976) Since some of these programs serve more than one school system, it is evident that several hundred school districts must be involved in some formal-

ized plan of environmental studies.

A national Earth Day on April 22, 1970 and the passage of the Environmental Education Act of 1970 marked the beginning of a new era of environmental awareness for the United States. Yet, while the interest in environmental education really became apparent in the early seventies, the concept is hardly a new one. Some schools were heavily involved in teaching about the environment long before the decade of the seventies. Prior to this time, the process now called environmental education was known as "outdoor education", and many of the topics now considered a part of environmental studies were similarly dealt with in these programs of outdoor education.

One of the earliest efforts in outdoor education was established here in Wisconsin. This program, now called the Trees for Tomorrow Environmental Center, has been in existence for some 35 years. The project originated at Eagle River, Wisconsin in 1944. (Wirsing, 1976) In the early years, the Center's prime concern was related to the conservation of our natural resources. Today, the Center's activities have been expanded to include a wide range of topics related to environmental issues. This program is unique in that it serves a wide variety of individuals in all age groups. The Center provides environmental education experiences not only for school-age children, but also for teachers and many other adult groups. According to the Center's director, Mr. Gene Wirsing, more than 125,000 people have participated in this program since it was first established in 1944. Today, the Center is operated and maintained through a joint effort by the U.S. Forest Service, the University of Wisconsin, the Department of Natural Resources, and a

number of other organizations.

Another early effort in teaching young people about nature and our environment was conducted by the Londonville, Ohio school system. This project was called the Mohican School in the Out-of-Doors Inc. (Reed, 1976) and began in 1961 as an experiment in outdoor education. Developed by a school district, Madison Local Schools, in Richland County, Ohio, in 1964, the program was expanded to include all of the district schools in the county. The program received some federal funding in 1965 and continued to grow. According to project director Ronald Reed, by 1976, well over 28,000 students had participated in the program.

In 1967, another early program of outdoor education was established at Waycross, Georgia. In this effort, four local school districts cooperated in the development and use of the Okefenokee Swamp as an outdoor environmental laboratory for grades K-12. (Berryhill, 1976) The overall purpose of the program was the development of attitudes which enhance the preservation and wise use of our natural resources, with special emphasis on a study of threatened and endangered species of both plant and animal life. Students involved in this program were offered first-hand experiences with nature through various field trips conducted through the swamp region. This project, called the Okefenokee Cooperative Educational Service Agency, has apparently been successful as it remains in existence yet today.

Another pioneer program in outdoor education was developed in 1968 by the Charlotte-Mecklenburg Schools of Charlotte, North Carolina. The first project instigated by this school was called the Outdoor Laboratory Program which involved providing students with first-hand experi-

ences with nature in an area of woodlands and fields adjacent to the school site. Since its inception, the program has been expanded into several environmental projects. The programs now in existence, other than the Outdoor Laboratory, include projects called Valuing the Environment, an Outdoor Education Camping Program, and a learning project called Man and His Environment. Students participating in these projects include grade levels, K-12. Charles T. Vizzini, one of the project directors, states a major objective for the programs offered: "We attempt to make our students sensitive to the natural environment and to develop within them a sense of responsibility for it, themselves and others." (Vizzini, 1976, p. 182)

Programs of outdoor education are still being developed today; as recently as 1974, a new program of outdoor education was established in Alabama by the Mobile County Public Schools. (Magnoli, 1976) This program, called Project COPEE, utilizes a 640-acre section of school property for environmental studies. This outdoor education site includes a large amphitheatre, a 20-acre lake, and four miles of nature trails complete with trail markers and species labels exhibiting various forms of plant life. Project director Dr. Michael Magnoli explains that the major objective of the program is "to expose students to the types of factual and unbiased information they need to become environmentally literate citizens capable of making wise decisions." (Magnoli, 1976, p. 4)

While many programs of outdoor education were established prior to 1970, the concept of environmental education was far less prevalent. One of the pioneer programs in environmental education, developed at

Billings, Montana in 1967, the Billings Cooperative Environmental Education Program, was a cooperative effort, including not only the local schools, but also a local college, and a conglomerate of federal and state agencies. These units worked together in a cooperative effort to provide environmental learning experiences for elementary students, grades K-6. The program included activities which took place inside the classroom and field experiences at a 1,400 acre outdoor site near the city. According to Ed Heiser, the program coordinator, "It is the objective of the school district to produce a student who is sensitive, knowledgeable, motivated, and equipped with problem-solving skills dealing with his environment." (Heiser, 1976, p. 153) The program has been highly successful, and in 1972, the American Association of Colleges for Teacher Education rated it as one of the top ten programs in the nation.

After the passage of the Environmental Education Act of 1970, funds were made available by the federal government through NDEA and ESEA to schools and other agencies for the development of environmental education programs. Some of these programs proved to be highly successful and a number of the more effective programs were approved for national dissemination. The unit plans and instructional materials were thus made available for adoption and implementation by school systems throughout the country.

One of the most impressive programs of environmental education was developed here in Wisconsin. This system, called Project ICE, was established at Green Bay in 1970. Project ICE (Instruction-Curriculum-Environment) offers a total K-12 curriculum and instructional program

for teaching environmental education. The project-developed teacher materials include a series of 39 ICE Environmental Education Guides for all grade levels and in all major subject areas. According to Robert J. Warpinski, the project director, "the primary goal is to lead students directly or subtly to awareness, appreciation, and action regarding vital issues, concerns, and factors shaping environmental attitudes and values." (Warpinski, 1976, p. 279) Project ICE has been a very effective program of environmental education, and, since July, 1975, it has been a member of the national dissemination network. Its instructional materials are being utilized by many school systems across the country.

Project KARE was another early program designed for teaching about the environment. (The acronym represents Knowledgeable Action to Restore our Environment.) The KARE program was developed and refined by a group of schools in Southeastern Pennsylvania during the years 1971 through 1975 to provide an effective approach for strengthening environmental studies in local schools. The program concentrates on a variety of environmental problems such as water pollution, air contamination, and other general issues of environmental deterioration. Students are encouraged to confront real environmental problems in an action-orientated, interdisciplinary system of instruction. The program serves students of all ability levels, grades K-12, and was approved for national dissemination in May of 1975. Since that time, over 200 schools across the nation have adopted the program. (Hickey, 1977)

One of the first programs approved for the national diffusion network was developed at Union, New Jersey. This project was called the Pollution Control Center - Priority One: Environment, and involved a

a 13-unit interdisciplinary program for grade levels 1-12. The emphasis was on values-clarification and decision-making activities as they relate to environmental issues and concerns. Pollution problems, the energy shortage, and conservation were the main topics of concern. The unit plans and instructional materials for the project were first approved for national dissemination in September of 1974. (National Diffusion Network, 1978)

The state of Florida also has an environmental studies program that has been approved for national dissemination. This program differs from the others in that it was designed especially for elementary students, K-8. It was developed in 1972 by a group of teachers at Jensen Beach, Florida as a hands-on, field orientated program of environmental education centered around an estuarine area on Florida's east coast. Students participating in the program must first undergo a period of classroom instruction before they become engaged in the field experiences. Environmental concepts presented in the classroom instruction are reinforced by a once-a-year field trip to the estuarine area. In December, 1975, the materials in this program were made available for adoption by other schools around the country. (Jarret, 1976)

In 1974, the LaSalle-Peru Township High School of Illinois developed a program of environmental studies called Project CREATION, interdisciplinary in approach, and designed especially for high school students. The program involves either a one-semester or a two-semester course of study, divided into four major categories: Land Use, Pollution, Urban Management, and Energy Issues. Each of these major categories is subdivided into a number of related units. A student studies

one unit under each category per semester. The program is unique in that students are allowed to select topics (units) that are of a particular interest to them as individuals. This project was made available for national dissemination in June, 1978. (Hauser, 1976)

The Highland School District of Seattle, Washington has designed one of the most extensive programs of environmental education, Project ECOLOGY, developed by the professional staff at the school. Individual teachers helped create a total of some 58 separate units for teaching about the environment. The program, focusing on nearly all environmental issues of concern, is interdisciplinary in its approach, serving students in nearly all levels, K-12. This program is also a member of the National Diffusion Network. Its materials were made available for adoption by other schools in December of 1975. (National Diffusion Network, 1978)

This study indicates that a number of Wisconsin schools have taken an active interest in environmental education. Some of our schools have adopted materials from Project ICE and the other national dissemination projects. In addition to this, a number of schools have developed and implemented their own systems of study.

A program of environmental studies called Ecology and Human Values was developed by the Sun Prairie Schools in 1972. The program was designed especially for senior high school students, grades 11 and 12. The curriculum emphasizes four units of study dealing with ecology, science and technology, energy issues, and food and population. The program is made available as an elective course for interested students. (Thomas, 1976)

The Melrose-Mindoro Public High School is also recognized for offering a program of environmental studies. In 1978, Mr. Stanley Strainis, a science instructor at the high school, developed a curriculum guide for environmental education. His guide is designed for a semester-length course of study. The materials in the program are divided into a four-unit system of study. Many laboratory exercises and learning experiences which take place outside of the classroom are included in the program. (Strainis, 1978)

It is noted by the Disinger Survey that programs of environmental studies are being offered by a number of Wisconsin schools other than those already described in this paper. Programs of environmental education are also known to exist at Brussels, Chetek, Fennimore, Milwaukee, Poynette, Stevens Point, and at Wausau, Wisconsin. (Disinger, 1976) There may also be other projects in existence that have not been widely publicized.

This author's study reveals that a great number of environmental education programs are in existence throughout the country. Most of these projects have only been developed in recent years. Yet, it is noted that some were established many years prior to the early seventies, when environmental education really became a matter of national concern. The early ventures originated as programs in outdoor education, with concerns primarily related to nature study and conservation. The new programs of environmental studies are, in many ways, merely an extension of the early processes, but there is now more emphasis placed on showing a concern for the total environment. Problems related to pollution and environmental deterioration are among the popular topics

being dealt with in today's programs. Such concerns were practically nonexistent in the early studies.

