DOCUMENT RESUME

ED 104 794 95 SO 008 292

AUTHOR	Jamison, Sandra; Campbell, Bruce
TITLE	Pollution: Problems and Solutions. Grade Nine, Unit One, 9.1 Comprehensive Social Studies Curriculum for the Inner City.
INSTITUTION	Youngstown Board of Education, Ohio.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	Jun 71
NOTE	78p.; For related documents see ED 070 693 and SO 008 272 through SO 008 300; Not available in hard copy due to marginal legibility
EDRS PRICE	MF-$0.76 HC Not Available from EDRS..PLUS POSTAGE
DESCRIPTORS	Citizen Role; Ecological Factors; *Ecology; *Environmental Education; Grade 9; Learning Activities; *Pollution; Secondary Education; Social Problems; *Social Studies Units; Teaching Techniques; *Urban Education
IDENTIFIERS	Elementary Secondary Education Act Title III; FICSS; Focus on Inner City Social Studies

ABSTRACT

The ninth grade unit of the FICSS series (Focus on Inner City Social Studies -- see SO 008 271) studies the economic and political realities of the inner city. This document, the first unit of the 9th grade section, deals with the ecological crises involving pollution and its causes. Specific problems include air pollution, pesticides, herbicides, water pollution, and population control. The unit provides both facts and scope of the crises and direction for positive action by citizens of all ages to aid in correcting the problems. Many of the learning activities in the unit will build skills in chart and graph reading as well as in interpreting pictorial data. Students also learn to utilize library sources and gather and interpret facts from field trips and interviews in an effort to understand their own immediate environment. Specific teaching procedures and strategies and knowledge, skill, and behavioral objectives are outlined to aid the teacher in developing the concepts of the unit. A bibliography of supplementary reading concludes the document. (Author/JR)

GRADE NINE, UNIT ONE

9.1

according to the
"Compreher.sive Social Studies Curriculum for the Inner City"
as developed by

Project FICSS
(Focus on Inner City Social Studies)
Meivin Arnoff, Project Director
Associate Professor
Kent State University

Unit Authors
Sandra Jamison
Bruce Campbell

Participating School Districts	and Superintendents
Akron	Mr. Conrad C. Ott
Canton	Dr. Henry Kurdziel
Mansfield	Mr. Robert E. Glass
Youngstown	Dr. Richard Viering
Youngstown Diocese	Msgr. Wm. A. Hughes

The work presented or reported herein was performed pursuant to a grant from the U. S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U. S. Office of Education and no official endorsement by the U. S. Office of Education should be inferred.

Project No. 6090

June, 1971

PROJECT FICSS

FOCUS ON INNER CITY SOCIAL STUDIES

Project FICSS is a Federally funded investigation sponsored by the U.S. Office of Education under Title 111 of the Elementary and Secondary Education Act. It began on June 12, 1968 and is to conclude in June 1971.

Purposes

According to the project proposal, the purposes of this investigation are:

1. to construct a K-12 inner city social studies curriculum.
2. to develop new materials and/or adapt available materials designed to implement the new curriculum, to field test these materials, and revise them as necessary.
3. to promote in selected central city school systems change in social studies curriculum and instruction which is in accord with the needs and problems of an urban society.

Organization

The grant was awarded to the Youngstown Public Schools in conjunction with four other northeastern Ohio school districts, Akron, Canton, Mansfield, and the Youngstown Diocese. Under the directorship of Dr. Melvin Arnoff of Kent State University, the original designer of the project, the five district social studies coordinators worked in concert to select a five-man team from each school district. These teams met together full time in the summers and part-time during the academic year. As a group they received the necessary input and participated in studies which helped prepare them for the challenging task of developing a social studies curriculum design for the inner city. In order to do this they needed to become knowledgeable in curriculum theory and the problems of the inner city.

Temporary Products

At the end of the first summer of study, some materials (units) were developed for use by the schools during the ensuing year. These, however, are no longer in print since they were intended as temporary materials. They were designed to meet specific immediate needs in the direction of providing some modest corrections within the prevailing social studies curriculum of the participating schools to better balance the treatment of minority groups.

Developing the Curriculum Design

Following a series of conferences held during 1968-69 the unit writers from the five school systems had arrived at a tentative K - 12 curriculum design. This design was reviewed by lay and professional persons as well as a 60 man Board of Reactors. It was subsequently revised and expanded to include more detailed outlines of the specific units of each grade level. The curriculum design was finalized on April 14, 1970. Even this design, however, has not been sacrosanct. As the writing of individual units progressed, it became clear that some units were part and parcel of others, some lacked sufficient content to stand on their own, and others could be better written by revising the intended content. The final design, therefore, is the product of investigation, speculation, review, and revision in accord with practical pedagogy.

Unit Development

As was indicated above, the first products of this project were temporary units intended as first-aid to the obviously unbalanced curricula of the participating schools. These are no longer available.

After the major portion of the curriculum design was completed during the summer of 1969, six units were developed to be classroom tested during the 1969-70 academic year. Sufficient data were collected on these units as they affected classroom achievement and attitudinal changes to permit judicious revision of the materials toward making them more effective in realizing the aims of the curriculum.

The major portion of unit writing was achieved during the summer of 1970. During this time, all of the previously prepared units were revised or modified to be in accord with the April 14, 1970 design. Approximately 50 of the 69 units of the K - 12 design were prepared by the end of the 1970 seven-week writing session. Thirty-six of these units were throughly edited and prepared for utilization in 108 classrooms in the five participating districts during the 1970-1971 school year.

Evaluation

The effect of these materials was evaluated via a design developed in accord with guidelines specified by the Division of Research, Planning and Development of the Ohio State Department of Education. The design called for the administration of an attitude and an achievement test prior to and following the teaching of the first semester units at each grade level, grades 1-12. While the cumulative effects of these units was being evaluated in one set of classrooms, a modest idea of the effect of each unit was being gained through the administration of achievement post-tests following the teaching of individual units in a second set of classrooms. (Although a pre-test post-test design would have been preferred, fundamental and other considerations obviated this possibility.)

Refining the Curriculum Design and Units

After the first semester units were classroom implemented and evaluated, the data were analyzed and utilized in unit revision. The units developed for the second semester were used in many classrooms, however, complete data on the effectiveness of these materials were not collected due to financial restraints and the improbability of immediately utilizing the data for unit revision prior to the legally imposed concluding date of the Project, June 11, 1971. (A three-year project life-span is the maximum allowed under Title III.)

Utilization of the FICSS Curriculum Design and Units by Other School Districts

It is the firm conviction of theProject staff and unit writers that theFICSS curriculum makes a significant contribution toward developing a relevant social studies curriculum in Grades K- 12. Relevancy here refers to the ability of a curriculum to enable pupils to comprehend the front pages of the newspapers, to understand the variety of ethnic and national cultures and aspirations of the peoples of America, and to be able to deal intelligently with the public and personal issues which are germaine to all of these areas.

Consequently, every school system is encouraged to review the products of Project FICSS and, should they find materials in harmony with their view of what is needed in the curriculum, to use these in part or in total, to adopt and/or adapt them as they see fit. This way Project FICSS will truly have served as an exemplary project.

INTRODUCTION TO THE NINTH GRADE CURRICULUM

The Political and Social Realities of the Inner City

The physical and social realities of urban life are the products of the political and economic factors which foster and sustain them. What is living in metropolitan areas like? What is the quality of life as viewed from various facets? These are some of the questions which the ninth grade segment of the Project FICSS Curriculum seeks to implore.

Specifically the units of this grade are:

9.1 Ecology and Health
9.2 Income
9.3 City Planning
9.4 Food Supply and Distribution
9.5 Education
9.6 Crime
9.7 Urban Problems in other Nations

Through the study of the curriculum of this grade, students in an urban setting should become familiar with some of the major political, economic, and social factors which affect the quality of life to which they are exposed. Armed with such understandings they may then be in a position to make personal choices concerning the kind of environment in which they would like to live. Further they should be able to make effective entry into that political-economic system as adults so that they can effectively work toward the constructive development of an improved environment.

SCOPE OF UNIT 9.1

This unit is the first in the ninth grade sequence which studies the economic political realities of the inner city. One of the major problems facing all people today is the ecological crisis, or that aspect of it dealing with pollution and its causes. This unit provides not just the facts and scope of the crisis but helps provide direction for positive action which citizens of all ages can undertake to help correct the problem.

Introduction to a Unit Teaching Strategy Incorporated in FICSS Units

Suggested Teaching Procedures and Introductory Activities

Teaching Procedures

1. These units are based on a depth study strategy approach. It is felt that this method is consistent with the "learn by doing" theories of John Dewey which have been corroborated by Piaget.
2. The basic steps for this stategy consist of introductory activities conducted by the teacher which excite the interest of the student and cause him to ask questions about the new study. These questions serve as an introduction to the scope of the topic.
3. The students, working in groups, or individually, research the questions they have raised and categorized. Each student contributes to the committee work in his own special way and at the same time develops the ability to work in a group situation.
4. One of the most easily recognized trends in the development of recent thought in social studies education is that which is directed toward providing inquiry experiences for the pupil. In these experiences students would not necessarily be told the meaning of the data they would encounter nor would the data necessarily be presented to them. They would have to search for it and to bring meaning to that which they found. From this description, then, it is seen where the depth study strategy proposed here is in concert with the spirit of inquiry.
5. When the group prepares its presentation for the class, they have many occasions to review and restructure their information. After hearing each of the presentations the teacher leads the class in an overview and helps them gain perspective on the topic. The facts gained are used to develop hypotheses and generalizations. Again the facts and understandings are used to develop the culminating activity. Although each of these activities is somewhat different, they all are forms of review or reuse of acquired information. The student, then, is involved in no less than three opportunities to recall and use the new data. Each time, of course, the information is called for in a new context.
6. In a depth study approach, the teacher assumes the role of the structurer of learning activities. Also, however, the teacher is the most readily available resource person, both for process and content. The class could conceivably ask the teacher to talk to them about a specific topic or to discuss a film or filmstrip. If the teacher has had special experiences which are pertinent to the study, the class may call upon him to show slides or to deliver a special talk.*

*Information taken from a monograph by Dr. Melvin Arnoff.

AN OUTLINE OF A TEACHING STRATEGY INCORPORATED INTO FICSS UNITS

PHASE	PURPOSE
I. Introduction	Motivation of students
II. Raising Questions	Listing students' questions
III. Categorization of questions by students	Organization of ideas. Experience in critical thinking.
IV. Forming and Instructing Committees	Grouping for social or psychological ends. Placement of responsibility for learning upon the shoulders of students.
A. Tasks	To let student know they are defining, pursuing, and reporting their own study.
B. Roles	To aid students in identifying desired organizational schemes for small groups and to help them define the responsibilities and behaviors or leaders and group members.
C. Methods of Researching Information	To aid students in locating, recording, organizing and presenting information.

