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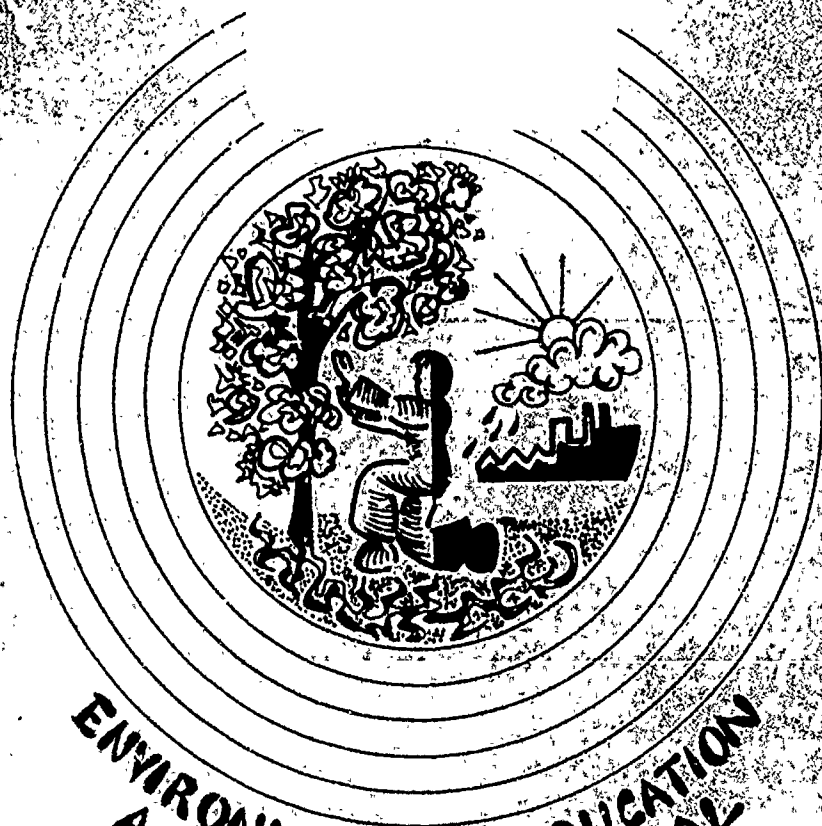
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ABSTRACT

This activities book for the senior high school level is the sixth book of a series of six books designed to provide developmental K-12 experiences designed to support the basic environmental philosophy of spaceship earth presented in Book 1. The aims of the four activity sections of this book are to aid in developing students to make them more sensitive to their environment, able to recognize problems, reach a sophistication in using problem solving skills, and inclined to participate in action activities to deal with environmental problems. The Concept Development Activities Section was developed to assist teachers in assisting students to further their understanding of major concepts basic to the development of an environmentally literate citizenry. These concepts are: ecosystem, population, economics and technology, environmental decisions, and environmental ethics. The Skill Developing Activities Section identifies eight skills as being essential to the environmental problem solving process. For each of the eight skills, skill developing activities have been designed. The Values Clarification Activities Section contains sample strategies that teachers have found helpful in assisting students to clarify their values regarding environmental issues. The Environmental Encounters Activities Section contains a series of school-community environmental problem solving activities. (BT)

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ENVIRONMENTAL ACTIVITIES EDUCATION MANUAL

**William B. Stapp
Dorothy A. Cox**

SENIOR HIGH ACTIVITIES

ENVIRONMENTAL EDUCATION ACTIVITIES MANUAL

Book 1: CONCERNING SPACESHIP EARTH

Book 2: LOWER ELEMENTARY ACTIVITIES

Book 3: MIDDLE ELEMENTARY ACTIVITIES

Book 4: UPPER ELEMENTARY ACTIVITIES

Book 5: JUNIOR HIGH ACTIVITIES

Book 6: SENIOR HIGH ACTIVITIES

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PREFACE

This grade level activities book is one in a series of six books which provide developmental K-12 experiences designed to support the basic environmental education philosophy of spaceship earth.

The educators who use this activities book are encouraged to thoroughly acquaint themselves with the philosophy, model description, implementing guidelines, and resource opportunities in Book 1.

The aim of the four activities sections of this book is to aid in developing students more sensitive to their environment, who are able to recognize problems, reach a sophistication in using problem solving skills, and are inclined to participate in action activities to deal with environmental problems.