A most notable characteristic of the new programs is the fact that they are multidisciplinary in their approach. Hungerford reflects on the early programs and notes that environmental studies were once exclusively dealt with only in the science-related subjects. The science teachers were expected to assume the total responsibility for instructing students in topics related to nature and the environment. Today, the more effective programs show a concern for the interdisciplinary approach. In such a system, teachers in all subject areas and students at all levels become actively involved in the process of environmental education. Hungerford expresses his views about the importance of the multidisciplinary approach:

> "Certainly, environmental education need not be relegated solely to the science staff. A sound instructional approach is the team effort across the disciplines represented in a departmentalized situation. Environmental education is multidisciplinary and, where personnel can plan and work cooperatively, a team approach would more appropriately reflect the true nature than any other strategy." (Hungerford, 1976, p. 7)

CHAPTER 3

METHODS

Introduction

This project originated because of the writer's interest in environmental education and the desire to develop a unit of instructional materials for teaching environmental education. The unit of activities contained in this project was designed especially for use with junior high school-age students. It is hoped that the learning experiences included in this program will help provide students with a better understanding of their environment and also make them more knowledgeable about the critical environmental issues of our times.

Procedure

Prior to developing the unit of instructional materials contained in this project, an investigation was undertaken of the projects and programs which had been previously developed in the area of environmental education. There was a special interest in the nature of the programs and the characteristics of the instructional materials which were being used by some of the more effective projects. The study involved correspondence with the project directors of several of the more successful programs in environmental studies resulting in valuable information being obtained. The research also involved a study of the literature related to the history and development of environmental education. ERIC (the Education Research Information Center) and the Education Index

were used as a source for reference materials in this research. The information obtained in this study provided some direction to the research effort of this project.

The first consideration in developing the materials included in this project involved the attempt to establish a set of instructional goals for the unit. The activities contained in this program are intended to serve the four major objectives outlined below:

(1) ...to help students develop a basic understanding of the concepts of environment, ecology, conservation, and other terminology related to the topic of this study.

(2) ...to provide students with pertinent information and first-hand experiences which will enable them to identify the major environmental problems we face in our society.

(3) ...to build an awareness and a concern within each student so that they might realize the seriousness of the problems described.

(4) ...to provide learning experiences which will help develop positive attitudes so that students might be encouraged to take an active part in helping to solve the critical environmental problems facing our nation.

Each of the individual activities included in this project were designed to contribute toward fulfilling the intent of these expressed goals. This was the major criteria used in the selection of each of the unit exercises. While the above described objectives are rather broad goals, each of the individual activities also has more specific objec-

tives described within them. These more specific objectives are defined at the beginning of each of the unit exercises.

The activities in this unit of instruction were obtained in a variety of ways. Some were selected from commercially prepared materials. A number of them were constructed by the writer through utilization of his own knowledge and personal experiences. The remainder were prepared by other educational groups and were adopted for this program. Most of these activities were redesigned or modified so as to meet the instructional objectives.

The activities in this unit have been arranged in a logical sequence. The initial exercises serve as an orientation toward environmental education for the students participating. Environmental terms are defined and basic concepts are introduced and explained. Many of the activities are related to identifying and exploring the major sources (or causes) of our environmental problems. The problems of air, land and water pollution are extensively dealt with. Other factors related to environmental deterioration are also investigated. The exercises are geared toward helping the students become more knowledgeable about environmental concerns. Some of the activities are designed to take students outside of the classroom where they might make a close investigation of their own immediate surroundings. It is hoped that such learning experiences will help build a new awareness on the part of each student and also cause them to develop a genuine concern for the present state of our environmental circumstance.

A wide assortment of instructional materials have been used in constructing this unit of activities. Various forms of educational media

are incorporated into the program. Motion pictures, cassette tapes, filmstrips and other audio-visual materials are used extensively. These materials provide for a variety of instructional activities and thus should stimulate more interest on the part of the students who are involved with the program.

CHAPTER 4

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

The purpose of this project was to develop a unit of instructional materials for environmental education. The activities in the project were especially designed for an eighth grade class of students enrolled in the Westby Area School District. There are 27 individual activities included in the unit. They provide for a variety of learning experiences and will involve an approximate six-week period of instruction.

Conclusions

There has not been the opportunity to use the complete unit of instructional materials contained in this project; however, the few that have been utilized for instructional purposes have been well received by the students participating. It is still too early to determine how effective this project might prove to be. The complete unit of activities will be used during the 1979-1980 school term. The effectiveness of the activities for instructional purposes can be more accurately determined after they have been used over a period of time.

An instrument will be constructed to help test the overall effectiveness of this unit. Such an assessment will involve both pre-test and post-test evaluations of each student's performance. The results of such an assessment will be used to revise particular activities and to improve the total instructional program, if necessary. Some of the

activities may need to be redesigned or replaced after a trial period. New activities or learning experiences will be added when the need arises. Continued updating of the content of the unit will occur in an effort to make it as effective as possible.

Recommendations

The unit of activities included in this project was designed for use in conjunction with teaching a junior high school science course. Traditionally, environmental education in the school curriculum has been handled by the science department. Yet, Hungerford and Peyton advise us that environmental education need not be dealt with exclusively by the science staff.

> Environmental education is an entity to itself, not to be confused with any other particular discipline or method in the educational enterprise. It is multidisciplinary, drawing from science, social science, language arts, and mathematics. Implementation may involve the creation of a distinct environmental education course or curriculum. Or, it may exist as strands threaded throughout the many facets of a multidisciplinary curriculum. Its methods involve inquiry training, value clarification, and outdoor education. Environmental education can probably best be described as any educational endeavor that focuses on the culturally imposed, ecologically related problems in man's environment. It is, further, that process which allows human beings to acquire and apply human values with respect to environmental issues. (Hungerford and Peyton, 1976, p. 10)

The writer believes that teaching about our environment is a responsibility that should be shared by all teachers. Every educator can make a contribution regardless of what their level, specialty, or subject area might be.

It is recommended that the activities included in this project be

tried in the classroom. The activities may be incorporated into various fields of study and need not be thought of as topics exclusively related to science. Many of the exercises can be adapted to fit mathematics, social studies, language arts, and other subject areas within the school's curriculum. Some valuable learning experiences can be provided for students using these exercises. Teachers are urged to use them to the best advantage.

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APPENDIXES

ENVIRONMENTAL EDUCATION INSTRUCTIONAL UNIT FOR JUNIOR HIGH SCHOOL GRADES

The unit of materials contained in this project was designed to be used with junior high school-age students. The unit contains 27 individual activities related to environmental education. The activities provide for a variety of learning experiences and will involve an approximate six-week period of instruction. The major focus of the unit is on issues related to the problems of environmental deterioration. Many of the exercises are involved with having students identify and explore the major sources (or causes) of our environmental problems. Issues related to air, land, and water pollution are extensively dealt with. Other contributing factors regarding environmental deterioration are also investigated.

The activities contained in this unit of instruction are intended to serve the four major objectives outlined below:

(1) ... to help students develop a basic understanding of the concepts of environment, ecology, conservation, and other terminology related to the topic of this study.

(2) ... to provide students with pertinent information and first-hand experiences which will enable them to identify the major environmental problems we face in our society.

(3) ... to build an awareness and a concern within each student so that they might realize the seriousness of the problems described.

(4) ... to provide learning experiences which will help develop positive attitudes so that students might be encouraged to take an active part in helping to solve the critical environmental problems facing our nation.

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UNIT ACTIVITIES

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UNIT ACTIVITIES

LEARNING ACTIVITY NO. 1

"Environmental Problems - Introduction to the Study"

SUBJECT AREAS: Science; Social Studies

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Become familiar with the concept of environment and other terminology related to this study

(2) Be able to identify some of the major environmental problems we face in our society

(3) Define and show examples of various types of environmental pollution

RESOURCES: Sound filmstrip: "The Problems - What Can We Do?" (Source: The Nystrom Company, Chicago, Illinois)

Filmstrip checklist for student responses

PROCEDURE: The Instructor Shall:

(1) Have the class view the sound filmstrip as a group. This will help serve as an introduction to this unit of study on the environment.

(2) Give the students the opportunity to reflect upon the concepts presented in the filmstrip. They should then be instructed to make a written response to the questions stated on the filmstrip checklist.

(3) Use the questions listed on the student response exercise as a basis for a class discussion.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 1

"Environmental Problems - Introduction to the Study"

Read this section before you view the filmstrip. After you have seen the filmstrip, use your information to answer the following set of questions.

1. What is meant by the term environment?

2. Why are we concerned about our life support system?

3. What are some of our major environmental problems?

4. How are we polluting our environment? List the various types of pollution which exist in our environment.

5. Why is pollution becoming a more serious problem?

6. How does the increasing world population affect environmental pollution?

7. What is needed for environmental problems to be solved?

8. What can we as individuals do to help solve some of our environmental problems?

LEARNING ACTIVITY NO. 2

"Pollution Evidence In Our Community"

SUBJECT AREAS: Social Studies; Science; Language Arts

INSTRUCTIONAL SETTING: Classroom and Outdoor Activity

OBJECTIVES: The Student Shall:

(1) Recognize various types of pollution problems which may exist in the local community

(2) Locate and cite examples of environmental deterioration

(3) Identify causal factors related to environmental pollution and offer possible solutions for the problems which may exist

(4) Make a comparison between a healthy and a polluted environment

RESOURCES: Film: "Pollution" (Source: Screenscope Inc., 1022 Wilson Blvd., Arlington, Virginia)

Student activity sheet for recording examples of environmental pollution

PROCEDURE: The Instructor Shall:

(1) Allow the class to view and discuss the film which cites examples of various forms of environmental pollution.

(2) Give the students directions for completing the activity related to investigating the local community for evidence of environmental pollution.