PHASE	PURPOSE
V. Information Retrieval	To allow students the opportunity to answer their own questions, to employ their library skills, to develop critical thinking and logical organization of data.
VI. Committee Reports	To develop and rehearse the presentation to the class.
VII. Perspective and overview	To hear the reports of each committee which has sought answers to the questions of the class.
VIII. Developing Hypotheses and Generalizations	To integrate the findings of the committee reports, to note trends, likenesses and differences when compared with other examples known by the students.
IX. Culminating Experiences	To study the information presented to discover some basic principles of the social sciences which may be operant.
	To gain further perspective and to enhance recall.*

MINIMUM ESSENTIAL MATERIALS
(FICSS KIT)

	Resource	Teacher	Pupil	Total Copies	Price
1.	The Silent Spring, Rachel Carson New York: Crest, 1969 @ 95¢	1	1	2	$ 1.90
2.	The Environmental Handbook, Garrett DeBell New York: Ballentine Books, Inc., 1970 @ 95¢	1	15	16	15.20
3.	The Population Bomb, Paul Ehrich New York: Ballentine Books, Inc., 1968 @ 95¢		5	5	4.25
4.	The Frail Ocean, Wesley Marx New York: Ballentine Books, Inc., 1969 @ 95¢		5	5	4.25
5.	Famine 1975, Win & Paul Paddock Boston: Little Brown & Co., 1967 @ $7.95		2	2	15.00
6.	Moment In The Sun, Robert & Leona Reinow Ballentine Books, 1969 @ 95¢		5	5	4.25
7.	SST And Sonic Boom Handbook, William A. Shurchill New York: Ballentine Books, 1969 @ 95¢		5	5	4.25
8.	Ecotactics, Mitchell & Stallinger Ed. New York: Pocket Books @ 95¢	1	5	6	5.20
9.	Our Precarious Habitat, Benerde, Melvin A. New York: W. W. Norton & Co., Inc., 1970 @ $4.95	1		1	4.95

Resource	Teacher	Pupil	Total Copies	Price
Filmstrips:				
CHIO "Air Pollution And You", color @ $7.50			1	$7.50
NYT "The Population Explosion" @ $6.00			1	6.00
			TOTAL	$73.65

00012

TABLE OF CONTENTS

OBJECTIVES

Knowledge

The pupil will know that :

1. The basic cause of air pollution is the imperfect burning of fuel for heating and propulsion.
2. Major type of air pollution from automobiles is carbon monoxide.
3. Photo-chemical smog is a product of the sun acting on car fumes.
4. Smog can be caused by temperature inversions when a layer of warm air is sandwiched between two layers of cooler air.
5. Air pollution is linked to respiratory diseases such as bronchitis.
6. Air pollution causes destruction to buildings, crops and forestation.
7. The major sources of air pollution are automobiles and industry.
8. The major piece of federal legislation to combat air pollution is the Air Quality Act of 1967.
9. The major pesticides are DDT, Parathion and Malathion.
10. Pesticides are used to control insects.
11. Pesticides do not easily decompose.
12. Pesticides are transferred in the food chain to humans.
13. Herbicides are used to kill vegetation.

Objectives (Cont.)

14. "Dead water" is caused by oxygen depletion.

15. Water pollution may be physical (phosphates), biological, physiological or physical (temperature).

16. The demand for water will double by 1980.

17. Polluted water carries diseases and kills aquatic life.

18. The major water sources in the U. S. are dying.

19. The major method of treating water is through city water treatment plants where the water is settled and then treated with chemicals.

20. The major piece of federal legislation for water pollution is the Federal Water Quality Act of 1965.

21. The doubling time for population is presently 35 yearss.

22. The world population is out-running the food supply.

23. New synthetic foods - with higher protein content - are being developed.

24. The refuse problem is getting out of hand - 5 lbs./person/day.

25. People are the cause of air and water pollution.

26. Industrial power accounts for 42% of all power used, and such power causes pollution.

27. Industries cause the greatest amount of waste.

28. Our conspicuous consumpsion adds to the pollution problem.

Objectives (Cont.)

29. Advertising creates our desire for products which are polluters.

30. Recycling natural resources is one of the major ways of not exhausting our resources and of reducing the rate of pollution.

31. Major terms:
    - pollution (water and air)
    - temperature inversion
    - herbicide
    - pesticide
    - smog
    - carbon monoxide
    - sulfur dioxide
    - ecology

Skills

The student will be able to:

1. Read charts and graphs and interpret pictorial materials.
2. Utilize library resources - books, magazines, newspapers.
3. Gather facts from field trips and interviews.
4. Write letters for information and expression of opinion
5. Run experiments to test for water and air pollution.
6. Speak and write with accuracy and poise.

Skills (Cont.)

7. Participate in committee oriented tasks - as a leader or a participant.

8. Do individual investigation.

9. Make simple outlines of materials read.

Attitudes

The student will:

1. Recognize that pollution in all its ramifications is everyone's concern.

2. Have a positive committment to work to help eliminate the problems of pollution.

3. Believe that even individual efforts can be effective.

4. Believe that efforts to identify and control the problem must be made now--time is of the essence.

5. Recognize that pollution is one of the most vital issues of our age.

6. Recognize that pollution and people cannot be separated - that pollution is a matter of degree or quantity.

Behaviors

The student will:

1. Be courteous when conducting interviews, working in groups or taking field trips.

2. Recognize that orderly discussion can be accomplished best through one person speaking at a time.

Behaviors (Cont.)

3. Listen attentively when others are speaking.

4. Become actively involved in some aspect of the fight against pollution - in school and out.

5. Make an effort to do something individually to combat pollution (keep the school yard free of litter), (stop smoking?), (walk?).

STRATEGY	LEARNING ACTIVITIES	MATERIALS
I. Introductory Activities A. To interest the pupils in the study of pollution and its causes.	1. Analyze samples of water taken from the water tap and a nearby lake, stream or pond using the following simple test.: Methylene Blue Test for Biochemical Oxygen Demand (BOD) Methylene blue is a chemical indicator that is blue in the presence of oxygen and turns yellow or colorless when a large amount of carbon dioxide is present. Collect various samples of water and test each one. The more polluted samples will have lower amounts of oxygen (turn yellow or colorless). This test does not indicate the amount of oxygen that is present so it has limited quantitative value.	Methylene Blue is a standard organic due available in drug stores or from the chemistry or biology teacher in your school. LaMotte Chemical Products. Educational Products Division, Chestertown, Maryland--Water testing kit.
	2. To study the amount of air pollution in various sites around the city and in the country. Use plain filter paper which has been weighed and the weight recorded. Place a number of these papers in various locations for a specific length of time (12 hrs., 24 hrs., 36 hrs., etc.). Collect the samples and reweigh. This will give a simple example of the amount of accumulation in a given period of time in a given place.	Filter paper. Scientific scale.
	3. Display numerous pictures of examples of all types of pollution (the more dramatic the better) around the classroom.	Pollution photos.
	4. Set up a book display using the kit and additional materials which should be available for browsing.	FICSS Kit.

STRATEGY	LEARNING ACTIVITIES	MATERIALS
1. Introductory Strategy (Cont.)	5. Display a graph or chart depicting population growth. (see charts and films in kit)	(Kit) "The Population Explosion".
	6. Show pictures of areas of Viet Nam which have been sprayed with herbicides.	
	7. Play a tape from the local airport, traffic at a major intersection, in an office or factory, etc.: to demonstrate the noise problem.	
	8. Play the song from Hair, "Sulfur Dioxide".	
	9. Display pictures of wild life which have suffered or died from pollutants.	
	10. Read excerpts from the Silent Spring or the Environmental Handbook.	(Books in kit)
	11. Have current newsclippings about the ecology crisis displayed around the room.	
	12. Read portions of or play tapes of Ralph Nader's speeches.	(in kit)
	13. Show pictures which indicate conjection in the cities, on the highways, and at recreation facilities.	

STRATEGY	LEARNING ACTIVITIES	MATERIALS
II. Raising Questions Purpose: 1. For students to form a basis on which to investigate the various demensions implied in the title of the unit. 2. Students should ask their own questions to facilitate the development of a student-structured unit.	Potential questions which the students might ask after experiencing the introductory activities: 1. What are the major types of air pollution? 2. What are the major types of water pollution? 3. What is pesticide pollution? 4. What are the major causes of this pollution? 5. How do the numbers of people affect the amount of pollution. 6. How does industry cause pollution? 7. What is being done about the problem? 8. What can I do? Note: This list of questions is not all inclusive nor phrased as the students might really ask the questions. The point is that they should ask: If they don't, then more introductory activities are called for. (It is hoped that there will be many more questions. Maybe 30 or 40). The content section of this unit contains only a small segment of information in answer to these questions. The students will be the guiding force for direction of research based on their questions NOT necessarily those listed above.	

STRATEGY		LEARNING ACTIVITIES	MATERIAL
III.	Categorizing Questions Purpose:	A. Although one cannot anticipate the exact questions students will raise and the categories they will devise, it is possible that the following categories will appear. The written form of this unit is organized in the following manner: 1. Air Pollution - - - - Pink section 2. Pesticides - - - - - -Blue section 3. Water Pollution- - - -Yellow section 4. Population - - - - - Green section 5. Industry - - - - - - -Pink section	
1.	To determine the number of committees needed to investigate the topics.		
2.	To organize basic ideas that should be explored.		
3.	To gain experience in critical thinking.		
4.	To identify several areas of pollution control which need to be studied.		

Strategy	Learning Activities	Content	Materia
IV Formation of and instructions to Committees 1. To identify the necessary tasks of the committees	The students may wish to work in groups to pursue those topics which most interest them. The content might also be revealed through a more traditional approach but the FICSS unit writers believe it of great importance that pupils learn the skills and the problems associated with cooperative efforts. Thus they do recommend the committee as the agent for seeking factual information. The committee organization also allows for individual excellence especially as it is perceived as effecting group goals. Activities Discuss and decide on something like this: Class discussion concerning: 1. The tasks of a committee 2. The roles of committee persons. 3. How to find information.	A. Tasks of Committees 1. Organize committee a. Random choosing by teacher or students. b. Students rank choices on slips of paper. c. Student's choice on basis of their interest in subject matter to be explored. d. Using sociograms to achieve balance within a committee (may be homogenous or heterogeneous) e. Number selection- students in the classroom count off, 1,2,3, etc., all 1's on committee, all 2's second committee, etc. 2. Utilize class questions as starting point for planning committee work. 3. Add new questions suggested by committee members. 4. Assign research, find information, coordinate information, develop and present.	

Strategy	Learning Activity	Content	Material
2. To determine desired roles in committee operation.		B. Roles in a Committee 1. Leader a. Help make everyone become a part of the group. b. Let everyone have his turn at the "good" group jobs. c. Get ideas from all members of the group. d. Let the group decide which ideas are best. e. Keep the group moving to get its job finished in the best way it can. f. Keep from being "bossy". g. Help your group decide what its job is. 2. Group Members a. Help the leader carry out plans. b. Do your share of the work. c. Work without disturbing other group members. d. Ask other members for their ideas. e. Select only those ideas which help the group do its best work. f. Cheerfully take the jobs the group wants you to do. g. Make other members of the group feel welcome.	