The following pages include only a sample of activities meant to suggest a host of possible spin-offs. To be most effective they will most probably need to be altered to fit individual situations and students backgrounds.

William B. Stapp
Dorothy A. Cox

August, 1974

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Section I

Senior High School Concept Developing Activities

SECTION I

Concept Development Activities

The following Concept Development Activities were developed to assist teachers in assisting students to further their understanding of five major concepts basic to the development of an environmentally literate citizenry.

The five major environmental education concepts are: ecosystem, population, economics and technology, environmental decisions, and environmental ethics.

For each of the five concepts, specific understandings have been identified as appropriate for lower elementary, middle elementary, upper elementary, junior high, and senior high. Two activities have been developed for each understanding to assist students in furthering their understanding of each of the five concepts. The activities were also designed to enrich existing subject matter.

The concepts, understandings, and supportive activities that have been developed are listed on the following pages of this section.

-3/4

Concept: Ecosystem

Understandings:

A. Lower Elementary (Kdg, 1st & 2nd)

1. The earth can be thought of as a "spaceship," containing all of the air, water, and land we will ever have.
2. The sun is the basic source of energy for all life in every ecosystem.
3. Plants capture sunlight and use it to help them make the food and oxygen that people and other animals need in order to live.
4. Some animals eat other animals which in turn eat plants; some animals (like people) eat both plants and animals.

B. Middle Elementary (3rd & 4th)

1. An ecosystem consists of all the plants and animals in a given area interacting with each other and their non-living environment.
2. The interaction of plants, animals and their non-living environment form many cycles in an ecosystem (carbon or food cycle, mineral cycles, water cycles, etc.).
3. Some of the sun's energy has been stored in coal peat, petroleum, natural gas, and other fossil fuels.

C. Upper Elementary (5th & 6th)

1. There are different forms of energy (i.e. light, heat, electricity, food, etc.).
2. Energy is neither created nor destroyed, but can be changed from one form into another.
3. With each transfer of energy (i.e., food chain) within an ecosystem, some energy is lost (mainly as heat energy).
4. Humans frequently, knowingly and unknowingly, waste energy.

D. Junior High (7th & 8th)

1. Anything added to the environment which accumulates in sufficient quantity to be unwanted by someone is pollution.
2. Too much pollution normally results in damaging the environment.

3. Natural cycles and systems have limited capacity to cycle or disperse pollutants.
4. Humans and natural resources are distributed unevenly around the earth.

E. Senior High (9th, 10th, 11th & 12th)

1. An ecosystem is complex and is vulnerable to sudden or long-term disturbances.
2. Human beings are capable of strongly altering the cycles and systems of the earth.
3. More diverse communities tend to be more stable.
4. Fission and fusion are two relatively new sources of energy.

Concept: Population

Understandings:

A. Lower Elementary (Kdg., 1st & 2nd)

1. A population is a group of plants and animals of the same kind living in the same area.
2. Populations interact with each other and their environment.
3. Populations are part of a given community.
4. The human community is closely interrelated with its environment.

B. Middle Elementary (3rd & 4th)

1. Populations increase, decrease, or stabilize depending on their interaction with each other and their environment.
2. The life style of a human population can affect the environment in significant ways.

C. Upper Elementary (5th & 6th)

1. Human beings both produce and consume materials.
2. Human populations have different standards of living which produce different environmental consequences.
3. As human populations grow, it becomes more difficult to attain and maintain environmental quality.

D. Junior High (7th & 8th)

1. Population changes like births, deaths, growth rates and migration patterns affect individuals, their surroundings and society.
2. The U.S. consumes a disproportionate amount of the earth's resources.
3. Populations have birth rates, death rates, growth rates, densities, immigration rates, emigration rates and age structures.

E. Senior High

1. As long as a few countries consume a disproportionate quantity of the earth's resources, while other countries need these resources, there will be political instability in the world.
2. Different sectors of populations have varying degrees of access to natural resources they need in order to survive.
3. Any position on human population policy has personal, social, ecological, political, and economic implications.