(3) Provide the students with the opportunity to present the results of their investigation during a class discussion period. The possible causes of pollution problems should be explored. Ask students to offer some possible solutions for the problems discussed.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 2

"Pollution Evidence In Our Community"

Many types of visual pollution may be easily observed and then recorded. A visually polluted environment might include litter in the park, on the school grounds, along the streets, or on private property. These are factors giving evidence of land pollution. Other examples related to this form of pollution might include dirty buildings, crowded or poorly maintained housing or trash heaps in empty lots. Examples of air, water, and noise pollution may also be evident in the community.

Look around your community. Locate and list examples of visual pollution that are readily apparent. If your community shows little or no evidence of visual pollution, state examples of what a healthful environment might represent. Spaces are provided for you to list examples of both negative and positive factors related to your environment. After having completed your investigation, report your findings in class during the discussion related to this activity.

Examples of Visible Environmental Pollution	Location
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Examples of a Healthful Environment	Location
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

LEARNING ACTIVITY NO. 3

"Technology - Problems and Solutions"

SUBJECT AREAS: Science; Social Studies

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Develop an understanding for the fact that man is able to cause profound changes in his environment

(2) Recognize that man's intellect and technology have allowed him to make many constructive changes to his surroundings, but that such changes have often had harmful side effects and have created new environmental problems in the process

RESOURCES: Sound filmstrip: "The Problems - What Can We Do?" (Source: The Nystrom Company, Chicago, Illinois)

Student activity sheet; reference books and other printed materials related to environmental problems

PROCEDURE: The Instructor Shall:

(1) Review the concepts presented on the filmstrip with the class.

(2) Read the directions for the student activity to the class.

(3) Give an example of one technological development that has benefited man, yet one that has also created some new problems in the environment.

(4) Discuss the results of the student research after they have completed the activity. Encourage each class member to contribute one example related to the research work.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 3

"Technology - Problems and Solutions"

Have you ever solved a problem and then discovered that your solution created a new problem? Throughout history, man has tried to find new ways to solve old problems. For example, man has faced the problems of growing enough food. Sometimes he has solved the problems by growing more crops. This has led to more damage to the crops by insect pests.

At times, insect pests have eaten total crops, leaving little for man. Within the last thirty years, we have developed and used chemicals to kill these pests. Many of the sprays and powders have been very good for killing the insects. But!! Some of the sprays and powders have affected other kinds of life. These chemicals poisoned other animals and plants. Such harmful effects in the environment are new problems that were caused by the attempt to solve old problems.

Below is a list of things developed to make our lives better. In the space provided, write down how each item has made our lives better. Also, write down some of the unexpected problems caused by the solution. You may want to add some of your own examples to the list. (Use the reference materials provided by your teacher for the research.)

Development	Benefit	New Problems Created
Gasoline for Automobiles		
Phosphate in Laundry Detergents		
Plastic Food Wrap; Garbage Bags		
Disposable Bottles and Cans		
Plant Fertilizers		
Insecticides and Weed Killers		
Jet Airplane Engines		

LEARNING ACTIVITY NO. 4

"Investigating Air Pollution"

SUBJECT AREAS: Science; Social Studies

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Be able to identify the major pollutants in the air and the possible causal factors

(2) Understand and describe the effects of air pollution in the environment

RESOURCES: Sound filmstrip: "Air: Pure or Polluted?" (Source: The Nystrom Company, Chicago, Illinois)

Filmstrip checklist for student responses

PROCEDURE: The Instructor Shall:

(1) Have the class view the filmstrip as a group.

(2) Assign the filmstrip checklist activity after the class has viewed the filmstrip.

(3) Use the checklist study question exercise as a basis for a class discussion.

(4) Ask students to cite examples of air pollution which may exist in the local area. Explore the possible causes for the examples given and have the class consider any possible solutions to the problems mentioned.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 4

"Investigating Air Pollution"

Read this set of questions before you view the filmstrip which discusses air pollution problems. After you have seen the filmstrip, use your information to answer the questions stated below.

1. What is air pollution?

2. What are some of the major sources of air pollution?

3. Name some of the common air pollutant substances.

4. Of the various contributors mentioned in the filmstrip, which factor was identified as being the major cause of air pollution?

5. What is smog?

   How is it formed?

6. Why is air pollution a matter of serious concern in our nation?

   What effects does air pollution have on our environment?

LEARNING ACTIVITY NO. 5

"Air Pollution - Graph Construction"

SUBJECT AREAS: Science; Mathematics

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Identify the major sources of air pollution

(2) Compare and illustrate the major contributors to air pollution in graphic form

(3) Use mathematics to calculate percentages for use in constructing a circle graph

RESOURCES: Informational table from the Public Health Service indicating the major causal factors related to air pollution

Paper for constructing a circle graph; protractor; compass; pencil; and a ruler (materials needed for each student)

PROCEDURE: The Instructor Shall:

(1) Furnish each student with the materials listed above.

(2) Help students interpret the information presented in the chart related to air pollution sources.

(3) Guide students in the construction of the circle graph.

(4) Discuss the questions which appear on the student activity sheet with the class. (After the students have completed the graph construction exercise)

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

STUDENT ACTIVITY - ASSIGNMENT NO. 5

"Air Pollution - Graph Construction"

Use the information given in the chart on sources of air pollution to answer the questions stated below:

1. What is the source for the information presented in the chart?

2. Of the sources listed in the chart, what is the source of the greatest amount of pollutants in the air?

   What is the source of the smallest amount of pollutants in the air?

3. Which type of pollutant gas is most abundant?

   Which form (substance) contributes the least amount?

4. Identify which source of pollution contributes the largest percentage of each of the following pollutants:

   carbon monoxide _____ oxides of sulfur _____

   hydrocarbons _____ oxides of nitrogen _____

5. Calculate the approximate percentage of air pollution contributed by each of the following sources:

   Motor Vehicles _____% Space Heating _____% Industry _____%

   Refuse Disposal _____% Power Plants _____%

6. Use the answers you recorded in question 5 to construct a circle graph showing a comparison of the various sources of air pollution. (Your teacher will assist you in construction of the graph if necessary.) Remember, a full circle contains 360 degrees!

ACTIVITY NO. 5 (Air Pollution Information Chart)

AIR POLLUTION

(Kind of Pollutant - in millions of tons)

Source of Pollution	Carbon Monoxide	Oxides of Sulfur	Oxides of Nitrogen	Hydro-Carbons	Particulates	Total
Motor Vehicles	66	1	6	12	1	86
Industry	2	9	2	4	6	23
Power Plants	1	12	3	less than 1	3	20
Space Heating	2	3	1	1	1	8
Refuse Disposal	1	less than 1	less than 1	1	1	5
Total	72	26	13	13	12	142

* SOURCE: Public Health Service - Publication No. 1548, "The Sources of Air Pollution and Their Control"

LEARNING ACTIVITY NO. 6

"Bad Air and Poor Health"

SUBJECT AREAS: Science; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize the harmful effects of air pollution on the human body

(2) Use reference materials to locate and record information pertinent to a given topic

RESOURCES: Student activity sheet listing common air pollutants and an illustration of the human body

Encyclopedias; medical dictionaries; other reference materials related to this topic

PROCEDURE: The Instructor Shall:

(1) Describe some of the effects of air pollution on the human body. Cite some examples of how contaminated air can affect human populations. (An example such as the one listed at the bottom of this page may be used.)

(2) Assign the student research activity related to bad air and poor health. Assist the students in locating the required information.

(3) Have the students make an oral report of their research during a class discussion.

ACTIVITY TIME LENGTH: ½ Day

EXAMPLE: Donora, Pennsylvania

The town is located in a river valley and is crammed with various industries. In October 1948, Donora had a cold fog which trapped the air pollutants emerging from the factories. The population was 14,000. Six thousand became ill. Twenty deaths were recorded. Sore throats, chest constriction, headaches, breathlessness, burning and tearing eyes, running nose, vomit, and nausea were common complaints.

LEARNING ACTIVITY NO. 6

"Bad Air and Poor Health"

Air pollution affects our health in many ways. Various parts of our bodies are damaged by air contaminants, even when we may not be aware of the pollution.

Using an encyclopedia, medical dictionary, or other reference materials, find the information you need to complete the chart shown below. (You may wish to add other pollutants to the list.)

POLLUTANT IN AIR	MAIN SOURCES	BODY PARTS AFFECTED
Carbon monoxide -		
Sulfur dioxide -		
Nitrogen oxides -		
Hydrocarbons -		

* Your teacher will provide you with a simple illustration of the human body. When you have completed the chart above, use the drawing to identify the organs (or body parts) that are affected by pollutants in the air.

LEARNING ACTIVITY NO. 7

"Air Pollution - Student Experiment"

SUBJECT AREAS: Science; Language Arts

INSTRUCTIONAL SETTING: Classroom and Outdoor Activity

OBJECTIVES: The Student Shall:

(1) Use scientific experimentation to gain information

(2) Examine the air in the local community for the presence of pollutant particulates

(3) Identify the various sources or causes of air pollutant particulates in the air

RESOURCES: Unlined white index cards, (3 x 5 inches); a large jar of petroleum jelly; a large roll of transparent food wrap; cellophane tape; a magnifying glass; and a student direction form for the experiment

PROCEDURE: The Instructor Shall:

(1) Give examples of various pollutant particulates which are common forms of air contaminants.

(2) Review the directions of the experiment with the class. Define the purpose of the activity; and provide each student with the materials listed above.

(3) Have the students describe the types of pollutants they have discovered after they have completed the experiment. Ask students to identify the sources of each form of pollutant particulate they have obtained in their traps.

ACTIVITY TIME LENGTH: 7 Days

LEARNING ACTIVITY NO. 7

"Air Pollution - Student Experiment"

Particulates are tiny pieces of soot, ash, and unburned specks of materials that pour out of incinerators, smoke stacks, burning dumps, and other sources where fuels and other materials are burned. A trap for collecting particulates can be easily made. Use the materials supplied by your teacher to construct a device for trapping these air pollutants. This activity will help you identify the particulates which contaminate the air where you live. Follow the directions given below:

1. Choose a window at home that you can open easily and safely. You will set your traps at this window.

2. Make two stacks of index cards, seven in each stack. Label all the cards in one stack with OUTSIDE. Label all the cards in the other stack with INSIDE.