Strategy	Learning Activity	Content	Material
2. To determine desired roles in committee operation.		3. Secretary a. Record group decision b. Verify motions and decisions c. Aid committee in coordinating research	
3. To identify sources for obtaining necessary information		C. Finding Information (See Section 1) 1. Textbooks and books a. Use of index b. Use of glossary, appendix, map lists, illustrations 2. Encyclopedias a. Use of key words; letters on volume, index, class reference 3. World Almanac 4. Pamphlets 5. Pictures 6. Filmstrips 7. Charts, cartoons, posters, graphs 8. Records 9. Community	
		Discussion possibilities for presentation: 1. Reports 2. Panel and round table discussions 3. Show visual aids 4. Make and show graphs and charts	

STRATEGY	LEARNING ACTIVITIES
V. Information Retrieval	SUGGESTED INFORMATION RETRIEVAL ACTIVITIES

A. The various committees, at this point-
   1. determine their tasks
   2. assign responsibilites
   3. research their topics
   4. organize their data
   5. make a presentation

Some content materials have been included that might be useful as resources for the teacher and the student. Since the emphasis in this unit is on the committees doing their own research, it is recommended that the content materials be used as backbround information for the teacher or student and not as a substitute for student investigation.

It is difficult to project the extent of student research. In all probability, the substance of student research will be somewhat different from what the authors of this unit have included in the content portion of this unit. But that is as it should be.

Students may need instruction in the use of the basic library research tools such as
- Reader's Guide to Periodical Literature
- card catalog
- specialized indexes

They should also not forget that resources other than library resources exist, such as:

STRATEGY	LEARNING ACTIVITIES
V. Information Retrieval	1. For Committees #1 and #3 - Air and Water Pollution. a. Kit materials - The Environmental Handbook and Ecotactics; also pamphlets in the resource section of this unit. b. Local Air Pollution Control Board or Regional Offices. *c. People on the street who can be surveyed concerning their feelings about pollution problems and control. *d. Films - see resources. *e. National, weekly magazines such as Life, Look. *f. Health, Education, and Welfare Department in Washington for federal regulations, also the Department of the Interior. *g. Daily newspapers and TV news broadcasts or special documentaries. h. Public Health Department. i. Water treatment plant field trip. 2. For Committee #2 - Pesticides. a. Kit book - The Silent Spring. b. County Agricultural Extension Agent who can tell about the use and misuse of pesticides. 3. For Committee #4 - Population. a. Kit books; films and books listed in the resource section. b. Demographer from the local university. 4. For Committee #5 - Industry. a. Kit books; films and books in resource section. b. Management of large factories who can be interviewed to find out what they are doing about pollution. c. Advertisements which are examples of ecological dishonesty. d. Tapes of Ralph Nader's KSU speech - in kit.

STRATEGY:	LEARNING ACTIVITIES
V. Information Retrieval	5. Generally those resources listed in 1 and * can be used by all groups. Also pages 276-78 in Ecotactics list agencies and groups involved with all phases of the problem.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval	Introduction to the topic:	

Ecology has become an important issue recently and has been given the title of a crisis. The causes of our ecological crisis are many, but there are three main reasons. Two fairly recent publications have suggested that the origin of our ecological crisis is in the Judeo-Christian tradition which teaches that man was created apart from his world and is superior to it. From this tradition it follows that every item in creation was put here to serve man's purpose. This view of creation is in striking contrast to earlier and more primitive religions which saw divinity in all of creation. Because of the Judeo-Christian tradition and the abundance of natural resources, we not only have used the fruits of our environment, we have abused them.

Another reason for ecological crisis is the population explosion that has stretched our resources to the breaking point. Durward Allen, an ecologist from Purdue University, recently pointed out that, "There appears to be unmistakable evidence that the world at large has passed the optimum level of population. Any living thing that is successful destroys the source of its livelihood and disappears with the community on which it depends."

The third reason that we are faced with an ecological crisis, and perhaps the most basic reason, is ignorance. Americans have for two generations been almost completely ignorant of the concepts and principles of ecology. Our ignorance is manifest in our almost indifferent attitude to the problems that confront us and our hand-wringing anguish with our attempts to solve them.

V. Information Retrieval

Introduction to the topic: (Cont.)

A fourth element that we should stress in our teaching is the interrelationships that exist between the various components in the environment. We have to help students to understand that it took millions of years through a slow gradual process for delicate interrelationships to be established. We cannot disturb these relationships without causing havoc. We also have to impress people with the fact that we are not divorced from our environment but are an integral part of it. Every time another species of plant or animal becomes extinct, every time a lake dies, we lose a part of our lives.

Another concept we must try to get across is that the only thing constant in nature is change; a pond becomes a swamp, which becomes a meadow which eventually becomes a forest. But students should realize that these changes differ drastically from the man-made assaults on the environment. Natural changes are gradual with subtle checks and balances allowing for almost unnoticeable adjustments by plant and animal life. These gradual changes do not have the devastating effect that the overnight conversion of a salt marsh into a parking lot has on the environment.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #1 Air Pollution	I. Air Pollution A. Definition - presence in the air of substances in amounts great enough to interfere directly or indirectly with our comfort and safety, or with our enjoyment of property. B. Some facts and figures. 1. 125-150 million tons of pollutants poured into the air per year or 390,000 tons every 24 hours. 2. Between 85 and 90 per cent of U. S. air pollution consists of largely invisible yet potentially deadly gases. 3. Each citizen now pays $65.00 per year for pollution in the form of property deteriation and maintenance while its cure would cost only 4¢ per person. 4. A New Yorker breathing that city's air inhales the equivalent of 38 cigarettes a day. C. Causes 1. Population growth and urbanization are the underlying causes of all air pollution. 2. The basic cause is the imperfect burning of fuel and other materials. This includes: a. Fuel for heating and electricity. 1) Sulfur compounds are emitted from burning heavy fuel, oil and coal, for heating, for industry, and private dwellings in the form of smoke. 2) As they burn, the sulfur combines with oxygen to form sulfur oxides which can damage crops, flowers, trees, building and stone buildings.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #1 Air Pollution (Cont.)	a) 23 million tons of sulfur oxides pollute the air each year. b) No economical method has yet been found to remove sulfur from heavy fuel oil. c) Sulfur dioxide combines with water to produce sulfuric acid which eats away stone buildings and statues. Rome's Colliseum is threatened as are the Greek bronze horses in Venice's St. Mark's Square. d) Hydrogen sulfide can blacken lead-based house paint and tarnish silver and copper. e) Metals corrode in sulfur rich air. 3) The New York or London type "smog" pollution is the result of this type of burning. b. Imperfect burning of fuel for automotive transporation. 1) Imperfect gasoline combustion produces 66 million tons of carbon monoxide a year, plus hydro-carbons and sulfur compounds. 2) The effect of the sun on the car fumes creates ozone and an eye burning compound called PAN. The result of this complex chemical interaction is photochemical smog - the major air pollution problem in Los Angeles. 3) Temperature inversion. a) An inversion occurs when a layer of warm air is sandwiched between two layers of cooler air. The lower ground level cool air is unable to rise and carry away air pollutants. If the wind dies away, the possibility of abnormally high concentrations of pollution in the trapped air increases drastically.	

V. Information Retrieval

Committee #1

Air Pollution (Cont.)

b) The massive type of inversion usually occurs in the late fall or early winter months.

c) In California, the cool sea air slides under the warm land air very frequently---260-270 days per year.

4) Radioactive pollutants.

a) Most of these come from nuclear device testing. Therefore are difficult to control. In high concentration, they may cause great varities of damage to the body.

D. Air Pollution and Health.

1. No death certificates have cited polluted air as a cause of death because air pollution cannot be pinpointed as the exclusive cause.
2. Respiratory diseases linked to air pollution
   - bronchitis
   - emphysema - has been doubling every 5 years
   - lung cancer - 50,000 deaths a year
3. Illness and death increase during periods of intense pollution, especially among people whose condition is already weakened.

E. [illegible]

E. Air Pollution Disasters

1. Meuse Valley of Belgium, Dec. 1930.
   a. Inversion over a heavily industrialized area caused 60 deaths, 6,000 illnesses in 5 days.
2. London, December 1952
   a. 5 days; 4,000 deaths.
   Traffic virtually stopped and cattle at an animal show choked and died.

STRATEGY		CONTENT	MATERIAL
V. Information Retrieval Committee #1 Air Pollution (Cont.)		3. Donora, Pennsylvania, October 1948. Inversion over industrial valley trapped pollutants for 6 days, killing 20 people and making 14,000 ill. 4. New York, Thanksgiving weekend, Nov. 1966.	
	F.	The "Price" of Pollution. 1. The added cost of living per person in a heavily polluted area can be over $200 per year. 2. The heavy load of soot which falls raises cleaning bills and increases house cleaning. (80 tons a month in New York) 3. See effects of sulfur dioxide in Section C, 2. 4. Oxidants cause rubber to crack so we have to buy new auto tires. 5. Reduced visibility causes highway and airplane accidents. The New Jersey Turnpike was blacked out by smog 23 times in 1965. 6. Agricultural losses in California are estimated at $100 million; more elsewhere; the cost is passed along to the consumer. 7. Pollution attacks and kills plants. Many New Jersey crops - grapes, beans, alfalfa, beets - have been damaged (over 36 varities). 8. Effect on trees. a. Flourides from an aluminum ore plant in Washington killed ponderosa pine 50 miles away. b. 17,000 acre area in Tennessee is completely barren. c. White pine died 30 miles away from an iron smelting plant in Ontario. d. Ponderosa pines in San Bernardino Mts. in California are dying due to Los Angeles smog 50 miles away and 5,000 feet below. 9. Evaporated gasoline costs car owners $3 billion per year. 10. The sulfur which goes up chimneys of power plants and factories is worth $300 million a year.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #1 Air Pollution (Cont.)	G. The fight against pollution. 1. 1966 - only 58% of the urban population is served by meagre local air pollution programs. 2. Every major city has a pollution problem. 3. The total budget for all air pollution control agencies was $14.3 million - 40% of that was spent in California. 4. Control devices for factories. a. Electrostatic precipitators can remove 99% of the fly ash from smoke stack gases. b. Higher smoke stacks. c. Activated charcoal can reduce odors. d. Basic oxygen furnaces are replacing open hearth furnaces in the steel industry. 5. Automobiles. a. Electric cars do not produce hydrocarbons, carbon monoxide or sulfur compounds, but do produce ozone. At the present stage of development, however, these cars lack power and need to be recharged after going only short distances. b. Ford Motor Company and Mobile Oil Company (1967) began a $7 million program to develop a fume-free gasoline powered automobile. c. New federal laws require devices to eliminate emission of hydrocarbons from exhausts. (It will take 10 years bef e 85% of the cars have these devices). They are not effective, however, unless the automobile owner keeps them in top condition. H. Political action. 1. Unless people see the need, first hand, they tend to be apathetic and refuse to approve tax increases for pollution control.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #1 Air Pollution (Cont.)	2. Many politicians, especially on the local level, are reluctant to push industries to get them to control their pollution. 3. Clean Air Act of 1963. a. Money available to establish state and local air pollution control programs $3.1 federal aid for regional programs. b. Federal criteria for clean air. c. Federal government can intervene in interstate air pollution problems. 4. Air Quality Act of 1967. a. This act will cost over 400 million dollars for three years. b. Approximately one million dollars of this money will be used for research into the control pollution due to fumes. c. The Act gives the Secretary of Health, Education and Welfare emergency power. 1) If he decides that a sizeable health hazard exists in a polluted area, he would have the authority to request that the court virtually shut down the area. 2) The court could conceivably shut down factories and halt all auto travel. 3) But the Act does not set air pollution standards. This is up to the state. 5. National Air Pollution Control administration at Cincinnati is doing research on the effect of air pollution on health. 6. Public Health Service helps promote action against interstate problems 7. Local citizens action groups: a. Citizens for Land, Air and Water Use. b. Citizens for Clean Air. c. Air Pollution Control Association.	