Concept: Economics and Technology

Understandings:

A. Lower Elementary (Kdg., 1st & 2nd)

1. In our country, people are generally trained to perform certain types of work. Teachers, farmers, factory workers, conservationists, as well as other workers, all have special jobs to perform.
2. The food most people eat, clothes they wear and the homes they live in are paid for by the money they earn from doing their jobs.
3. Industries and business sell some things that people want and need; and encourage people to buy some things that factories have made, but people don't really need.
4. Not all people have enough money to buy all the things they need, want, or are encouraged to buy.

B. Middle Elementary (3rd & 4th)

1. The way people live their lives has an effect on how the earth's resources are used.
2. The way people live their lives has a direct effect upon the amount and type of industrial growth that takes place.
3. Businesses can create a demand for a product through the use of advertising.

C. Upper Elementary (5th & 6th)

1. The cost of producing a particular product includes such things as the resources used, wages of workers, advertising, taxes and improving working and environmental standards.
2. There are two kinds of costs associated with pollution: the cost of preventing pollution, and the cost of (or damage from) pollution once it occurs.
3. Some pollution costs cannot be put into dollars and cents.

D. Junior High (7th & 8th)

1. Usually, the costs (economic, resource or technological) of goods and services vary proportionately to societal demands for those goods and services.

2. Patterns and practices of using the earth's resources are largely determined by people's life styles, and the level of industrialization necessary to meet the demands of such life styles.
3. As the production of goods increases with demand, consumption of resources also increases.
4. Both supply and demand of a product influence the cost of the product.

E. Senior High (9th, 10th, 11th & 12th)

1. Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.
2. Some businesses and industrial plants in the process of producing marketable products pass on social costs (i.e., air, water, and noise pollution) to society.
3. Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by that economic system.
4. Each country has its own particular economic system, but all countries' economic systems are tied together through world markets of raw materials, food, and manufactured goods. Thus economic events that occur in one country affect other countries (i.e., crop failures).
5. Three major ecological trade-offs are (1) between population growth and environmental quality, (2) between levels of production and environmental quality, and (3) between the degree of urbanization and environmental quality.

Concept: Environmental Decisions

Understandings:

A. Lower Elementary (Kdg., 1st & 2nd)

1. To make a decision is to make a choice.
2. A decision can be made by one person or by a group of people such as a family or a class.

B. Middle Elementary (3rd & 4th)

1. Environmental decisions should be made only after considering all alternatives and the consequences of each alternative.
2. Your personal feelings and the feelings of others should be considered before you decide to act.

C. Upper Elementary (5th & 6th)

1. Many environmental decisions are made by consumers, governments, businesses, industries, clubs, and various community groups.
2. People working together with similar interests can often be more effective in influencing environmental decisions than individuals working alone.

D. Junior High (7th & 8th)

1. Making effective environmental decisions requires consideration of ecological, economic, political and social and technological aspects of the problem.
2. Effective environmental decision-making includes considering carefully the pros and cons of all possible alternative solutions, policies and actions, and studying the trade-offs among them.
3. Individual or personal decision-making involves one's feelings, attitudes, and values.
4. In many cases it is necessary to change the law in order to prevent environmental abuses.

E. Senior High (9th, 10th, 11th & 12th)

1. Decisions not carefully thought through frequently have unwanted results.
2. People most often affected by environmental abuses may be the least able to bring about effective action to correct them.

3. Environmental decisions should seek to improve the lives of people from all socio-economic classes.
4. Some people and organizations have more power to influence decisions than others.

Concept: Environmental Ethics

Understandings:

A. Lower Elementary (Kdg. 1st & 2nd)

1. Children all over the world have similar basic needs.
2. Every individual has something which he gives and which he receives from society.

B. Middle Elementary (3rd & 4th)

1. If human beings protect the earth it will be able to continue to support a diversity of living things.
2. Humans can be "stewards" of the earth, rather than careless exploiters of it.
3. Humans can develop both a way of thinking and feeling about the earth if we are to live harmoniously with each other and our environment.

C. Upper Elementary (5th & 6th)

1. If humans develop an ecologically sound way of thinking, feeling, and acting toward the earth, then we will be able to live harmoniously with each other and our environment.
2. If we protect the earth it will continue to meet the needs of all living things, now and in the future.

D. Junior High (7th & 8th)

1. The earth's resources exist for all living things, not just man.
2. Certain life styles enable man to live as a complimentary part of the environment.

E. Senior High (9th, 10th, 11th & 12th)

1. Only when each of us lives a life guided by respect for the earth and all living things, now and in the future, will we be able to live in harmony with each other and our environment.
2. An essential part of an environmental ethic is a human ethic based on social justice for all individuals and groups.