3. On the first card in each stack, write FIRST DAY. On the second, write SECOND DAY. Label each of the cards in the stacks through the seventh day.

4. Spread a thin layer of petroleum jelly on the labeled side of the first card in each stack.

5. Tape the first OUTSIDE card to the outside window ledge or window surface. Tape the first INSIDE card to the inside ledge or surface of the same window.

6. Twenty-four hours later, collect the two cards. Cover the surface coated with jelly by placing transparent food wrap about it.

7. Spread petroleum jelly on the cards labeled SECOND DAY. Tape them in the same places as before.

8. Observe the cards each day as you replace them. On the back of this sheet describe the sizes, shapes, colors, and numbers of particulates that have been trapped on the cards each day. Compare the INSIDE and OUTSIDE traps and record any differences. Continue setting the traps and observing and recording the results for 7 days.

9. Write a short summary of the results of your experiment. Include information that will answer the following questions:
   A. Did you find more particulates inside or outside?
   B. Did you find more particulates on days in the middle of the week or on days at the end of the week?
   C. Are particulates a serious problem in the area where you live? Explain your answer.

LEARNING ACTIVITY NO. 8

"The Effects of Air Pollution on Plants"

SUBJECT AREA: Science

INSTRUCTIONAL SETTING: Classroom (Lab Activity)

OBJECTIVES: The Student Shall:

(1) Discover the effects of air pollutant gases on plant life

(2) Use scientific experimentation to gain information and draw conclusions

RESOURCES: Sodium bisulfite solution; dilute sulfuric acid; a medium-sized beaker; a graduated cylinder; a large cardboard box; marking pen; a watch or clock; and 4 potted Coleus plants of the approximate same size

Student background sheet describing the experiment

PROCEDURE: The Instructor Shall:

(1) Describe the nature of the experiment the students will conduct.

(2) Explain to students that the gas they are making (sulfur dioxide) is one of the more common air pollutants found in or near large cities. (Caution students to use extreme care in handling the sulfuric acid.)

(3) Ask the class to predict the effects that sulfur dioxide will have on the plants.

(4) Assign several students per group for carrying out the experiment. (Four Coleus plants will be needed for each group conducting the experiment.)

(5) Discuss the results of the activity after the students have completed the experiment.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 8

"The Effects of Air Pollution on Plants"

One of the gases which pollutes the air, especially in and near large cities, is the gas called sulfur dioxide. This gas comes from the burning of all kinds of fuels. As you may know, sulfur dioxide affects people. It also affects other living things in the environment. In this activity you will discover how sulfur dioxide affects plants if it is present in large amounts in the air.

You will work with other students while conducting this experiment. However, each person should record the data and answer the questions which are related to this experiment. Follow the instructions given below:

(1) Place some sodium bisulfite solution in the beaker until the beaker is one fourth full. Using a graduated cylinder, add about 20 ml of dilute sulfuric acid to the sodium bisulfite solution. Then quickly place the beaker inside the cardboard box. Close the box tightly. The reaction between the sodium bisulfite and the sulfuric acid will cause the gas called sulfur dioxide to be made in the box. Place the box inside a large plastic bag to help keep the gas trapped.

(2) Place the four potted plants near the box and bag. Using a marking pen, label each pot with a letter (A, B, C, and D). Plant A should not be placed in the box. This plant will be the control. In other words, you will compare all the plants that have been exposed to sulfur dioxide with Plant A.

(3) Open the bag and box, and place plant D in the box. Note the time you placed it in the box. Close the box and bag tightly. After ten minutes, open the bag and box, and place Plant C in the box. After ten more minutes, place Plant B in the box and bag tightly. When Plant B has been in the box for ten minutes, remove all the plants from the box, and close the box. Describe the differences among the four plants.

_____

_____

_____

_____

_____

(4) Use the results you obtained from the experiment to answer the following questions.

A. What effect did the amount of time in the box have on the condition of the plants?

B. From what you have seen, do you think sulfur dioxide is harmful to plants? _____ Explain your answer.

C. Do you feel that people should be concerned about the amount of sulfur dioxide in the air?

D. How did the results of this experiment compare with your expected outcome?

LEARNING ACTIVITY NO. 9

"The Peppered Moth - Air Pollution Effects on Animals"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize the harmful effects of man's activities on the environment and other forms of life

(2) Understand the concept of natural selection

(3) Discover that all organisms must adapt to changes in their environment if they are to survive

RESOURCES: Ditto sheet on the Peppered Moth story for each student

Student study question sheet related to the Peppered Moth reading assignment

PROCEDURE: The Instructor Shall:

(1) Furnish each student with a copy of the Peppered Moth story and the set of study questions related to the reading.

(2) Ask students to read the story and make a written response to the study questions for the story.

(3) Use the story and the study questions as a basis for a class discussion. Describe man's effect on his environment. Emphasize the positive and negative factors related to man's interaction with nature. Discuss the effects of man's activities on other forms of life.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 9

"The Peppered Moth - Air Pollution Effects on Animals"

The story of the Peppered Moth shows how natural selection caused at least one characteristic of an animal species to change when an environment changed. One hundred years ago, most of the members of this species were white with black, pepper-like spots. Some, however, were dark. Today, most of the members of the species are dark. This is the story of how the change occured.

In England, there are many birch trees. A hundred years ago they had white bark, spotted with patches of darker mosses. When the white peppered moths sat upon the trunks of the trees with their wings spread, they were very difficult to see. The members of the species that were dark all over were quite easy to spot.

Several species of birds feed upon moths. You can imagine which variety of the peppered moths they found most easily! Both dark and light moths were eaten, but many more of the dark moths were eaten.

Gradually, in the cities of England, factories were built. These factories burned coal to run their machinery, and from the smokestacks poured tons and tons of soot. The soot settled upon the countryside, causing the bark of the birch trees to look black instead of white.

In areas where there were factories, the dark moths had an advantage over the light moths. With wings spread, the light moths were easily seen by the birds, but the darker ones were difficult to see. So more of the darker moths survived to reproduce. And their offspring, since they inherit the characteristics of their parents, were more likely to be the dark color also. That is why today, in most places in England, there are more dark moths than white ones with the peppered spots.

The only places where the light moths still make up the larger part of the population are the places where there are no large factories nearby. Here, the trees are still white, and it is an advantage for the moths to be white with peppered spots.

Questions to the Peppered Moth reading

1. What color were the moths 100 years ago before the industrial revolution?

2. What did the trees look like before the industrial revolution?

3. What color were the moths that were easy for the birds to catch? (100 years ago)

4. What happened to the color of the trees as factories were built up in England?

5. Which moths were easily spotted by birds after the factories were built?

6. Which kind of moths would most likely be found after the factories were built?

7. Which moths would most likely die out? Peppered? Black?

8. What is this process called?

9. What does natural selection mean? (Use a science reference book to locate a definition.)

10. How is man responsible for the changes that occured in the Peppered Moth population?

11. Can you identify any other forms of animal life which have been disturbed as a result of man's activities? (List some examples and explain the circumstances.)

LEARNING ACTIVITY NO. 10

"The Water Cycle"

SUBJECT AREAS: Science; Art

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize the importance of water in our environment

(2) Develop an understanding for one of nature's natural cycles

(3) Recognize the fact that our supplies of fresh water are not limitless

(4) Understand the effects of pollution on our supplies of fresh water

RESOURCES: Student background sheet on the water cycle; a supply of drawing paper for the student's illustrations of the water cycle

Science texts and other reference materials that give a detailed description of the water cycle

PROCEDURE: The Instructor Shall:

(1) Describe the importance of water as one of our most precious natural resources.

(2) Briefly describe some of the various stages that water goes through in this natural cycle.

(3) Direct students to reference materials which will give more detailed information on the water cycle.

(4) Ask students to make a drawing showing the various steps that water goes through in the water cycle.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 10

"The Water Cycle"

Many of the natural resources provided for us by nature seem to be in an almost endless supply. This is because Mother Nature processes some of our resources so that the supply might be used by us over and over again. Such events, carried on my nature, are called natural cycles. The water cycle is but one of these continual processes. Because of the water cycle, man is assured of a never-ending supply of fresh water. In this process, nature collects, cleans, and recycles our supply of fresh, clean water. Even much of our polluted water can be restored in this system.

Your science text, or the materials provided by your teacher, will provide you with more information concerning the water cycle. After you have obtained more information about this natural process, complete the following assignment as described below:

(1) Make a drawing showing the various steps or stages that water goes through in the water cycle.

(2) Be sure to label all of the important steps in the cycle.

(3) Below your illustration, give a brief, written description of what takes place in each step of the cycle.

LEARNING ACTIVITY NO. 11

"Community Survey on Water Needs"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Field Trip and Classroom Activity

OBJECTIVES: The Student Shall:

(1) Investigate the sources that man has available for his supplies of fresh water

(2) Develop an understanding for the processes involved with cleaning, treating, and recycling water resources

RESOURCES: Student survey questionnaire form

PROCEDURE: The Instructor Shall:

(1) Make arrangements with the local water department for the class to visit their plant and facilities.

(2) Advise students of the planned field trip and explain the purpose of the activity.

(3) Ask students to review the questions given on their survey forms for this field trip. (These are questions they should obtain information for while visiting the water department plant.) Also, encourage students to raise any of their own questions during the interview.

(4) Use the survey questions to summarize what was observed and learned during the field trip.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 11

"Community Survey On Water Needs"

No matter how much you read or hear about water pollution, little of the information is useful if you don't know anything about the water you use. This activity will help you gain more information about the sources of our fresh water supplies. After completing the activity, you will also have a better understanding of the processes involved with cleaning, treating, and recycling our water resources. Answering the following questions will help. You will obtain all the information you need during the class field trip to the local water department.