STRATEGY	CONTENT	RESOURCES
V. Information Retrieval Committee #2 Pesticides	II. Pesticides A. Pesticides which are made from chemicals. 1. DDT has been the most commonly used insect pesticide. a. Was introduced in 1946. b. Filled a gread need for combating disease carriers and lowering disease level. c. So effective in controlling insects that tremendous quantities have been used. 1) 1 million pounds - 1946. 2) 1 billion pounds - 1965. 2. DDT does not break down rapidly, so it accumulates in soil and enters streams, lakes and oceans. a. About one-half of it remains unchanged after 20 years. b. The other half is changed to DDE which is still toxic. 3. DDT contaminates the entire food chain. a. It is soluble in water where there are universal low level concentrations. b. It enters minute aquatic organisms (plankton) in low concentrations. c. It is very soluble in fat and remains there until fat in organism is used. d. The concentration increases as the organism continues to feed and take in water. e. If organism uses its own fat for energy, it becomes ill or dies. f. Concentration of DDT becomes higher as one animal eats others. g. DDT is in every American's fat because man is a high order consumer.	Silent Spring

CONTENT

4. DDT causes problems within organisms.
   a. It affects photosynthesis in plants.
   b. It affects reproduction in plants.
   c. It affects the reproduction in animals.
   d. It is thought to be related to the cause of tumors in mice.
   e. It causes a breakdown in sex hormones.
   f. It reduces the effectiveness of many drugs.
   g. It may cause calcium deficiency in bones.
5. DDT can be transferred.
   a. From mother to offspring.
   b. From cattle in milk.
   c. From chickens in eggs.
   d. From fruits and vegetables.
6. Insects have built an immunity to DDT.
   a. Larger doses are required.
   b. Some are not killed (resistant strains).
7. Elimination of the problem.
   a. The government has recently awarded a contract to the Aerojet-General Corporation to develop a self-destructing DDT.
   b. The process devised involves developing a catalyst that combined with a pesticide weakens the strength of the pesticide in a matter of hours or a few days. Now it takes DDT 10 to 12 years to decompose.

Christian Science Monitor (Aug. 14, 1970)

B. Synthetic Pesticides.
   1. Parathion is a chlorinated hydrocarbon with phosphates and sulfur also present.
      a. One of the most widely used organic phosphates and also one of the most toxic.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #2 Pesticides (Cont.)	b. About 7 million pounds of parathion are now applied to fields and orchards in the U.S. c. The amount used in California farms alone provide a lethal dose for 5 to 10 times for the whole world's population. 2. It is lethal to humans. a. It is the favorite instrument for suicide in Finland. b. California reports an average of more than 200 cases of accidental parathion poisoning annually. c. 100 fatal cases in India per year. d. 67 fatal cases in Syria per year. e. 336 fatal cases in Japan per year. f. Example: TOBACCO PESTICIDE CAN KILL ITS USER Pink Hill, N.C.--After he planted his nine acres of tobacco this Spring, Claren Lee Boyette came to a store here to buy pesticides. He wanted something to kill the worms that can riddle tobacco leaves--something like DDT, which he had used for more years than he could recollect. The man at the store suggested parathion because DDT could not be used on tobacco if a farmer wanted to qualify for government price supports. Parathion went by the local trade name of "Big Bad John," and all the farm experts said it was a "sure-fire killer." AND SO it was. No budworms or hornworms "worried" his crop, Boyette said. But his youngest son, Daniel, 7, is dead. Another son, Curtis, 11, barely escaped death. They were poisoned by parathion.	Akron Beacon Journal Aug. 23, 1970

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #2 Pesticides (Cont.)	Several dozen other cases of serious parathion poisoning, mostly among young people, have occurred across this tobacco-growing state this Summer (1970). Doctors at Duke University's poison control center report five fatalities since late July. State health officials are sure at least two of the deaths came from exposure in sprayed tobacco fields. Although parathion poisoning is not new, the deadly outbreak this year represents a classic case of what can happen in an environment-conscious society when one pesticide is replaced by another, less familiar one, such as parathion or related organic phosphates. Parathion decomposes fairly fast, but presents a more immediate threat. It is 300 times more toxic than DDT, for it is a member of the same chemical family as the nerve gas that the army dumped in the Atlantic Ocean recently. Six of the nine pesticide poisoning cases in Dade County, Fla., this year including two fatalities, were traced to parathion, which is used extensively on vegetables. Parathion can be dangerous for several weeks after it is sprayed on a crop.	

V. Information Retrieval

Committee #2

Pesticides (Cont.)

Workers going into a sprayed field can breath vapors from it or touch the chemical still on the leaf. The skin readily absorbs parathion. It is most lethal during application by spraying or when the liquid is spilled.

C. Synthetic pesticide - malathion.

1. Malathion is a chlorinated hydrocarbon.
   a. Is widely used by gardeners, in household insecticides, in mosquito spraying.
   b. Used for blanket attacks in Florida for the Mediterranean fruit fly.
2. It is dangerous to man.
   a. It does damage to the human nervous system.
   b. It has produced muscular weakness in the legs of people who have come in direct contact with it.

D. Herbicides (used to kill vegetation).

1. 2-4-D and 2, 4, 5 T are the most commonly used.
   a. Both long lasting in soil and water.
   b. They are used extensively
      1) For roadside weed control.
      2) For weed control in crop production.
      3) For defoliation of trees in Viet Nam on a huge scale.
   c. Causes birth deformations in experimental animals.
   d. Is thought to cause birth defects among children of exposed mothers in Viet Nam where massive accumulations have occurred.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #2 Pesticides (Cont.)	E. Organophosphates - the most deadly chemicals known to man. 1. Over 75,860,000 pounds were produced in the U.S. in 1968. 2. One drop in the skin will kill a human being in 30 seconds. 3. No one is allowed in a field for 15 days after spraying. 4. This is the spray used on most food crops in the U. S. today. a. The residues are usually invisible and in most states, except for California, the farm worker has no idea of what has been sprayed on the crop. 5. According to Edward Jester, president and director of Central California Medical Laboratories and a noted expert in the field of organophosphate poisoning, it is possible for consumers to come into contact with fruits or vegetables which still contain active residues.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #3 Water Pollution	III. Water Pollution A. Definition 1. Depletion of oxygen with consequent septic conditions such as offensive odors, floating masses of sludge, and death of fish and other aquatic life. 2. Some waterways undergo self-purification through activities of bacteria, sedimentation and energy of sunlight. If oxygen is removed faster than it can be replaced by natural aeration or photosynthesis, pollution may result. B. Types of pollutants. 1. Chemical (organic and inorganic) a. Dairy, textile, cannery, brewery and paper-mill wastes; laundry wastes, slaughterhouse wastes. b. Phosphates, nitrates and potassium aid weed growth and promote algae blooms which depiete oxygen. The Department of the Interior has issued the following list of laundry products and their percentage of phosphates: Pre-soaks: Biz, 73.9 per cent; Enzyme Brion, 71.4; Amway Trizyme, 71.2; Axion, 63.2. Laundry detergents: Blue Rain Drops, 63.2; Salvo, 56.6; Tide, 49.8; Amway SA-8, 49.3; Coldwater Surf, 48.2; Drive, 47.4; Oxydol, 46.6; Bold, 45.4; Cold Water All powder, 45.4; Ajax Laundry, 44.6. Cold Power, 44.6; Punch, 44.2; Dreft, 41.9; Rinso with chlorine bleach, 41.0; Gain, 39.5; Duz, 38.3; Bestline B-7, 38.0; Cheer, 36.3.	Our Precarious Habitat

V. Information Retrieval

Committee #3

Water Pollution (Cont.)

Fab, 34.8; White King with borax, 34.7; Royalite, 21.7; Instant Fel Soap, 16.6; Wish liquid, 14.2; Par Plus, 4.3; Addit Liquid, 2.2; Ivory Liquid, 1.9; Lux Liquid, 1.9; White King Soap and Coldwater ALL liquid, less than 1 per cent.

Automatic dishwasher detergents: Amway, 60; Cascade, 54.5; ALL, 54.0; Calgonite, 49.4; Electrosol, 34.8.

Household cleaners: Ajax all Purpose, 28.5; Mr. Clean, 27.0; Whistle, 3.1; Pinesol, less than 1 per cent.

Miscellaneous: Snowy Bleach, 36.4; Borateem, Downy and Amway Dish Drops, all less than 1 per cent.

c. Inorganic salts.

2. Biological pollutants.

Microscopic animal and plant forms such as protozoa and viruses which transmit disease.

3. Physiological pollutants.

Objectionable tastes and odors due to inorganic chemicals such as hydrogen sulfide.

4. Physical effects.

a. Foaming, color, turbidity and increased temperature.

b. Rise in temperature of only a few degrees can kill plants and animals in water. The Ohio Department of Natural Resources recently sued the Ohio Sugar Company of Freemont for the loss of fish because of discharges of hot water from its plant.

V. Information Retrieval

Committee #3

Water Pollution (Cont.)

c. The warmer the water, the less oxygen it contains.

5. Factors that alter the composition of water:
   a. Dust particles and gases are filtered out of the atmosphere by snow and are trapped in snow banks.
   b. Flowing water erodes rocks and soil, adding suspended solids to the water.
   c. Mine acid wastes have a severe effect on the pH and the chemical composition of the water.
   d. Industrial gases are washed from the atmosphere by falling rain and snow.
   e. Crop dusting contributes to both air and water pollution.
   f. Rainwater leeches chemicals from the soil which run off into streams and rivers.
   g. Large quantities of soluable fertilizer salts plus insecticides and herbicides are washed into water.
   h. Domestic septic systems ultimately pass to ground water supplies.
   i. Heat laden waters from powerplants induce thermal pollution.
   j. Oil leaks from vessels and offshore drilling operations can be disastrous
   k. Municipal water treatment plants must be carefully managed.

NOTE: Our technological society makes it mandatory that we accept a certain degree of pollution. It is impossible to have totally "pure" water. Therefore, it is necessary to discover the degree of waste a body of water can tolerate without harmful conditions.

V. Information Retrieval

Committee #3

Water Pollution (Cont.)

C. Demand for water.
1. The average city family of 4 uses about 600 gallons of water per day.
2. A typical large city uses 70 million gallons of water per day resulting in:
   a. 17 tons organic suspended solids.
   b. 17 tons organic dissolved solids (including a ton of detergents).
   c. 8 ton inorganic dissolved solids.
   d. 80 cubic feet of grit.
3. Industry requires 5 gallons of water to produce a gallon of gasoline, 10 gallons to produce each can of vegetables, 25,000 gallons to process one ton of steel, 50,000 to produce 1 ton of paper.
4. Demand for water will double by 1980 in the U. S.

D. Scope of the pollution problem and some examples.
1. Health effects on man.
   a. Produces serious diseases and can cause death.
   b. 228 known outbreaks of disease or poisoning attributed to polluted drinking water from 1946-1960.
   c. Water borne outbreaks result in typhoid fever, dysenteries, viruses and infectious hepatitis.
   d. Parasitic life forms such as tapeworm, hookworm and blood flukes are often present.
   e. Fumes and water odors often affect breathing and irritate the eyes, nose and throat.
2. Effect on other living organisms.
   a. Lack of oxygen in the water affects fish.
      1) The caviar and sturgeon fishing industry in New York's Hudson River has completely disappeared.
      2) Lake Erie fish companies are being driven out of business due to the lack of fish.