High School

Ann P. Sibole

Affect of Sulfur Dioxide on Vegetation

1. Concept to be developed: Ecosystem
2. Understandings to be developed: An ecosystem is complex and extremely vulnerable to sudden or long-term disturbances.
3. Time: 2 days to set up; perhaps several weeks to run.
4. Materials: seed (alfalfa, barley, radish, lettuce, bean or aster)
2 flats for plants
20 - 30 flower pots for transplanting
soil
2 small greenhouses, 3 x 3 feet, built of wood frame and plastic covering
plastic tubing
tape and heavy duty stapler
small electric fan to circulate air and gas in greenhouses
pressure reducing valve
1 cylinder containing sulfur dioxide.
a small one ~ 1.25 ppm sulfur dioxide for short time fumigation (about 1 to 2 hours)

(All obtainable through Matheson Co., E. Rutherford, N. J. or Scott Laboratories, Inc., Perasie, Pa. or other local gas suppliers.)

5. Procedure:

- a. Plant seeds and transplant ahead of time.
- b. Construct green houses with gable roof.
- c. Find location outside for this experiment, within reach of electricity and preferably on the school roof or in a court yard where it can be left for some time undisturbed.
- d. Hook up plastic tubing so it is air tight for adding gas to the greenhouse atmosphere.
- e. When one greenhouse is fumigated, the other will serve as a control - not exposed to SO_2 at all.
- f. Attach a length of plastic tubing to the pressure reducing valve and attach the other end to the tubing on the greenhouse.
- g. Open the valve and allow the SO_2 to enter the greenhouse.
- h. Start the fan - be sure there are some holes in the side of the greenhouse where the fan is operating to circulate the air inside.

1. Students should be instructed to keep track of the following:

- 1) watering frequency
- 2) rate of plant growth - height measurements in both greenhouses
- 3) length of time the plants were exposed to SO_2 and the approximate concentration
- 4) date of appearance of damage to leaves and description of injury
- 5) take color slides of damage as it occurs, compared to normal leaves

6. Discussion Questions:

- a. What might be the source of SO_2 in the atmosphere?
- b. What happens when SO_2 in the atmosphere combines with rain droplets in a shower? What compound is formed?
- c. Can you suggest how this compound might affect plant growth?
- d. When SO_2 is absorbed by the leaves of the plant, the injury occurs. How does SO_2 or any other gas enter the leaves?
- e. Plants are more resistant to SO_2 at night than during the day. Explain this on the basis of your answer to d. (Check your biology text on photosynthesis if necessary.)
- f. Describe the effect of SO_2 on plant growth and leaf development.
- g. On the basis of this experiment, do you feel that plants be vulnerable to injury and disease from certain air pollutants besides SO_2 ? What are some other common pollutants which should be studied to see what effect they have on plant growth?

7. References:

- a. Any high school or college biology text.
- b. Any number of books out on air pollution such as:
Air Pollution, Stern, Arthur C. Academic Press: New York. 1968.

Senior High

Understanding

1. Concept to be developed: Ecosystem.
2. Understanding to be developed: An Ecosystem is complex and vulnerable to sudden or long-term disturbances.
3. Time: 3 - 4 weeks--preparation-field trip-evaluation.
The actual field trip requires about 6 hours if done by well-prepared students. This can be done in one day or a few hours for several days.
4. Materials: notebooks and pencils
topographical maps
aerial photographs
labels and marking pens
collecting jars for
soil and insects
hand lenses
trowel or small shovel
soil sampler
soil thermometer
soil testing kit
sling psychrometer
wind velocity gauges
thermometers (air)
light meter
clinometers
binoculars
field study guides
increment borer (if available)
5. Procedure:
 - a. Introduce the concept of ecosystems and develop a working knowledge of the following terms: ecology, ecosystem, biotic, abiotic, biome, community, niche, succession, autotrophic, heterotrophic, carnivore, herbivore, food chain, web, producer, consumer, and decomposer. (See textbook sources.)
 - b. Show various movies recommended introducing the ecosystem concept and following up with movies on specific types of biomes. (Discuss with students.)
 - c. Select a local wood lot that has been relatively undisturbed by man. A mixed woodlot usually contains a diversity of organisms. The ideal time to study your field site is when it is fully developed vegetatively, although much can be learned by studying your site at various phases.
If a woodlot is unavailable for study, a local park or farmland will give good results. In both of the latter an added study of man's influence on an ecosystem could be incorporated into your investigation.