1. What is the name of the person interviewed and what is his position?

2. Where does your community get its fresh water supply?

3. Why do we obtain it from this source?

   Are there any other sources where the city could obtain water?

4. Has the community ever had a water shortage? If so, when?

   Why did these shortages occur?

5. Is the city recycling any water? Are there any plans to do this in the future? Why or why not?

6. Does the city supply water to any large industries? If so, how much of the water supply is utilized by these consumers?

7. How much water is distributed daily to the residential areas of the community?

   On the average, how much does each home consume on a daily basis?

8. Does the community have any reservoirs or water tanks? If so, where are they? How large are they?

9. Does your community have an adequate water system? How could it be improved?

10. What actions should be taken to make the water in the community more healthful?

LEARNING ACTIVITY NO. 12

"Water Pollution - Field Trip"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom and Outdoor Field Trip

OBJECTIVES: The Student Shall:

(1) Develop an understanding of what water pollution is, what causes it, and what some of the major effects are on the environment

(2) Locate and describe some conditions of water pollution which may exist in the local community

RESOURCES: Sound filmstrip: "Water: Clean or Contaminated," (Source: The Nystrom Company, Chicago, Illinois)

Student activity exercise - filmstrip checklist

PROCEDURE: The Instructor Shall:

(1) Have the class view the sound filmstrip as a group.

(2) Assign the filmstrip checklist questions. After the students have completed their written responses, use the questions as a guide for discussing the content of the filmstrip.

(3) Plan a field trip to a nearby lake, river, or stream. Ask the students to look for evidence of water pollution. Have them record what they observe. After returning to school, allow the students to present their findings during a class discussion.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 12

"Water Pollution - Field Trip"

Read the questions listed in this exercise before your class views the filmstrip, "Water: Clean or Contaminated." After you have seen the filmstrip, you will use the information to answer these questions.

1. List the three main sources of water pollution identified on the filmstrip.

2. How do industries pollute our water?

3. How does agricultural run-off contribute to water pollution?

4. In what ways do you and your family add to the water pollution problem?

5. Nature is also sometimes responsible for polluting water. Why is this so? (Give some examples.)

6. What is meant by thermal pollution?

   How does this condition affect plant and animal life?

7. What is meant by eutrophication?

   What affect does this condition have on plant and animal life?

   Can you name a location in your community where this condition exists?

FIELD TRIP DIRECTIONS:

Your class will visit the small stream which flows through our community. While there, find if there is any evidence of water pollution in or near the body of water. Make some notations on what you see. (You will be asked to report on what you observe.)

LEARNING ACTIVITY NO. 13

"Water Analysis - Laboratory Activity"

SUBJECT AREA: Science

INSTRUCTIONAL SETTING: Classroom - Laboratory Exercise

OBJECTIVES: The Student Shall:

(1) Determine the quality of water from various sources by properly sampling and analyzing the samples

(2) Use scientific experimentation to gain information

(3) Identify the various types of pollutants which contaminate water

RESOURCES: Covered glass jars (pint size); microscope; and microscope slides

Student activity response exercise

PROCEDURE: The Instructor Shall:

(1) Ask students to collect water samples from various sources prior to the time the laboratory activity will be conducted.

(2) Read the directions to the student laboratory exercise and explain the purpose of the activity.

(3) Direct students to proceed with the activity either individually or in small groups. (At least six water sample jars will be required for each group.)

(4) Discuss the results of the activity after the students have analyzed the various water samples. Ask students to identify the various types of contaminants present in the water samples. (Students should be reminded that water which appears clean and clear may not be necessarily free of all the various contaminants.)

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 13

"Water Analysis - Laboratory Activity"

Think about the area where you live. Is there a pond, river, lake, drainage ditch, stream, well, or spring nearby? How is the water in these places? To find out, collect samples from several of these places. Each sample should be collected in a clean, transparent container. It should hold at least two cups of water.

In Collecting the water sample, get some mud or other material from the bottom as well. Mark each container to show where and when you collected the sample. Number each container. Let each sample settle for at least two hours. Then examine the sample against a strong light source. (Use a microscope for close investigation.) Record your observations in the chart below.

JAR NUMBER AND SOURCE	ODOR, IF ANY	COLOR, IF ANY	SOLID PARTICLES PRESENT	MICROSCOPIC LIFE OBSERVED
1				
2				
3				
4				
5				
6				

LEARNING ACTIVITY NO. 14

"Cleaning Polluted Water"

SUBJECT AREA: Science

INSTRUCTIONAL SETTING: Classroom - Laboratory Exercise

OBJECTIVES: The Student Shall:

(1) Undertake an experiment to gain a better understanding of nature's natural system for cleaning and recycling contaminated water

(2) Use scientific methods to gain information and draw conclusions based on the results of experimentation

RESOURCES: Ring stand and ring; 2 medium-size beakers; large funnel; microscope and slides; cotton; food coloring; charcoal; gravel (coarse and fine); sand (coarse and fine); pond water (with microscopic organisms) * (These materials are required for each group of students conducting the experiment.)

Student activity sheet for the experiment

PROCEDURE: The Instructor Shall:

(1) Explain that nature has the ability to clean and recycle much of our polluted water through a natural system of filtration. (Point out that a similar system is used by many cities in the treatment of waste water.)

(2) Read the directions for the laboratory exercise to the class.

(3) Assign several students to a group for conducting the laboratory exercise. Furnish each group with the materials listed above.

(4) Use the student study questions to summarize the activity after the students have completed the laboratory exercise.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 14

"Cleaning Polluted Water"

One of the steps in treating water is filtering it. Water-treatment plants often use filtration beds or filtration towers to filter water. The water looks clear after it is filtered, but it may still have to be treated in other ways.

Filtration is a necessary step in treatment plants, but filtration happens in nature, too. The slow-moving water that filters down through soil and gravel is often cleaned before it reaches the underground layer of water known as the water table. This activity will help you better understand this natural process.

You may work with other students in doing this activity. However, each person should record their own results and answer the questions given in this exercise. Follow the directions given below:

1. Place the funnel in the ring of the ring stand, and position the ring up high enough so that a beaker can fit underneath the funnel.

2. Place layers of material in the funnel so that the layering looks much like the sample the teacher will show you. Place the coarse gravel in the funnel first, followed by a layer of coarse sand, a layer of charcoal, and a layer of fine sand. If the stem of the funnel allows the coarse gravel to pass through, place a wad of cotton in the stem of the funnel.

3. Place a beaker under the funnel. Then pour some water into a second beaker. Place a small amount of mud in the second beaker, and stir the contents of the beaker. Pour all the contents of the beaker into the funnel. However, be careful not to pour the muddy water so fast that the water overflows the funnel.

4. Look carefully at the water in the beaker below the funnel. Describe the water.

   _____

   _____

   _____

5. Continue the activity by responding to the questions given on the following page.

ACTIVITY NO. 14 - Review Questions

1. Was the water cleaner before passing through the layers in the funnel or after passing through the layers in the funnel?

2. What must have happened in the funnel?

3. Which of the layers of material in the funnel, do you think, was most effective in filtering the muddy water? Why do you think so?

4. What kinds of layers, do you think, could be used in the filtration beds or filtration towers of water-treatment plants?

5. Place some food coloring in some water, and stir the water. Pour the water into the layers in the funnel as before. What happened to the food coloring? Is the water pure after it passes through the filter? Explain.

6. Pour pond water, which contains microscopic organisms, into the layers in the funnel. Examine the water that has passed through the funnel with a microscope to see if any of the microscopic organisms passed through the filter. What can you state about how well the water was filtered?

LEARNING ACTIVITY NO. 15

"Water Pollution - Story Problem"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize the importance of water resources in the environment

(2) Discover some of the many effects man's activities can have upon the water resources in our environment

(3) Understand some of the social and political problems related to controlling pollution in our society

RESOURCES: Motion Picture: "The River Must Live" (Source: The Shell Oil Company Film Library, 1433 Sadlier Drive, Indianapolis, Indiana)

Student story problem activity sheet related to water pollution

PROCEDURE: The Instructor Shall:

(1) Have the class view the motion picture. The film will identify some of the major causes of water pollution in our nation's lakes and rivers. (Students should recognize that man is a major contributor to the problems related to polluted water.)

(2) Have the students list and describe some of man's activities which contribute toward water pollution.

(3) Assign the story problem activity related to a community water pollution problem. After the class has completed the activity, discuss the problems presented in the exercise. Challenge the students to find some reasonable solutions to the problems presented.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 15

"Water Pollution - Story Problem"

Here is a story about a town that has a serious water pollution problem. As you read the story, remember that people living in the town have differing points of view about the water pollution problem which is described.

THE STORY

The town of Stevensville has a population of 7,500. Four hundred men from the town work in its only large factory. The factory was built next to a small river from which Stevensville gets its drinking water.

The factory makes plastic containers for many different uses. Dangerous waste chemicals left over from the manufacture of the containers are dumped into the river.

Many people in the town have complained that the water near the factory looks and smells bad, and that their drinking water is starting to have a foul taste.

The mayor of the town calls a meeting of all concerned people to discuss the problem.

THE ACTIVITY

Now that you have read the story, answer the questions which are stated on the next page, while considering the four different points of view described below.

Role No. 1 - Pretend that you are the owner of the factory which is causing the pollution problem.

Role No. 2 - Assume that you are the mayor of Stevensville and are responsible to all the citizens and must try to do what is best for everyone concerned.

Role No. 3 - Pretend you are a worker in the factory.

Role No. 4 - Take the position of a person in the town who needs the products made by the factory.

STORY PROBLEM QUESTIONS

Write your answers to the following set of questions on separate sheets of paper. Title the first sheet, OWNER, the second sheet, MAYOR, the third, WORKER; and the fourth one, CONSUMER. Answer the following questions for each of the four roles described.

1. Should the factory be closed so that it doesn't pollute the water? Explain your answer.

2. Should the factory be forced to buy very expensive equipment that will collect the waste chemicals before they are dumped into the water? (This might make the plastic products cost more.) Explain your answer.