V. Information Retrieval

Committee #3

Water Pollution (Cont.)

3) Mercury poisoning of fish in Lake Erie.
4) 5 million fish killed in 1963 by endrin- a pesticide polluting the water.

b. Water fowl are killed directly or indirectly by polluted water-they eat the contaminated fish.
c. Water plants which are essential food for certain fish and birds are destroyed by the concentration of oxygen depleting algae on the water's surface.

3. The Cuyahoga River in Cleveland has been declared by some to be a fire hazard due to debris and oil slicks.

E. Control of water pollution.
1. Early history.
a. Before the 19th century, towns were small and people carried garbage to outskirts of town.
b. Population was sparse and water demands were small.
c. By early 19th century, the growth of cities in the U. S. and Europe led to development of watercarriage system of sewage.
1) Growth of factories attracted more people to cities.
2) Population increase caused increase in waste.
d. As streams became more noxious some cities took action.
1) Built waste treatment plants.
2) Two kinds of plants: primary and secondary.
e. At present, population increase resulted in more technical advances.
2. Primary treatment of water.
a. This type of treatment eliminates about 35% of pollutants.
b. Water is pumped up from the lake through intake cribs.
c. Water passes through screen (filter) to catch stikks, rags, solids and other objects.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #3 Water Pollution (Cont.)	d. Water flows slowly through "grit chamber" where sand, gravel and other heavy objects settle. e. Water flows into a settling tank where it is first mixed thoroughly by large paddles so that particles will build up in size and weight and drop easily. f. Water then flows to settling tank where it stands from one to 3 hours and heavy solids settle to bottom as "sludge" and oils rise to top as "scum". g. Water between scum and sludge is drained off. h. Chemicals are then added to water: 1) Chlorine - sterilizes water. 2) Carbon - eliminates odor. 3) Lime - protects pipes from corrosion. 4) Aluminum sulfate - collects dirt, microscopic plant growth. 5) Fluoride for teeth is added. i. Some plants pass water through huge sand and gravel filters where remaining pollutants are screened out. 3. Secondary treatment of water. a. Water is carried from the settling tanks into filters and "activated sludge". b. Bacteria work on dissolved materials in water to destroy organic waste. c. This process removes almost all pollutants. 4. Shortcomings of treatment plants. a. Facilities inadequate--not all water gets treated. b. There are not enough plants: 1/4 of the cities have none and waste of sewage is dumped directly into waterways.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #3 Water Pollution (Cont.)	c. 31% of cities have only primary treatment. d. 90% of cities have secondary treatment. e. Some pollutants cannot be removed, such as detergents, radioactivity and certain minerals. f. No new treatment methods developed in the last 50 years. F. The politics of water pollution. 1. The federal Water Pollution Control Act - 1956. a. This Act provided a means to help combat pollution through: 1) Grants of financial assistance to state water pollution control programs. 2) Grants to communities to assist in construction of waste treatment works. 3) New federal enforcement authorities. 4) Research. b. Although a good start was made, it became apparent that the program was inadequate to cope with the problem. 2. Congress amended to Act in 1961. a. To broaden assistance to states and communities. b. To strengthen federal enforcement capability. c. To expand research and training. 3. Federal Water Quality Act - 1965. a. Established a separate agency - the Federal Water Pollution Control Administration - to administer an expanded program designed not only to abate existing pollution but to prevent new pollution. b. Authorized grants and contract funds to communities or agencies which can demonstrate new methods to control pollution from overflowing of combined sanitary and storm sewers.	

V. Information Retrieval

Committee #3

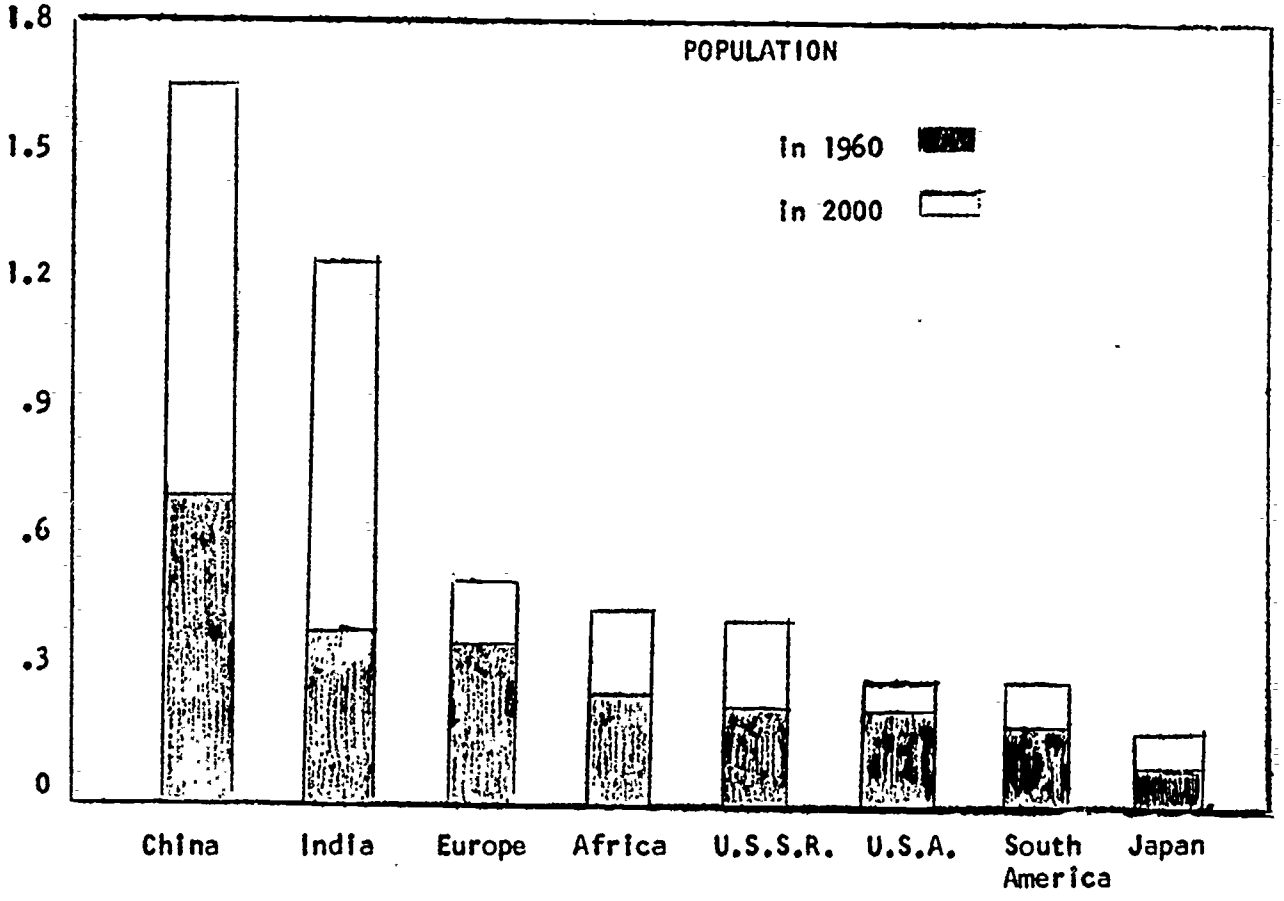
Water Pollution (Cont.)

c. Provide further financial assistance to municipalities and states affected by pollution on interstate water and outside the political jurisdiction of such communities or states.
d. Emphasis is given to research in finding ways to reclaim waste waters and otherwise control pollution.
e. Provides for the establishment of water quality standards for interstate and coastal waters across the nation.
f. Specifies that the states should have the initial opportunity to develop such standards for the interstate waters within their jurisdiction subject to the approval of the Secretary of Interior.
g. Emphasizes that such proposed standards shall be developed following public hearings.
h. Emphasizes that the hearings will provide opportunity for the public to participate in the process by expressing its views about water pollution and stating its desires as to the public uses which the standards of quality adopted should permit.
i. Authorizes to Secretary of Interior to establish standards for interstate and coastal water if a state fails to act effectively, or if it does not act at all.

4. <u>The Water Pollution Control Act of Ohio</u> - 1951.
a. Created a Water Pollution Control Board of five members.
b. This Board has the authority to develop programs for the prevention, control and abatement of water pollution, including investigation, research, education and enforcement.
c. The Board can require the construction or modification of sewage and waste disposal systems.

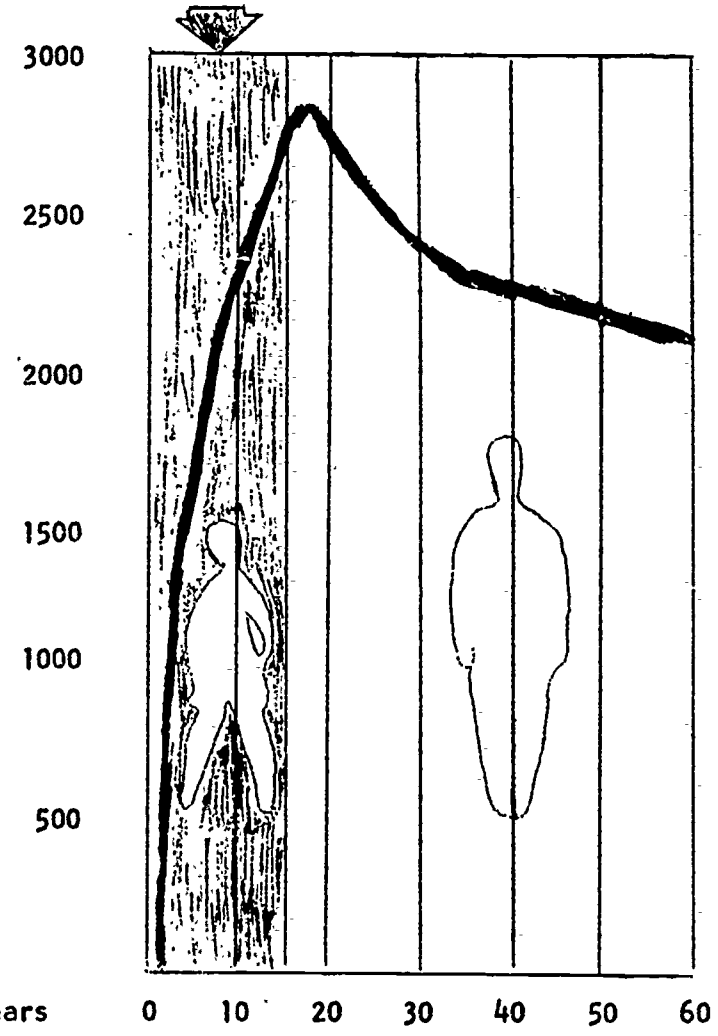
STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #3 Water Pollution (Cont.)	d. Violations are punishable by fines up to $500 a day, or imprisonment up to a year or both. e. The Board's policy has been to seek compliance first by education and cooperation, using court action only when other methods have failed. f. The Board has adopted a procedure which only occasionally calls for formal hearings and orders, yet maintains a constant review and steady pressure for pollution abatement. g. Board pressure is based on the issuance of permits to municipalities, industries and other entities for waste discharges. h. Steady progress toward pollution abatement (or satisfactory operation of approved waste treatment facilities) merits renewal of these permits. i. Lack of progress results in formal hearings and possible Board legal action.	