- d. A pre-field trip examination of topographic maps and aerial photos of the region will give the student an insight as to the relative location of the site, topography of the area, the influence of streams or rivers and the overall function of the site in the broader ecosystem.
- e. At the site select a topographic high point on the perimeter to observe the study area. Using your topographic maps and aerial photos sketch a general overview of the area in your notebook, noting the boundaries of the actual study area. Be sure to include prominent land features that can be used as reference points in your study.
- f. Approach your study area slowly in small groups. Visit the areas you have designated on your map as possible study sites. Observe the vegetative growth noting the dominant types of plants. Can you detect a succession of plant life as you enter the study area from grasses to shrubs to trees? What types of trees appear most abundant?
- g. Be observant as to the animal life using binoculars to help in identification. Note the location and abundance of the particular species. What stratum was it in? Was it at the edge of the site or in the interior?
- h. Regroup at a predetermined site to discuss findings and evaluation. At what successional stage is the site in? Designate specific areas to be studied (100 M² or less depending on the size of the study site.) by each group. (Try to diversify your areas of study.) Identify the vegetative species in the quadrant assigned you. Describe the abundance of each species as frequent (f); occasional (o); and rare (r).
- i. Study the animal life in your quadrant using the collecting instruments available. Look particularly for insects and arthropods. Be sure to note the location and vegetation where the animal was found. Use hand lens to observe small animals. (Anatomical parts will help determine the niche of the animal.)
- j. Investigate the following abiotic factors in your quadrant: light intensity, relative humidity, wind velocity, soil and air temperature and soil conditions using testing kits and various instruments provided.

Some additional studies if time permits.

- a. Leave pieces of wood (10 CM x 10 CM) in designated areas to be observed in 2-3 weeks. Note the various animals that have gathered on your board.

- b. If an increment borer is available, sample and preserve cores of specified trees you feel will give you an insight into the past history of the woodlot.
- c. If areas of the woodlot appear to be extensively used by humans, try to determine their impact on the system.

6. Discussion Questions:

- a. Write up and discuss in class the following:
Summarize the biotic and abiotic measurements, using data charts.
- b. From your observations of the data collected, determine the influence of the biotic and abiotic factors on each other keeping in mind the ecosystem concept. How did the abiotic factors affect vegetation?
How did vegetation modify soil, air, etc.?
Did you observe plant-animal relationships?
- c. Determine as many food chains as possible from your observations. Try to establish a food web for your site.
- d. Based on your observations, is this site being used properly? If not, what would you recommend to insure its' proper use in the future?

Follow-up:

1. Find out from the owner(s) of the site what they propose to do with it in the future. (You may be able to suggest some ideas based on your findings.)
2. Research a particular animal you found interesting. (It's fun to predict the habits of the animal and then substantiate your predictions.) Report to class.
3. Study or research an ecosystem you would not find in your geographic area. How does it differ from your ecosystem? What were the major influential factors in causing the diversity observed?

7. References:

- a. A Guide to the Study of Terrestrial Ecology, William A. Andrews, Prentice Hall, 1974.
- b. Basic Ecology, Ralph & Milered Buchsbaum, Boxwood Press, 1957.
- c. Biological Science: An Ecological Approach, B.S.C.S. Rand McNally, 1973. (Green edition)
- d. Readings in Conservation Ecology, G.W. Cox, Meredith, 1969.