3. Should the town build a bigger waste water treatment plant that will collect the water and clean it before it is discharged into the river? (The people in the town will have to pay special taxes to finance the cost of this new plant.) Explain your answer.

4. Who is responsible for stopping the pollution? Why?

LEARNING ACTIVITY NO. 16

"Community Dump Survey - Investigating Land Pollution"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Field Trip

OBJECTIVES: The Student Shall:

(1) Observe and identify conditions which contribute to land pollution

(2) Use survey techniques to collect data; draw conclusions or make inferences on the basis of the data collected

RESOURCES: Notebook; pencil; and student survey sheet with questions related to the garbage dump survey

PROCEDURE: The Instructor Shall:

(1) Make arrangements for the class to visit the local community dump site.

(2) Describe the purpose of the field trip to the students involved.

(3) Ask students to make a close observation of what they see at the dump site. Require them to take some notes concerning their observations.

(4) Assign the study question exercise related to the dump survey after the students have returned to the classroom. After the students have given a written response to each of the questions, use the survey questions as a basis for a class discussion.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 16

"Community Dump Survey - Investigating Land Pollution"

Use the notes you recorded while on the field trip to the community dump site to help you in making a response to each of the following questions.

1. Where is the dump located in relation to the community?

2. What is its size? Does it appear adequate for the community needs?

3. Dumps can be classified as sanitary landfill, rubbish-burning dumps, or open dumps. In which of these categories does this dump fit? Why?

4. Why was this particular site selected as the location for the community waste disposal site? (You may need to ask a local official for the answer to this question.)

5. Are there evidences of pollution in the dump area? (Consider such things as smoke, water runoff pollution, visual pollution, etc.)

6. Briefly describe the uses of the land areas immediately adjacent to the dump property. (Is it residential, farm land, public land, etc.?)

7. What kinds of problems, if any, does the dump present to adjacent property owners?

8. How long can this area continue to serve the community?

   What problems might be involved with relocating the dump to another site?

9. Could the disposal site be reclaimed? Will the land be productive again for other useful purposes?

10. What alternatives are there for the people using this dump? Could some of the items deposited here be recycled?

11. What kinds of waste materials seem to present the most serious problems for the sanitation department? Why is this so?

12. Is there evidence that animals inhabit the dump? What kinds? Do they present health or safety problems? (Consider rats, insects, dogs, stray cats, etc.)

LEARNING ACTIVITY NO. 17

"Constructing A Model Community - Land-Use Problems"

SUBJECT AREAS: Social Studies; Language Arts

INSTRUCTIONAL SETTING: Out-of-doors

OBJECTIVES: The Student Shall:

(1) Recognize certain issues which exist in relation to land-use problems

(2) Use a model to portray a real-life situation

(3) Indicate in writing or state orally the need for zoning laws which exist in most communities

(4) Recognize how the improper use of land resources can complicate problems related to environmental deterioration

RESOURCES: A section of cordstring 50 to 100 feet in length; 4 small wooden or metal stakes; a collection of various objects to use for representing homes, factories, railways, highways, an airport, and other elements found in the typical community (for example; wood blocks and boards of assorted sizes)

Student activity background sheet for the exercise

PROCEDURE: The Instructor Shall:

(1) Explain to the class that this activity is designed to help them realize the importance of using land resources wisely. (They will also recognize how the improper utilization of available land areas can contribute to problems related to environmental pollution.)

(2) Read over the activity background statement with the class. Follow the procedure outlined in the steps which follow.

(3) Assign individual students to play the roles of the various community members. Each student should be given an object representing one of the various elements found in the typical community.

(4) Use the stakes and the cordstring to rope off an area on the school playground. An area of some 100 to 200 sq. ft. should be sufficient. (The size of the land plot will be determined by the number participating.)

(5) Ask the students to place the objects, (representing homes, industries, roads, an airport, etc.) inside the defined plot of land. Allow them to position their objects wherever they see fit.

(6) After everyone has completed this part of the activity, ask them why they chose these particular locations for their objects. (Answers will vary.)

(7) Next, ask the students if they are happy with the arrangement of the community. (Many conflicts should arise! Homeowners and other players will be unhappy about the haphazard arrangement of the community elements. Concerns about noise, visible pollution, and other issues will be expressed.)

(8) Have the students remove the objects from the plot of land. Explain that this is precisely the manner in which many communities have evolved. (Poor planning in land utilization is a major problem in many parts of our country.)

(9) Analyze and discuss the problems which existed in the first community. Have the students devise a plan for the construction of a new community. In this plan, try to make an arrangement which will make all community members compatible with one another. (Suggest an industrial park for one section of the square. Establish a certain area for housing. Place roads, railways, and the airport in a way that seems most appropriate to fit the needs of the community.) Several attempts may be necessary to reach a satisfactory arrangement. DO NOT EXPECT TO RESOLVE ALL CONFLICTS!

(10) Summarize the major concepts brought out in the exercise. Ask questions to see if the students have developed a new awareness for the problems discussed.

(11) Assign students to investigate their own community for problems related to this activity. They should make a written report of their observations. These findings may be shared with others, in the class, at a later date.

LEARNING ACTIVITY NO. 17

"Constructing A Model Community - Land-Use Problems"

Our earth offers man a limited amount of usable land. When one considers that the oceans and other water bodies cover nearly three-fourths of the earth's surface, one can easily recognize this fact. Since much of earth's available land space is nonproductive and uninhabitable, we can readily see the value in using this resource to the best advantage.

This activity is designed to help you understand some of the problems which exist in man's attempt to use land areas in the most productive manner. In this exercise, we will make use of a small plot of land to serve as a model for a typical community. You will be asked to take part in constructing a small community consisting of homes, industries, roads, a railway, an airport, and other elements which are found in a typical community. While involved in this exercise, you must consider all the land-use problems which may arise in constructing the model community. An attempt will be made to place or position all of the community elements within a defined plot of land, yet making them compatible with one another.

Make a mental note of the problems which arise in this activity. Examine some possible solutions to the problems which develop. You will be asked to survey your own community for possible conflicts in land utilization. You will report on your findings. (FOLLOW YOUR TEACHER'S INSTRUCTION.)

LEARNING ACTIVITY NO. 18

"A Bounty of Natural Resources"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Define the terms renewable and nonrenewable resources and cite examples of both categories

(2) Recognize and explain that natural resources are unequally distributed in terms of land areas and political boundaries and that the misuse of such resources is becoming a matter of world-wide concern

RESOURCES: Sound filmstrip: "Using Up Our Natural Resources", (Source: Our Changing Environment Filmstrip Set, Troll Associates)

Student research activity sheet; Science books and other reference materials related to mineral resources

PROCEDURE: The Instructor Shall:

(1) Have the class view and discuss the content of the filmstrip. Ask the class to define the terms renewable and nonrenewable resources. Have them cite examples of both classes.

(2) Describe the importance of conservation of our natural resources, especially the nonrenewable types. Give the class several examples of mineral resources that are now in short supply.

(3) Assign the research activity related to mineral resource reserves.

(4) Discuss the results of the study after the class has completed the exercise. Ask the class to list some examples of minerals that are still abundant in supply. Also list the minerals in which the reserves are becoming critically low. Ask the class to suggest some methods to help in the conservation of these minerals.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 18

"A Bounty of Natural Resources"

Citizens of the United States have been fortunate for a number of reasons, not the least of which is the unusually large supply of natural resources to be found within our boundaries. Some nations, like Great Britain and Japan, do not have enough resources of their own to supply their personal and industrial needs. The United States, on the other hand, has always had more than enough of almost every major resource and, in fact, we have been an exporter of many of them.

Of course, that doesn't necessarily mean that we're "all set" for all of history, as far as resources go. We're already aware of the dwindling supply of petroleum, copper, natural gas, and other minerals on which our way of life depends. What kind of shape are we <u>really</u> in as far as our native minerals go? How long can we really continue to rely on our own resources for everything we need to keep our way of life running? These are some of the questions this activity is designed to answer.

The chart on the following page lists a number of important minerals. For each one in the chart, find out whether it is found in the United States, and if so, where (what states or regions). Also find out what part of the supply we use every year comes from the United States, and what part from outside this country. Finally, see if you can discover how much of that mineral is left in reserves. Your teacher will supply you with reference materials to help you in this research.

MINERAL	PLACES FOUND IN U.S.	% OF ANNUAL USE FROM U.S.	% OF ANNUAL USE IMPORTED	SUPPLY REMAINING IN YEARS
Petroleum				
Coal				
Copper				
Iron				
Zinc				
Silver				
Uranium				
Aluminum				
Magnesium				
Lead				
Sulfur				
Asbestos				
Potash				
Phosphate				
Gypsum				
Salt				

LEARNING ACTIVITY NO. 19

"Using Natural Resources - Student Inventory"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom; home environment

OBJECTIVES: The Student Shall:

(1) Illustrate the fact in writing that the conservation of our natural resources is essential to meet the needs of present and future generations

(2) Investigate their personal consumption practices in terms of using natural resources

RESOURCES: Student activity sheet related to consumption of natural resources

PROCEDURE: The Instructor Shall:

(1) Describe the importance of conserving our natural resources during a class discussion. He will explain the implications of earth's increasing population as it relates to resource consumption.

(2) Ask students to compare our standard of living and lifestyle with that of people in underdeveloped countries. Have them discover how the demands on natural resources are directly related to these factors.

(3) Assign the student activity related to consumption of natural resources. Ask students to inventory their own personal demands on natural resources.

(4) Discuss the results of the student inventory after the class has finished the activity. Have the students identify some of the methods by which they are wasting or misusing natural resources. Ask the class to list alternatives that would help correct some of these wasteful practices.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 19

"Using Natural Resources - Student Inventory"

Consider the types of natural resources you have consumed or made use of in the last 24 hours. Using the chart below, identify how each was used by listing them under the appropriate category. After you have completed your listing, consider some methods by which you could help conserve our natural resources without drastically changing your lifestyle.