Billions of People



Calorie Requirements at Differnt Age Levels

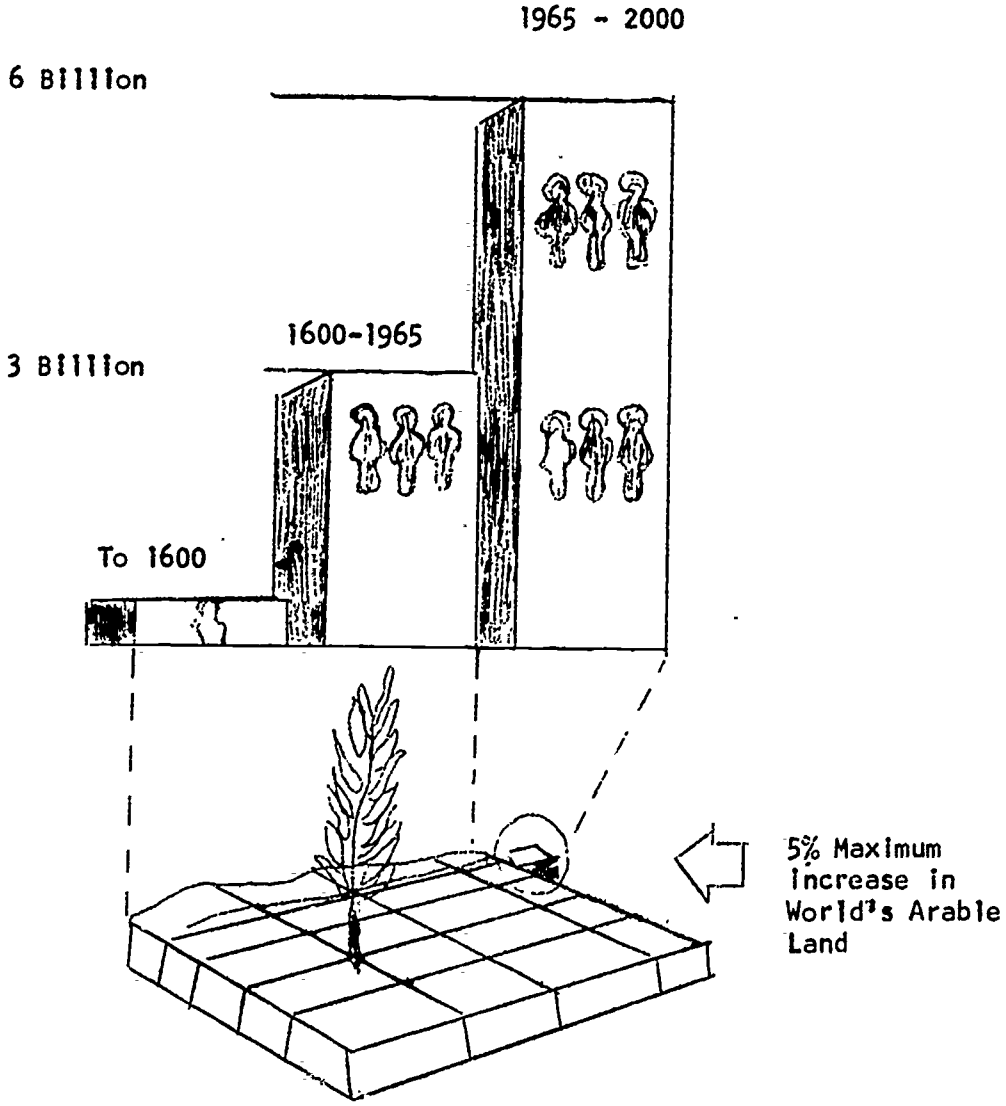
Under 15 years
Age groups of half the people now living in hungry nations of the world.



Growth in World's Population

vs

Increase in Arable Land



STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #4 Population	IV. Population (Excessive population as a cause of the types of pollution already discussed) Although the United States does not at present have a population problem, many parts of the world do. Since the world is inter-related, the problems affecting other nations ultimately affect us. It is thus in our own self-interest to be aware of the problems caused by excess population. A. A finite earth cannot support an infinite population. 1. The world population today is about 3.5 billion people. 2. Birth rate exceeds the death rate - (350,000 per day born; 178,000 die). 3. Doubling time - the time necessary for the population to double in size. The present doubling time is 35 years to reach 7 billion. B. Food shortages. 1. Half the world is undernourished, 10,000 people die of starvation every day. 2. Foor resources must increase 20-35% in underdeveloped areas just to keep up with the birthrate. 3. The deficit in both the total quantity of food and in the very necessary protein will increase unless the rate of population growth is halted. Protein deficiency causes illness in children called kwashiorkor. 4. Solutions: a. Fortification of corn with other protein sources	See charts in kit.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #4 Population (Cont.)	1) Such as cottonseed meal, dry yeast powder and vitamins - called "Icaparina". 2) Sold and manufactured in Central America. Cost - about 6¢ per pound. 3) Accepted or rejected on the basis of cultural influences. b. Macaroni like enriched seeds to be used in place of rice and substituted in native dishes. Substituted for bean meal in Nigerian recipes. c. Simulated meats produced from soy protein. d. Water plants such as sea kelp - 50-70% protein by weight. e. Use of algae, found in bodies of fresh water, as feed for animals; but to date no economical way to harvest them has been found. f. Feed yeast from wood and paper mill wastes. g. Growth of yeasts from petroleum products. h. Cellulosic wastes such as leaves, grass, corncobs and sugar cane pulp can be converted by micro-organisms into high protein foods. Pound for pound, micro-organisms can produce about 250,000 times more protein from grass than can cattle (as meat and milk). c. The refuse problem. 1. Approximately 5 million tons of garbage and trash are collected every year in New York City. 2. Sanitary land fills require one acre per 10,000 people for disposal per year; the space isn't available. 3. 5 pounds of refuse per person in 1970.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #4 Population (Cont.)	4. Approximate direct and indirect amounts of waste for one day's time for the average city dweller: REQUIRED / CONVERTED TO WASTE 150 gal. of water — 120 gal. of sewage 4 lb. of food — 4 lbs. of refuse & rubbish 19 lb. of fossil fuel (motor fuel, oil, natural gas, coal) — 1.9 lb. of air pollutants (about one-half from vehicles and one-half from heat and power production) 5. Every year Americans throw away over 30 million tons of paper, 4 million tons of plastics, 48 billion cans and 26 billion bottles. 6. Americans are no longer consumers, they are users and discarders. (Ours is not the Space Age - but the Garb-age). D. People and water. 1. See Section III, part C--Demand for water. 2. Households have increased and with it the demand for water. 3. Recreation areas are being polluted by careless and wasteful practices of vacationers; not just trash in the water, but oil slicks from motor boats. E. People and water. 1. 60% or more of the nation's air pollution is from automobiles. 2. Population increase help increase air pollution. Therefore, public transportation is one of the major ways to combat this problem.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry	V. Industry (as a <u>cause</u> of pollution) A. Types of industrial pollution. 1. <u>Factories</u> put many pollutants into the air. a. Hydrofluoric acid, sodium and calcium fluorides, compounds of arsenic, chlorine, sulfur dioxide, sulfuric acid, hydrochloric acid, and compounds of zinc and lead. 1) Eighty tons of soot per square mile rains down on Manhattan each month. 2) In one county of upstate New York, one million tons of pollutants fill the air each year. 3) The city of Chicago counts an average of 43 tons of pollution dustfall per square mile every month. b. Each of the major forms of power generation does its own kind of harm to the environment. 1) Fossil fuels-coal and oil produce smoke and sulfur dioxide. 2) Hydroelectric power requires dams that cover up land, spoil wild rivers, increase water loss by evaporation, and eventually produce valleys full of silt. 3) Nuclear power plants produce thermal and radioactive pollution and introduce the probability of disaster. 4) Power use is presently divided about as follows in the U. S. a) Household and commercial--33%. b) Industrial--42% c) Transportation--24%.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry (Cont)	2. Industrial wastes. a. Phosphorus, nitrogen, and other plant nutrients are principal source of overfertilization of rivers, lakes and estuaries. b. Industrial plants are the source of chemical contamination of water. 1) Oil and tarry substances. 2) Phenolic compounds or other persistent organic chemicals contributing to taste and odor problems. 3) Ammonia and other nitrogenous materials. 4) Phosphorus, suspended matter and highly acidic or alkaline materials. c. Paper mill wastes is one of the largest causes of pollution. d. Much water used in industry which is disposed of after its use in an unclean state. 1) 1400 gallons of water used to make one dollar's worth of steel. 2) 200 gallons used for every dollar's worth of paper. 3. Agricultural wastes. a. Much irrigation water is returned to water courses laden with salts, minerals and agricultural chemicals. 1) These are difficult to remove by conventional waste treatment methods. b. Animal wastes are a major source of water pollution entering through surface runoff or underground seepage. c. Insecticides and pesticides often contaminate the waterways.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry (Cont.)	4. Mining wastes. a. Acid mine drainage has polluted many miles of streams. 1) 3.3 billion tons of waste rock and mill tailings were discarded near mine sites. 2) Refining of ores, combustion of coal, production of metalic and non-metalic goods result in much slag, ash and other waste materials. 5. Also see other examples in Sections I, II and III. B. The psychology of industrialization. 1. The American public estimates progress and growth by amount of material possession families or nations have. 2. The standard of living is based on the amount of luxuries one has. (especially electrical gadgets) 3. The gross national product "measures".growth - it cannot expand indefinitely however, because resources are limited. 4. Most people are willing to accept the bad side effects - i.e. pollution of industrialization - fearing you can't have one without the other. C. The advertising industry. 1. The advertising industry is a critical element in encouraging an economic system committed to growth and thus continually increasing pollution. 2. Two steps are called for: a. Honesty in advertising - admitting that a detergent is a potential pollutant. b. Reduction in the amount of advertising which stresses conspicuous consumption	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry (Cont.)	3. Some steps have been taken to stop the advertising of certain chemicals, detergents, pesticides, airlines, glass containers, lumber company products, mining company products and the furs of endangered species. 4. Recent advertising is capitalizing on the ecology concern by appealing to our "conservationist" nature. a. Shell Oil ad read: "Last year we saved a lot of fish from drowning and made a lot of kids happy". They had removed the sudsing agent from some detergents, but had <u>not</u> explained that suds don't cause pollution, the phosphates do. D. Recycling our resources. 1. Americans consume about 19 tons (per person) of the world's resources per year, but resources are limited. 2. A possible solution to excessive consumption is one of converting the end product back to resources so that there is no "end product" but only a cyclical process. 3. <u>To make any resource cyclic, the first requisite is a large supply of the original resource, since a cycle may not be completed for years or even centuries. At present the use of only five resources, nitrogen, iron, copper, lead and lumber, is in any sense cyclic.</u> (However, we are beginning to worry about air and water, resources not included in the 19 tons.) 4. <u>Enchantment of the original supply of a resource depends on new discoveries or on the use of slimmer and slimmer reserves of resources.</u>	"The Science Teacher" Vol. 36, No. 4 April, 1969 page 35

V. Information Retrieval

Committee #5

Industry (Cont.)

a. Geologists recognize that oil and gas discoveries even in the United States have surpassed usage by about 3 percent per year since 1920.
b. Slimmer reserves (oil shale in Colorado and Wyoming) are untapped at present but will extend the oil supply 135 years at present consumption.
c. Coal reserves (new discoveries are not expected in the United States) will last several centuries (500 years' supply under Utah).
d. The world's supply of oil, gas and coal will last about 900 years at present rates of use, but only 200 years at rates expected by the year 2000.
e. After exhaustion of fossil fuels, the combustion products (carbon dioxide and water) may have to be converted back to liquid fuels, first by atomic energy, and finally by the sun's energy.