Senior High

Linda Brigham
Diane Haskell

Lawn Study

1. Concept to be developed: Ecosystem
2. Understanding to be developed: Human beings are capable of strongly altering the cycles and systems of the earth.
3. Time: 1 - 2 weeks
4. Materials:
 - a. Soil analysis kit
 - b. Access to two lawns at opposite ends of the continuum (for comparison purposes)
5. Procedure:
 - a. Discuss the normal mineral cycles that take place on a lawn in which fertilizers, pesticides, herbicides are not used.
 - b. What effects do fertilizers, pesticides, herbicides, and grass catchers have on the mineral cycle described above?
 - c. Prepare a soil analysis on a lawn containing monoculture grass, and prepare an analysis on a lawn containing a wide variety of plant species.
 - d. Survey the lawns along several streets around your community to determine the following usage:
 - (1). Soil tested before applying fertilizer
 - (2). Fertilizer used
 - (3). Herbicide used
 - (4). Pesticide used
6. Discussion Questions:
 - a. What did you observe about the color and texture of each lawn?
 - b. Which type of lawn required more care and was more costly to maintain?
 - c. From the information learned from soil analysis, were beneficial chemicals being applied?
 - d. Is what you observed in the street around your community typical of your community? State? Nation?
 - e. What consequences might occur if what you saw continued to be the pattern over time?
 - f. Does lawn care effect other ecosystems?

Senior High

John L. Adams

Nuclear Modification

1. Concept to be developed: Ecosystem
2. Understanding to be developed: Human beings are capable of strongly altering the cycles and systems of the earth.
3. Time: 5 days - (Note advanced time required for reading assignment.)
4. Materials:
 - a. Hiroshima
 - b. On the Beach
 - c. Notebooks for gathering environmental data.
5. Procedure:
 - a. Assign well in advance (depending on student level) the above two books.
 - b. In class define, or get students to define, a cycle or system. Strong recommendation for in class reading: "Recycling, an old Idea with New Significance" from The Conservationist, June-July, 1971.
 - c. Assign students to observe the following and take notes to be shared in class discussion:
 1. Home heating system - how is it a closed system? What cycles are involved? Etc.
 2. The classroom environment - good and bad features. Recommended improvements.
 3. School environment. Presence or absence of trees, wild life, plant life. How much of this is natural-- how much created by man?
 4. Shopping center--compared to school, using similar criteria.
 5. Local community.
6. Discussion Questions:
 - a. Which systems or cycles you observed were protected by man? Which were being destroyed?
 - b. How would you improve the environments you observed?
 - c. What actions by man can preserve natural cycles or systems?

- d. Which actions can disrupt them?
 - e. How is man's psychological/sociological behavior altered as the scientific systems are changed?
 - f. In the book, Hiroshima, how does the author bring out changes in human behavior due to man's alteration of the environment?
 - g. How does the chapter, "Panic Grass and Fever few" relate to the idea of a cycle or system? What is the underlying meaning or symbolic comment here?
 - h. Which behavioral cycles were upset due to the bomb? How did mankind compensate for the changes in his environment?
 - i. How are irony and paradox a natural result of upsetting one's environment?
 1. Things which are normally vulnerable survive the Blast, while seemingly indestructible objects vanish.
 2. No noise at ground zero-only heard miles away.
 3. Great leveling of social status.
 - j. What are the main differences between On the Beach and Hiroshima?
 - k. In what way is On the Beach a novel of despair over mankind's upsetting the natural environment.
 - l. Imagine that the areas you analyzed in the notebook underwent an atomic (nuclear) experience, i.e. direct hit or fallout. Select one of the sites and rewrite an entry explaining how it would have changed. Be descriptive and realistic (Include vegetation, people, buildings, weather.)
7. References:
- a. Population Resources Environment (Issues in Human Ecology). Erlich and Erlich. P. 150. See Aswan Dam project.
 - b. "Forecasting the Future of Spaceship Earth." Science Teacher 40: 28-30 December, 1973.
 - c. "Snow Sampling". Science Teacher, 40: 38-39. Nov., 1973.
 - d. The Biosphere, A Scientific American Book.
 - e. The Closing Circle, Barry Commoner, Nov. 1972.
(See especially--chapter 3, "Nuclear Fire"
chapter 11, "The Question of Survival")
 - f. "Recycling: An Old Idea with New Significance." The Conservationist, June-July, 1971.