ESSENTIAL FOR SURVIVAL (BASIC NEEDS)	USED FOR MAINTAINING LIFESTYLE (BUT NOT ABSOLUTE NECESSITIES)	LUXURIES (WASTEFUL PRACTICES)

LEARNING ACTIVITY NO. 20

"Comparing Information Sources - Coal Reserves"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Gain experience in comparing conflicting information sources for varying value positions

(2) Draw valid conclusions from data and make inferences on the basis of the data presented

RESOURCES: Student activity sheet containing information representing two conflicting views concerning coal reserves

PROCEDURE: The Instructor Shall:

(1) Explain to the class the purpose of this activity. Tell students that the exercise is designed to give them experience in making a critical evaluation of conflicting information sources.

(2) Assign the activity and allow the class a reasonable period of time to complete the exercise. Ask students to analyze what they read critically and answer the questions to the best of their ability.

(3) Use the questions stated on the student activity sheet as a basis for discussion after the class has completed the exercise.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 20

"Comparing Information Sources - Coal Reserves"

This activity is designed to give you some experience in making a critical evaluation of information sources. The following information was taken from the May 27, 1972 issue of Environmental Action. It represents two conflicting views concerning the extent of our nation's coal reserves. You will be asked a number of questions which pertain to these two sources of information. Analyze what you read critically and answer each question to the best of your ability.

> Not long ago General Electric published an advertisement in the U.S. dealing with man's limited coal supply and the need for developing nuclear generators for supplying electricity. Here is the main text of that advertisement:
>
> Experts say all the economically recoverable coal in the U.S. may disappear in 80 to 150 years. The world's supply in 300 years. And gas and oil before then. The world must find other fuels, especially new fuels to generate electricity. One answer is nuclear power. General Electric has 68 nuclear power plants in the works to help meet electric needs for years to come. Far beyond that, G.E. is working with the government and utilities on a new nuclear power plant, a fast-breeder reactor. The fast-breeder reactor has already been tested. Not only will it make electricity but it will also make more fuel than it uses. So it will postpone the fuel shortage...perhaps for thousands of years. G.E. is also working on ways to transmit more electricity over present wire and through new underground distribution systems. There is no easy way to meet future energy needs, but G.E. is working to make it easier.

1. It is clear that General Electric is attempting to convince the public of something. What is it? Write your answer below:

2. G.E. is clearly in favor of promoting more nuclear power plants. What argument is G.E. using to establish the need for the plants?

Now let's turn to another set of figures. This data was prepared from the Bureau of Mines statistics.

LIFE EXPECTANCY OF COAL RESERVES

The following is the estimated timetable for depletion of presently recoverable bituminous coal and lignite reserves, assuming annual production figures for the year 1970.

	Quantity (billions of short tons)	Life Expectancy
Total deep mine reserves	356	590 years
Deep mine (low sulfur) reserves	221	367 years
Total strippable reserves	43	71 years
Strippable (low sulfur) reserves	31	51 years

1. In what ways do these figures differ from those presented by General Electric?

2. Why is it important for you to critically evaluate what you read?

   Could you write a rule or principle that should be followed by anyone doing library research on an environmental problem? (One should be obvious from this activity!)

3. Can you give an example (from your own personal experience) where you have been presented with conflicting facts from two different information sources? _____ Explain the circumstances.

LEARNING ACTIVITY NO. 21

"The Population Explosion - Graph Construction"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize earth's rapid population growth as one of the serious contributing factors to our environmental problems

(2) Describe the relationship between resource demands and increasing population

(3) Recognize how overpopulation can cause an increase in air, water, land, and noise pollution

(4) Develop skills in constructing and interpreting graphs

RESOURCES: Sound filmstrip: "Population Statistics", (Source: The Ecological Crisis Filmstrip Set, Singer Visual Education Inc.)

Graph paper; Student background sheet listing facts and figures related to world population growth

PROCEDURE: The Instructor Shall:

(1) Have the class view the sound filmstrip as a group.

(2) Summarize the major points presented in the filmstrip. Describe the effects of the population explosion and illustrate how it contributes to the problems of our environment.

(3) As a reinforcement for the concepts presented on the filmstrip, have the students construct a line graph showing the nature of earth's population growth since 1650.

(4) Read the student background sheet and help direct the students in the graph construction exercise. Have the students use their completed graphs for answering the questions stated on the background sheet.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 21

"The Population Explosion - Graph Construction"

A graph is an instrument used to make comparisons or show relationships between various factors. The graph you will construct in this activity relates world population growth to the element of time. Use the figures given below to construct a line graph. The completed graph will show the increase in world population over many years. The graph will also help you to make a response to each of the questions listed below.

WORLD POPULATION
(Estimated Figures)

1650	550 million	
1700	600 million	
1750	730 million	
1800	920 million	
1850	1.1 billion	
1900	1.6 billion	
1930	2.0 billion	
1940	2.2 billion	
1950	2.5 billion	
1960	3.0 billion	
1970	3.6 billion	
2007	7.0 billion	Projected figure
2044	14.0 billion	" "
2070	25.0 billion	" "

- -

1. What does the flattened curve before 1850 tell you about the rate of population growth up to that time?

2. What does the curve after 1850 tell you about the rate of population growth since that time.

3. What is meant by the term "population explosion"? (Reflect on the information presented in the filmstrip!)

4. At about which point (year) did the population explosion really become evident?

LEARNING ACTIVITY NO. 22

"Population Studies - Creative Writing"

SUBJECT AREAS: Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize that increasing world population is a major problem and a serious contributor to the problems related to our environment

(2) Describe in writing how the demands on natural resources increase as world population multiplies

(3) Recognize that family planning and the limiting of family size is important if overpopulation is to be avoided and a reasonable standard of living is to be assured for future generations

RESOURCES: Sound filmstrip: "Population Trends", (Source: The Ecological Crisis Filmstrip Set, Singer Visual Education Inc.).

Student activity sheet for creative writing

PROCEDURE: The Instructor Shall:

(1) Have the class view the sound filmstrip as a group.

(2) Discuss the content of the filmstrip and describe the implications of earth's population explosion.

(3) Ask the class to express their thoughts on the problems described in narrative form. Assign each student to write a story, essay, poem, or other piece of creative writing in which they describe the implications of the population explosion on future generations.

(4) Have the students read what they have developed after they have completed the exercise. Ask the class to react to the ideas presented and exchange their ideas. Finally attempt through discussion to arrive at some generalization held by the class.

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 22

"Population Studies - Creative Writing"

The filmstrip describes some of the problems related to earth's population explosion. What impact will the population growth have on you as an individual and others in the years to come? How might your lifestyle or standard of living be affected? Think about the implications of increasing world population for the next 20, 50, or 100 years. How will this affect you, your community, state, nation, or the world? Describe your views in narrative form; either an essay, short story, poem, or in some other manner. (You may use this paper for your response.)

LEARNING ACTIVITY NO. 23

"Endangered Species Investigation"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize and explain the fact that some of the things man does to satisfy himself can be harmful to other living things in the environment

(2) Use research materials to identify animals which have become extinct or endangered species as a result of man's activities

(3) Define the probable causes for the endangerment of certain animal species

RESOURCES: Sound filmstrip: "Evolution and Extinction", (Source: The Ecological Crisis Filmstrip Series, Singer Visual Education Inc.)

Student activity sheet related to endangered animal species; Reference materials giving information concerning extinct or endangered species of animal life

PROCEDURE: The Instructor Shall:

(1) View and discuss the filmstrip with the class. Cite some examples of animals which have become extinct or endangered as a direct or indirect result of man's activities in the environment. Ask the class to list some possible causal factors which have caused the problems of extinction or endangerment. Also encourage the students to suggest some possible solutions for the problems described.

(2) As an enrichment exercise, have the class do research to locate examples of endangered species other than those already mentioned on the filmstrip. Students should also list the probable causes for each endangered species. After the research has been completed, allow the students to present their findings during a class discussion.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 23

"Endangered Species Investigation"

In this activity, you are to list some examples of animals which are actually classified as endangered species. Complete the chart shown below with the information you obtain in your research. List as many examples as you can possibly locate. Your teacher will provide you with some reference materials for the research. You may also have access to other resources to help you in this investigation.

ENDANGERED ANIMAL SPECIES

Name of Endangered Animal	Number Remaining	Probable Cause of Endangerment
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

LEARNING ACTIVITY NO. 24

"Investigation of Noise Pollution"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom and Outdoor Activity

OBJECTIVES: The Student Shall:

(1) Describe how noise can contribute to problems related to environmental pollution

(2) Investigate the sources and nature of noise in the environment and its effects on human populations

RESOURCES: Motion picture: "Noise - The New Pollutant", (Source: Indiana University A.V. Center, Bloomington, Indiana)

Student activity sheet; cassette tape recorders; a supply of blank tapes

PROCEDURE: The Instructor Shall:

(1) Advise the students that noise is a form of pollution that is often overlooked when considering problems related to the environment.

(2) Ask the students to define noise. Have them list some sounds which are especially irritable to the sense of hearing.

(3) View and discuss the film which describes the effects of noise pollution on human populations.

(4) Ask students to keep a record for 24 hours of all the sounds they encounter that might be classified as noise. They should also record some of the most unpleasant sounds to serve as examples of noise pollution. Provide blank tapes for the activity. (Most students will have access to a tape recorder.)

(5) Play the tapes of the recorded noise examples. Ask the class to identify the noises which are most irritable. Discuss the effects of these sounds on people.

(6) Develop, on the chalkboard, a master list of noise examples from the individual lists made by the students.

Categorize the disturbing sounds into groups such as those caused by people, automobiles, trucks, airplanes, and so forth. Try to determine the major sources of this form of pollution.

(7) Ask students to offer some suggestions for reducing noise pollution in the local community.