5. In the field of mineral exploration, the reserves get larger every year, because new discoveries in technology allow use of slimmer and slimmer resources.
   a. The first copper ores in Michigan contained about 14 percent copper. The content gradually retreated to 2 percent, and the ores now mined in Arizona and Montana, containing 0.9 percent (even as low as 0.5 percent) copper, are still economic.
   b. Iron ores were once economically unrewarding unless they contained at least 30 percent iron. Now taconite ores of 15 percent iron are beneficiated and compete with better grade ores from the Mesabi range.

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry (Cont.)	c. Uranium resources. (In 1945 our uranium reserves were so low that it was classified information to conceal a military weakness. By 1954 the uranium ore reserves were in the millions of tons. Now we have 80 million tons of proven reserves, and the United States government has not been buying uranium ore since 1962.) 6. To sum up, scarcity of natural resources in the United States has actually been decreasing by 1/3 of 1 percent per year since 1870. 7. The United States obtains only two important metals completely from our own sources, magnesium and molybdenum. We import substantial quantities of copper, iron, zinc and lead ores and all the tin that we use. 8. We could make our comsumption of metallic ores more nearly cyclic by solving the problems of scrap metal rovery. a. Only about 25 percent of scrap iron gets back into circulation. b. The aluminum industry is not old enough to have formed a large scrap industry. Two-thirds of all the aluminum ever used was made in the last 10 years, and the 30-year cycle of recovery is not nearly complete. c. Copper gets back into the stream of usefulness more completely than does any other metal--about 75 percent is recycled over a 35-year period. d. Lead scrap, nearly 500,000 tons per year, comes largely from storage batteries. At present 50 to 60 percent of the lead in use is recycled.	

STRATEGY	CONTENT	MATERIAL
V. Information Retrieval Committee #5 Industry (Cont.)	9. We do such a good job of scattering our metals that someday we may have to lengthen the 30-hour week back to 40 hours and spend 10 hours gathering scrap metal. 10. In conclusion, the total resources of the world might be enough for three times its present population but not at the American rate of consumption and not with our present attitude toward cyclic recovery.	

STRATEGY

VI. Reporting Committee Findings

SOME SUGGESTED REPORTING ACTIVITIES

The reporting activities listed are to provide possible ways in which the 5 committees can present their research to the rest of the class.

1. Make a slide school using any collection of pictures on air or water pollution that is available. Use this in connection with an oral report.

2. Invite a guest speaker to speak to the class on some aspect of the committee work. (e.g. A member of the air pollution control board, or a water treatment engineer, or a speaker for the Planned Parenthood Association).

3. Make a scrapbook of current news articles dealing with a committee's area of concern.

4. Present the results of a survey taken to determine what the factories and industries in the town are doing about pollution.

5. Set up a display of ecologically dishonest advertising. Pair the ads for "modern conveniences" with pictures of the environment destruction caused by the mines and power plants necessary for the existence of the "convenient" appliance.

6. Keep a bulletin board of the best examples of ecologically dishonest ads in magazines and newspapers.

7. Keep a chart of politicians' statements and actions, such as Nixon's statements on ending pollution and his go ahead on the SST. Give a prize to the most contradictory person of the month.

STRATEGY	SOME SUGGESTED REPORTING ACTIVITIES
VI. Reporting Committee Findings (Cont.)	8. Make art and poster displays to enhance the committee reports.
	9. The usual format for committee reports would be oral or written reports, panel discussions, debates, etc.

STRATEGY

LEARNING ACTIVITY

VII. Overview

At this juncture, the students will have raised questions concerning the unit, researched answers to these questions and will have reported their findings to the class. It is now desirable that the class look at the original list of questions generated during the second step (II, Raising Questions) to determine if all their questions have been answered, and formulating new questions they would like to answer individually as a result of this unit study.

With the detailed questions answered, the class is now ready to face the broader synthesizing questions which should be posed by the teacher and/or the class. Some of these questions might be:

1. Is there any way to determine which aspect of the pollution problem should be given top priority.

2. Whose responsibility is the problem? Federal government, state or local?

3. Considering the cost involved, how should it be met and by whom?

4. What societal values must be re-evaluated to solve the problem now and prevent it's reoccurrence.

5. How does the ecology crisis affect our education system.

6. Does the concept of power need to be re-evaluated.

STRATEGY	CONTENT
VIII. Generalizations	1. "Where water is scarce enough to jeopardize the well-being of a community, its control (conversation) becomes a matter of public concern."
	2. "Prevention of soil erosion through sound soil management programs will remove soil as a polluting influence on streams."
	3. "Over wide areas men have overstepped the limits of stable, permanent production and in many cases have destroyed the very soil on which they depend."
	4. "(Since) mineral resources are exhaustible,....only thru wise and careful use can the supply be maintained for use."
	5. "Recent production figures for many...crops...indicate that yields per acre can be increased greatly. The development of hybrids, resistant to temperature and moisture extremes, and their protection by chemicals from insects, and other hazards, further increases production."
	6. "When forests are protected from fire, insects, disease, and over-grazing of animals, they serve to preserve soil, hold underground water, shelter wildlife, supply material for man's use, add beauty to the landscape, and regulate climatic conditions."
	7. "Successful reform that puts land in the hands of owners that can count on the fruits of their own enterprise has again and again in country after country almost literally turned sands into gold."
	8. "To the extent that human beings discover the nature of the cultural process, they can anticipate, prepare, and--to at least a limited degree--control (their future)."

STRATEGY	CONTENT
VIII. Generalizations (Cont.)	9. "The family bears the primary responsibility for human conversation in its vital functions of child bearing and rearing and of personality development and fulfillment through homemaking and the maintenance of the family way of life for adults and children."
	10. "A nation that is looking toward permanent greatness and happiness cannot afford to destroy today what (natural resources) future generations will need but cannot reproduce..."
	11. "...the education of the public in the conservation and better utilization of natural resources is a matter of world-wide concern."
	12. "Since all natural resources together constitute the indivisible environmental composite...it is impossible to conserve one without the regard for others."
	13. "Everywhere in the world natural resources have been depleted by ignorant and reckless exploitation that has ignored the inexorable nature laws which maintain them."
	14. "Factory production brought population congestion."

STRATEGY 5

IX. Culminating Activities

LEARNING ACTIVITY

SOME SUGGESTED CULMINATING ACTIVITIES

1. Develop and stage an ecology teach-in for the entire school. Invite guest speakers, make posters, distribute information, etc. (See Ecotactics for suggestions)

2. Present the results of the committee research to local civic organizations and the PTA.

3. Write letters to the local newspapers, and elected representatives (local, state, and national) about the suggested means of combating pollution or in connection with questions discussed in the Overview Section.

4. Volunteer, as a class, to spend a weekend cleaning up a trash-filled lot or stream bank.

5. Duplicate the list of phosphates in laundry products and distribute the list in the community.

6. Participate in local ecologically oriented groups.

7. In Connection with the art class, make bumper stickers and buttons to wear and distribute to show where you stand on the pollution problem

8. Have an art contest for the best pollution poster or display.

Teacher's Books and Articles

Benarde, Melvin A. Our Precarious Habitat. New York: W. W. Norton & Co., Inc., 1970.
An integrated approach to understanding man's effect on his environment. Covers all aspects of the ecology problem in well written, easily understood, but detailed manner.

Borgstrom, George. The Hungry Planet. New York: Collier, 1965. $2.95
Shows the lack of food available in relation to the growing population and some of the possible solutions to the problem.

Bucksbaum, Ralph and Mildred. Basic Ecology. Pittsburgh: The Boxwood Press, 1957.
Stresses those principles of ecology which do most to unify and to give meaning to the miscellany of information about the natural world with which the reader is already equipped. That the same ecological rules apply to all plants and animals no matter where they occur, and that these rules have not been repealed for Homosapiens.

Calderone, Mary Steichen, ed. Manual of Contraceptive Practice. New York, 1965, MacMillan, $2.95
A discussion of the tested methods of birth control and their effectiveness.

Commoner, Barry. Science and Survival. New York, 1968, Viking Compass, $1.35

Carr, Donald E. Death of the Sweet Waters: W. W. Norton and Co., Inc., New York, N. Y.

Carson, Rachel. Silent Spring. New York: Crest, 95¢, 1969
The book points out the reckless attempt to control our environment by the use of chemicals that poison not only the insects, but the birds, fish, and the earth which supplies our food and, inevitably (to what degree is still unknown), man himself.

Curtis, Richard. Perils of the Peaceful Atoms: The Myth of Safe Nuclear Power Plants. New York: Ballantine Books, Inc., $12.5, 1968.
Shows a case against nuclear power, a massive threat to our world and to generations to come.

Resources (Cont.):

Teacher's books and articles:

DeBell, Garrett, Editor. The Environmental Handbook. New York: Ballantine Books, Inc., 1970, 95¢.
A source of short readings about the enemies of the environment.

Douglas, William O. Wilderness Bill of Rights. Boston: Little Brown, 1965, $1.95.

Ehrlich, Paul R. The Population Bomb. New York: Ballantine Books, Inc., 1968, 95¢.
This book tells why we have a population problem, what is being done to solve the problem, what needs to be done, and what the individual can do to help solve the problem.

Ewald, William R., Jr. ed. Environment and Change: The Next Fifty Years. Bloomington: 1968, Indiana University Press, $4.95.

Galbraith, John K. The New Udystruak State. Boston: Houghton Mifflin Co., 1967.
A lucid view of our economic society and the quality of modern life.

Goldstein, Jerome. Garbage As You Like It. Emmans, Pa.: 1967, Podale Books.

Graham, Frank, Jr. Disaster by Default: Politics and Water Pollution. M. Evans and Co., Inc., New York, N. Y.

Herber, Lewis. Crisis in our Cities. Prentice Hall, Inc., Englewood Cliffs, New Jersey.

Jacobs, Jane. The Death and Life of Great American Cities. New York: Modern Library, 1961, $1.95.

Marx, Wesley. The Frail Ocean. New York: Ballantine Books, Inc., 1969, 95¢.
This book shows what man has done to the ecology of the oceans as a result of his reckless dumping of his wastes.

Mowbray, A. Q. The Road to Ruin. Philadelphia: 1969, J. B. Lippincott, $5.95.

Resources (Cont.)

Teacher's Books and Articles

Mitchell & Stillings. ed. Ecotactics New York: Pocket Books, 95¢.
Is the programs for environmental activists. Committed youth on college campuses throughout the country are organizing to reverse the horrifying waste. What the individual can do.

Osborn, Robert. Mankind May Never Make It. New York: New York Graphic Society, 1968, $2.50.