Community Structure

1. Concept to be developed: Ecosystem.
2. Understanding to be developed: More diverse communities tend to be more stable.
3. Time: 5 - 6 days -- 2 days-field trips
3-4 days - evaluation and discussion.
4. Materials:
 - a. Notebook and pencil
 - b. Identification guide books
 - c. Collecting jars for soil samples and insects
 - d. Insect nets
 - e. Insect aspirators
 - f. trowel
 - g. air and soil thermometers
 - h. soil test kit
 - i. light meter
 - j. sling psychrometers.
5. Procedure:
 - a. Take students on a field trip where a community can be studied. Using the materials available, proceed to investigate the area as to diversity of populations. A mixed hardwood woodlot or forest makes an excellent study area.
 - b. Make a list of as many plant and animal populations of the study area as possible.
 - c. Construct a food web for the area studied (You may want to research the characteristics of the plants and animals of your community as a guide to constructing your food web.)
 - d. What biotic factors limit the diversity of population in this community?
 - e. Determine as many abiotic factors of your community as possible, i.e., soil, climate, etc. How do they limit the diversity of population?
 - f. Study the school lawn as a community, evaluating its biotic and abiotic factors.
 - g. Establish a food web for the lawn.
6. Discussion Questions:
 - a. Which community had the greater population diversity?

- b. Hypothetically introduce a natural predator or parasite into each community. Example: Dutch Elm disease into your mixed hardwood woodlot: a common lawn problem such as leaf fungus, grubs, etc can be used for your lawn.
Which community was most adversely affected by the introduction of the new species?
- c. Explain the statement "Complexity is, in part, responsible for the stability of most ecosystems."
- d. Explain the statement "Man's activities tend to reduce the complexity of ecosystems."
- e. How does the statement if #4 apply to
 1. a farmer growing a crop?
 2. A shopping center with large parking lots?
 3. engineers channelizing a river?
 4. consumption of natural resources?
- f. How is diversity of population important to a landscaper?
- g. How do pesticides affect the diversity of population?
- h. What are some alternatives to pesticides for controlling undesirable insects?
- i. Use the idea of "the stability of an ecosystem is proportional to the complexity of the system" to evaluate the economic stability of your community.
Do the majority of jobs rely on a particular industry?

7. References:

- a. Pesticides and the Living Landscape, R.L.Rudd, U. of Wisc. Press, 1964.
- b. The World of Living Things. Brandwein Beck, Strahler, Hollingsworth and Brennan.
- c. Environment Resources, Pollution and Society. William Murdock Simauer Associates, Inc. 1971.
- d. Concepts of Ecology. E.J.Kormondy. Prentice-Hall, Inc. 1969.
- e. The Distribution and Abundance of Animals. H. G. Andrewartha and L.C. Birch, University of Chicago Press. 1954.
- f. Plants and the Ecosystem. W.D.Billings. Wadsworth Publishing Co. 1964.
- g. The Study of Plant Communities. H. J. Oosting. W.H.Freeman & Co. 1956.
- h. Ecology and Field Biology. R.L.Smith. Harper & Row, Inc. 1966.

- i. The Life of the Forest. J. McCormick. McGraw-Hill. 1967.
- j. A Guide to the Study of Terrestrial Ecology.
Wm. Andrews et. al. Prentice-Hall. 1974.
- k. Films:
 1. Population Ecology (19 minutes. color) E.B.F.
 2. Cave Community (13 minutes color) E.B.F.
 3. Community, (10 minutes color) E.B.F.
 4. Desert Biome (22 minutes)
 5. Distribution of Plants and Animals (17 minutes color) E.B.F.
 6. Grasslands (17 minutes color) E.B.F.
 7. High Arctic Biome (23 minutes color) E.B.F.
 8. Temperate Desiduous Forest (17 minutes color) E.B.F.
 9. Conservation and Balance in Nature.
 10. Vacant Lot
International Film Bureau, 332 S. Michigan Avenue, Chicago,
Illinois. 60604.

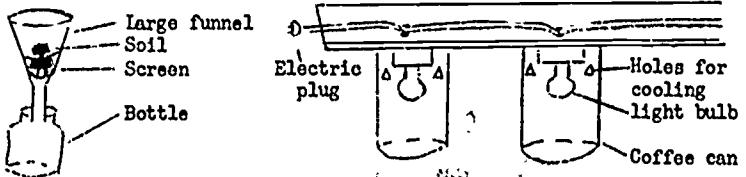
Study of an Invertebrate Community

1. Concept to be developed: Ecogystem
2. Understanding to be developed: More diverse communities tend to be more stable.
3. Time: 2 days - day 1 - Field trip and assemble apparatus
day 2 - Classification of organisms, compile data, discussion
4. Materials:

- a. Large funnels
- b. Fine screening or cheesecloth
- c. Light source
- d. Collecting jars
- e. Shovels or large spoons
- f. Containers for soil samples (small cans)
- g. Pencils and paper
- h. I.D. books
- i. Data chart for the numbers and types of organisms found in soil samples:

Sample	Number of Different Organism Types	Number of Each Type of Organism
1.		
2.		
3.		
4.		
5.		

j. Diagram of Berlese apparatus:



As many coffee can light sources as wanted can be placed on the board. Wire the lights in parallel.