ACTIVITY TIME LENGTH: 2 Days

LEARNING ACTIVITY NO. 24

"Investigation of Noise Pollution"

This activity will help you become more aware of the seriousness of noise pollution in the environment. Use the chart below to list various examples of noise pollution you encounter during the next 24 hours. When listing the examples, be sure to identify the source and location of each. The teacher will provide you with a blank tape so that you might record some of the most irritable and unpleasant sounds.

NOISE POLLUTION EXAMPLES	SOURCE AND LOCATION
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.

LEARNING ACTIVITY NO. 25

"Environmental Values Clarification - Student Survey"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Identify personal values and beliefs concerning environmental issues

(2) Recognize conflicting points of view regarding issues related to the environment

(3) Debate the issues related to environmental problems

RESOURCES: Student Environmental Values Clarification Questionnaire"

PROCEDURE: The Instructor Shall:

(1) Read the directions for the environmental clarification form to the class. Explain the nature of this survey and the factors which it will measure or assess.

(2) Ask the class to complete the questionnaire.

(3) Compile the results of the survey for the entire class on the chalkboard.

(4) Compare the responses on each survey question. Note any similarities or wide differences in the responses. Have the students discuss their values and explore the reasons for the differences. (Consider the postsummary discussion questions.)

ACTIVITY TIME LENGTH: ½ Day

LEARNING ACTIVITY NO. 25

"Environmental Values Clarification - Student Survey"

This activity is designed to let you compare a few of your environmental values with those of your classmates. Below, you will find ten statements with which you may agree or disagree. Following each is a number line ranging from "strongly disagree" to "strongly agree". You are asked to circle the number of the response which best reflects how YOU feel about the statement. (Follow the key shown.)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

1. The killing of deer by hunters is an important part of keeping the herds healthy.

1 2 3 4 5

2. The great whales don't belong to any nation and, therefore, any nation that wants to hunt them should have the right to do so.

1 2 3 4 5

3. No human female should be allowed to have more than two children.

1 2 3 4 5

4. Laws should be passed making car pools mandatory in large towns and cities.

1 2 3 4 5

5. I would be willing to cut my television viewing in half as a voluntary act to conserve electrical energy.

1 2 3 4 5

6. Humans should be required to recycle steel, aluminum, and glass.

1 2 3 4 5

7. The recycling of steel, aluminum, and glass should be mandatory even if it is not currently profitable.

1 2 3 4 5

8. Air pollution standards should be lowered in order to get better gasoline mileage in automobiles.

1 2 3 4 5

9. Only those people who live alone or have special problems should be allowed to keep a dog or a cat because of the tremendous amount of food energy consumed by pets.

1 2 3 4 5

10. Nuclear power plants should be built at the fastest possible pace to produce needed electrical energy.

1 2 3 4 5

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POSTSUMMARY DISCUSSION QUESTIONS

1. Analyze those statements for which there is a wide difference of opinion. Why does that difference exist?

2. What seems to be the solution to an environmental issue where there are strong and differing value positions?

3. Could it be possible that differing value positions are the very things that create environmental issues in the first place? Why?

LEARNING ACTIVITY NO. 26

"Environmental Deterioration - Cartoon, Poster Creations"

SUBJECT AREAS: Art; Social Studies

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Illustrate or describe how some aspects of our technological culture contribute to environmental degradation.

(2) Use cartoons, posters, and other illustrations to communicate ideas concerning issues related to environmental deterioration

RESOURCES: Drawing paper; tagboard; construction paper; colored pencils; magic markers; other drawing materials

Student background sheet for the activity

PROCEDURE: The Instructor Shall:

(1) Review some of the major concepts presented in this unit of study related to the environment. Help the students reflect on the major forms of environmental pollution and ask them to describe some of the main causal factors. (Emphasize the fact that man is often a major contributor to the degradation of our environment.)

(2) Ask the students to think of an example of visual pollution or some other evidence of environmental deterioration. Have them illustrate their examples by creating a cartoon, poster, or some other form of art work.

(3) Display the illustrations in the classroom and throughout the building. (They may also be displayed in business places and other public buildings.)

(4) During a class discussion, comment on the variety of the ideas presented in the illustrations. Express the value in this form of communication.

ACTIVITY TIME LENGTH: 1 Day

LEARNING ACTIVITY NO. 26

"Environmental Deterioration - Cartoon, Poster Creations"

We have explored many of the causal factors which are related to environmental deterioration in this unit of study. We can recognize, through our study, that man is often the major contributor to the degradation of our environment. Much of the visual pollution which surrounds us is a product of man's destructive activities.

Think of one example of visual pollution that has been brought to your attention. (Consider water pollution, air contamination, land misuse, wasteful practices, and noise pollution in making a selection for your topic.) Illustrate the nature of this form of pollution by creating a cartoon, poster, or some other type of art work. A caption for your illustration would be most appropriate! Try to convey some message related to environmental deterioration in your effort. (The illustrations from all class members will be displayed.)

LEARNING ACTIVITY NO. 27

Unit Summary - "We Can't Run Away Any Longer"

SUBJECT AREAS: Science; Social Studies; Language Arts

INSTRUCTIONAL SETTING: Classroom

OBJECTIVES: The Student Shall:

(1) Recognize that early man had little influence on his environment, yet that modern man has been able to cause profound changes in his surroundings

(2) Realize that the environmental crisis is the result of hundreds of years of abuse and misuse of nature's gifts

(3) Describe how increasing world population makes continually greater demands on nature and causes environmental problems to multiply at an alarming rate

(4) Recognize that man has the intelligence and ability to meet the crisis of the environment. But people must be made fully aware of it and of its probable consequences.

RESOURCES: Short story related to the history of man's interaction with nature: "We Can't Run Away Any Longer"

PROCEDURE: The Instructor Shall:

(1) Allow the students an ample amount of time to read the short story. (Or it may be read orally to the class.)

(2) Discuss the content of the story. Stress the fact that man can no longer ignore the serious environmental problems facing our society. (Only by solving the great problems we have created in the environment can we achieve the promise of a healthier and more satisfying life for ourselves and for future generations.)

(3) Summarize the major concepts developed in this unit of study.

ACTIVITY TIME LENGTH: $\frac{1}{2}$ Day

LEARNING ACTIVITY NO. 27

Unit Summary - "We Can't Run Away Any Longer"

Until recently man did not have much influence on the biosphere. When he was a hunter, he killed the animals and gathered the plants he needed for food and clothing. He used stone for tools and clay for pots. His few activities exterminated no animal or plant species and polluted few streams and his campfires did not seriously pollute the air. He used such small amounts of the natural resources that even if he had not existed, it would have made no noticeable difference.

When man became more numerous and civilized, he did begin to make a difference. This was especially true in Europe. He destroyed the forests in some areas. His domesticated animals overgrazed the grasslands which then became unproductive wasteland. He had so many children that the land could not support the ever increasing population. His wastes began to pollute the streams and air. All of this meant that the local environment could not tolerate his activities. He was destroying natural resources faster than nature could replace them.

But there was always a solution - move. And so he did. Many people found new homes in Africa, North America, South America, and Australia. For several centuries these new lands could supply their needs and cope with their wastes. Nature seemed soooo big, and for a while man's demands on the whole biosphere were not so great.

Things are different now. There are no new continents to be discovered. Nearly all the land that can be used to grow man's food is being used. We can't run any longer to a place where there is an abundance of fertile land, clean air, plenty of natural resources and unpolluted streams. For the first time in history, man must face this choice: Either he learns to live with nature, or he cannot live at all. He can no longer live by destroying nature and then moving on.

Your parents now face this choice, and in the years to come you will have to face it. More water is needed in homes and in industry, yet we are polluting the water we have. We enjoy the convenience of the automobile, but its exhausts are making the air in many of our cities harmful to health. We need more food, yet some of our agricultural practices actually destroy the ability of the land to produce.

The environmental crisis is the result of several hundred years of neglect. The problems cannot be cured overnight. Though the situation is serious, it is certainly not hopeless. More and more, industries and government are making efforts to cooperate in improving environmental conditions. Lead is being removed from gasoline. Automobile manufacturers are spending large sums of money to design engines that will not cause pollution. We may see steam or electric-powered cars in production within a few years. Cleaner, faster systems of public trans-

portation in and between cities are being designed. There is widespread concern about the extinction of wildlife species. Chemicals such as phosphates in detergents, long-lasting pesticides, compounds containing mercury, and many other polluting substances are being banned. New methods of reclaiming water from sewage are being designed. The importance of photosynthesis, the key to life, is being recognized by more and more people. Many factories are being equipped with filters and other smoke-control devices. The use of "clean-burning" fuels is increasing. New methods and better locations for disposal of solid wastes are being sought out.

You might wonder, What can one person do to keep the world livable? Perhaps the first thing to do is change the question to, What must I do? There is quite a lot! All of us, both individuals and groups, have to change our lives so that we live in balance with the biosphere. We have to insist that industries not be allowed to dump their wastes into lakes and streams, killing the fish and making the water unsuitable for drinking. We must insist that means be taken to reduce air pollution, from industries and from automobiles. We must save enough of the undisturbed landscape to ensure the survival of wild animals and plants--and to provide ourselves with places to observe and enjoy nature.

These and other large, long-range tasks will require support from all parts of our society--government, industry, and general public. You can help by indicating your concern in letters to your local newspapers, business leaders, representatives, senators, mayor, or governor. And, before long, you will be able to vote for those lawmakers who show they care about the environment and are anxious to protect it.

There are also things you can do that will make a difference immediately. Most people are thoughtful, but some are not. You may see litter in the streets, in parks, or even in parts of your school yard. If you and your classmates decided not to litter, and also decided that every day each of you would pick up one piece of paper or an empty bottle and put it in a trash basket, you would soon have a much more pleasant environment.

But more than anything else, you must think. You now know a great deal about the biosphere. You know that it is in delicate balance and must be treated gently. It is up to each of you to see that what you, your community, and your country do will not interfere with that balance. Protect the biosphere--it is the only one you have!

SOURCE: "Ecology: The City"
by George McCue
Ben Ziger, Inc.
C - 1971