Paddock, William and Paul. Famine 1975. Boston: Little, Brown & Company, 1967.
It shows in the best fashion the problems the world will face when the famines in the underdeveloped world occur and what the developed countries of the world can and must do.

Rienow, Robert and Leona. Moment in the Sun. New York: Ballantine Books, 1969, 95¢.
How the wide open spaces are getting smaller all the time. How man is speeding up his own destruction.

Rudd, Robert L. Pesticides and the Living Landscape. Madison: University of Wisconsin Press, 1964, $1.95.

Russell, Jerry and Renny Russell. On the Loose. New York: Sierra Club and Ballantine Books, 1969, $3.95.

Sax, Karl. Standing Room Only, The World's Exploding Population. Boston: Beacon Press.

Shepard, Paul and Daniel McKinley, eds. The Subversive Science: Essays Toward An Ecology of Man.
Boston: 1969, Houghton Mifflin, $5.95.

Shurcliff, William A. S/S/T and Sonic Boom Handbook. New York: Ballantine Book, Inc., 1969, 95¢.
A documented source book on the supersonic transport planes that proves the SST is an incredible, unnecessary insult to the living environment, and tells you what you can do to stop the SST's.

Stewart, George Ripley. Not so Rich as You Think. Boston: Houghton Mifflin, 1968, $5.00.

Resources (Cont.)

Teacher's Books and Articles

Udall, Stewart. 1976: Agenda for Tomorrow. New York: Holt, Rinehard and Winston, 1969, $3.75.

Whyte, William H. The Last Landscape. New York: Doubleday, 1968, $6.50.

Wright, Congressman Jim. The Coming Water Famine. Coward-McCann, Inc., New York, N. Y.

STUDENT BOOKS

Bird, John. Our Dying Waters. The Saturday Evening Post, The Curtis Publishing Co., Reprinted for the Federal Water Pollution Control Administration, Washington, D. C.

Bucksbaum, Ralph and Mildred. Basic Ecology. Pittsburgh: The Boxwood Press, 1957.

Carson, Rachel. Silent Spring. New York: Crest, 1969, 95¢ P.B.

DeBell, Garrett, Ed. The Environmental Handbook. New York: Ballantine Books, Inc., 1970, 95¢.

Ehrlich, Paul R. The Population Bomb. New York: Ballantine Books, Inc., 1968, 95¢.

Marx, Wesley. The Frail Ocean. New York: Ballantine Books, Inc., 1969, 95¢.

Mitchell & Stallings, Ed. Ecotactics. New York: Pocket Books, 95¢.

Needed: Clean Water., Channing L. Beto* Company, Inc., Greenville, Mass.

Paddock, William and Paul. Famine 1975. Boston: Little, Brown & Company, 1967.

Rienow, Robert and Leona. Moment in the Sun. New York: Ballantine Books, Inc., 1967, 95¢.

Shurcliff, William A. SST and Sonic Boom Handbook. New York: Ballantine Books, Inc., 1969, 95¢.

Resources (Cont.)

Articles and Pamphlets for Teacher and Student

"Air and Water Conserversation News", American Petroleum Institute, 1271 Avenue of the Americas, New York, New York 10020. Available free to teachers and students; study units for science and social studies classrooms; provides experiments and discussion questions.

"The Air You Breathe", published by the Akron Air Pollution Control Board (Louis E. Bunts, Director, 177 S. Broadway, Akron, Ohio 44308). Monthly bulletin containing pollution statistics for Summit County and quality control efforts.

"Air Environment Fit For People", Raymond F. Dasmann Public Affairs Pamphlet No. 421. General summary of all types of pollution and their affect on cities and country side.

Bundy, McGeorge. "Charting the Complexities", Saturday Review, April 4, 1970.

Commoner, Barry. "Beyond The Teach-In", Saturday Review, April 4, 1970.

Ehrlich, Paul and Anne. "The Food From The Sea Myth", Saturday Review, April 4, 1970.

Fremlin, J. H. "How Many People Can The World Support?", New Scientist, October 29, 1964.

Galton, Lawrence. "The Word Is Getting Thirstier", New York Times Magazine, September 27, 1964.

"It's God's Will. Why Interfere?", The New York Times Magazine, January 14, 1968.

Lindsay, Sally. "How Safe Is The Nation's Drinking Water", Saturday Review, May 2, 1970.

Milner, Harold. "Now Bread From The Sea", Collier's, April 16, 1954.

"Our Polluted Planet", Ambassador College Research Department, Ambassador College Press, Pasadena, California, 1968. Excellent color pictures of pollution with descriptive examples of our polluted planet.

Resources (Cont.)

Articles and Pamphlets for Teacher and Student

Pell, Claborne. "The Ocean's Mans Last Great Resource", Saturday Review, October 11, 1969.

Quillier, Paul C. Population Boom--or Boomerang?. The 1964 World Book Yearbook. Chicago: Field Enterprises and Corp.

Renn, Charles E. "Our Environment Battles Water Pollution", Educational Products Division, LaMotte Chemical Products Company, Chestertown, Maryland. This company makes water test kits for student use.

"The Story of Water Supply". Available from local Water Departments. Cartoon drawings of uses of water, methods of transporting water, functions of local water departments including treatment procedures.

Stycor, Mazone J. "Obstacles to Programs of Population Control--Foots and Fancies", Marriage and Family Living, February, 1965.

Taylor, Harold. "Inside Buckminster Fuller's Universe", Saturday Review, May 2, 1970.

Udall, Marvin K. "Standing Room Only on Spaceship Earth", Arizona Magazine, July 27, 1969, Reader's Digest, December, 1969.

Woodwell, G. M. "Toxic Substances and Ecological Cycles", Scientific American, March, 1967.

Wurster, C. F., Jr. "DDT Reduces Photosynthesis by Marine Phytoplankton", Science 159: 1474-75

Wurster, Charles. "DDT in Mother's Milk", Saturday Review, May 2, 1970.

Challenging Problems Of Water, Calgon Corporation, Pittsburgh, Pa.

A Clean Lake Erie, Enforcement Program, Federal Water Pollution Control Administration, Department of Health, Education and Welfare, Washington, D. C.

Resources (Cont.)

Articles and Pamphlets for Teacher and Student

A Look At Our Water. Federal Water Pollution Control Administration, Washington, D. C.

Clean Blue Water. U. S. Department of Health, Education and Welfare, Washington, D. C., Public Health Service Publication, No. 1270.

"Pollution", The Courier-Journal Magazine, U. S. Department of Health, Education and Welfare, Washington, D. C.

Resources To Meet Community Sewage Treatment Needs. U. S. Department of Health, Education and Welfare, Washington, D. C.

Water Pollution Problems Of The Great Lakes Area. U. S. Department of the Interior, Chicago, Illinois.

Films

Answer Is Clear. Sound, 14 min., color. It discusses the aspects of air pollution and the progress made in reducing diesel exhaust smoke and odor., Modern Talking Pictures, 1212 Avenue of Americas, New York, New York 10036.

Expedition: City Fallout. 28 min., black and white. This film uses actual scenes of air pollution in New York City to highlight a discussion of the effects of air pollution upon an urban environment. National Medical Audovisual Center, Film Distribution, Chamblee, Georgia 30005.

The First Mile Up. 28 min., black and white. This film shows that the average city dweller anywhere breathes air contaminated by smoke and gasoline fumes. Consultate General of Canada, Film Library, 310 S. Michigan Avenue, Chicago, Illinois 60604.

Glen Canyon. 29 min., color. Shows the destructive effects of a large dam on a major river. Association Films, 600 Grand Avenue, Ridgefield, New Jersey 07657.

Ill Winds On A Sunny Day. 28 min., color. Points out how air pollution has evolved over the past few decades from a relatively simple and obvious smoke problem to a more complex and dangerous problem of nationwide concern. National Medical Audiovisual Center, Film Distribution, Chamblee, Ga. 30005

Films: (Cont.)

Less Than Human. 28 min., sound, black and white. Shows how certain people feel they have more of a right to have children than other groups. Planned Parenthood Organization.

Let's Clear The Air. 28 min., black and white. This film deals with air pollution in the upper Valley and focuses particularly on the cities of Steubenville, Ohio, Pittsburgh, Pa., and Weirton, West Virginia. It presents the major sources of pollution. National Medical Audiovisual Center, Film Distribution, Chamblee, Georgia 30005.

No Room For Wilderness? 28 min., color. Shows the over-crowding we are now experienceing and the future problem of over-population. Association Films, 600 Grand Avenue, Ridgefield, New Jersey 07657.

A Plague On Your Children. 72 min., black and white. This film shows the subtle effect pesticides have on human beings. Peter M. Robeck & Co., 230 Park Avenue, New York, New York 10017.

Pure Water And Public Health. 28 min., color. Explains and illustrates the workings of a modern community's water supply system. It also presents the alarming facts about possible shortages of pure water in the U. S. Modern Talking Picture Service, 1212 Avenue of the Americas, New York, New York 10036.

The River Must Give. 25 min., color. The problem of water pollution. It explains how a river purifies itself, and illustrates exactly what happens when a waterway is overloaded with waste.. Shell Film Labrary, 450 North Madison St., Indianopolis, Indiana 46204.

Take A Deep Breath. 25 min., black and white. Features air pollution problems in one of America's largest cities. The emphasis is on health effects of air pollution, dramatizing the potential threat of air pollution to a young boy's lung and portraying the crippling illness of a two year old victim of emphysema. National Medical Audivisual Center, Film Distribution, Chamblee, Ga. 3005

Pull Over America. 15 min., black and white. Presents a summary of the national air pollution problem. It shows some of the principal sources of dirty air, including industrial operations, burning dumps, motor vehicles, combustion of fossil fuels. It describes the effects of air pollution on materials, plants and human health. National Medical Audiovisual Center, Film Distribution, Chamblee, Georgia 3005.

Films (Cont.)

Troubled Waters. 28 min., color. Is a documentary report to alert and inform the public regarding the problem of water pollution in the U. S., Committee on Public Works, U. S. Senate, Room 4204, Washington, D. C.

Filmstrips

Air Pollution. 40 frames, color, script, Popular Science Audo-Visuals, 5235 Ravenwood Avenue, Chicago, Illinois 60640.
Establishes urgent need for controlling air pollution. Discusses causes and approaches for solving this critical problem. Steps that are being taken and additional measures now recommended by public health authorities. The part that individual citizens can play in air pollution control.

Scarcity--A Basic Economic Problem. 40 frames, color, script, Popular Science Audo-Visuals, Inc. 5235 Ravenwood Avenue, Chicago, Illinois 60640.
Implications of economic scarcity in regard to allocation of land, labor and capital, economic development and opportunity costs. Effect of the scarcity principle in different economics, particularly in the market economy.

Water, Water Everywhere. 36 frames, color. McGraw Hill.
Some elementary facts about water are illustrated showing why it is important to man, how we obtain water.

The Water We Drink. 45 frames, color. Young America
Drawings illustrate various sources of drinking water and explain that disease is spread by polluted water. Descriptions follow of how pure water is obtained from wells, and the process of purification used for city water supplies.

World Population Patterns. 40 frames, color. Popular Science Audio-Visuals, Inc., 5235 Ravenwood Avenue, Chicago, Illinois 60640
Describes trends in world population and considers causes of rapid population expansion. Outlines the consequences of overpopulation, with particular emphasis on the critical need for more food. Discusses projections for future population growth and the need for population control.