5. Procedure:

- a. Students will work in pairs or groups of 3 and make a soil collection from various habitats. Example; beach, forest litter, farm field, school yard, old farm field, etc.
- b. Using a spoon or shovel each study group will collect one soil sample from the locality they chose. This will be placed into a container and brought back to class.
- c. In the classroom, each student will set up his berlese apparatus as shown in the diagram.
 - (1). Place a screen in the bottom of a large funnel and place your soil sample on top of it or wrap a layer of cheese cloth around the soil and place in the funnel.
 - (2). When several other groups have their apparatus assembled, place the light sources over them.
- d. The following day observe the organisms found in the jar, dividing them into phylums and classes. Example; Nematoda (roundworms), Platyhelminthes (flatworm), Annelida (segmented), Crustacea, Arachnid, Gastropoda.
- e. Fill in the data chart listing the number of organisms of each different type, and the number of each type of organism.

6. Discussion Questions:

- a. What soil type has the greatest number of organisms? What soil sample has the greatest number of organism types? Why?
- b. What soil type has the least number of organisms? What soil sample has the least number of organism types? Why?
- c. Why did you have the light on?
- d. What is the function of the screen?
- e. Is there a correlation between soil complexity and the number of types of organisms, or the number of organisms present?

Senior High

James Seuryneck

Future Energies

1. Concept to be developed: Ecosystem.
2. Understanding to be developed. Fission and fusion are two relatively new sources of energy.
3. Time: 1 week
4. Materials:
5. Procedure:
 - a. Construct a timeline from the beginning of the use of energy to the present. (Let 1CM = 10 years). Consult your library for the earliest date that the following materials were used as a source of energy: wood, coal, natural gas, petroleum, liquid natural gas, water, and nuclear matter. Plot the dates on your timeline. This should give you an idea of the nuclear age compared to other fuel sources.
 - b. Do the research topics suggested. They may be done individually or in groups.
 - c. Present topics in class using audio-visual aids where appropriate.
 - d. Open floor to discussion of topics.
6. Discussion Questions: (Topics for Research)
 - a. What is the source of nuclear energy? (Include transmutation of elements by radioactive decay and types of radiation.)
 - b. How is uranium mined? Mineral sources, geologic features containing uranium bearing ores. Countries in which uranium ores are found.
 - c. Research the history of nuclear fission including man responsible for development.
 - d. How does a nuclear power plant work?
 - e. What is atomic fusion? What is its history? What are some problems in using atomic fusion?
 - f. What is thermal pollution? How can this change an ecosystem? What are some ways it is being controlled?
 - g. What are radioactive waste pollutants? How is it harmful to our environment? What is being done with this material?

Fission and Fusion

1. Concept to be developed: Ecosystem
2. Understanding to be developed: Fission and fusion are two relatively new sources of energy.
3. Time: 5 days - day 1 - Preliminary research
 day 2 - Field trip to power plant
 day 3 - Field trip to DNR Regional Office
 (alternative: send letters)
 day 4 - Compile data
 day 5 - Discussion

4. Materials:

- a. Access to local Consumers power plant (regular and/or nuclear) or office
- b. Library
- c. Access to DNR Regional Office
- d. Camera
- e. Pencil
- f. Graph paper
- g. Colored pencils and pens
- h. Rulers
- i. 2 graphs per pupil:

2050
 2040
 2030
 2020
 2010
 2000
 1990
 1980
 1970

Fission, Fusion and
 Fossil Fuel Power
 Plant Rates of Growth
 (projected)

Fission Installations vs. Fusion Installations
 vs. Fossil Fuel Installations

2050
 2040
 2030
 2020
 2010
 2000
 1990
 1980
 1970

Fission, Fusion, and Fossil
 Fuel Production Waste
 Accumulation

Waste Products Resulting From Power Production
 in Fossil Fuel, Fission and Fusion Plants

5. Procedure:

- a. Research the basic principles of the fusion and fission nuclear mechanisms in the library.
- b. Research the basic mechanisms of burning coal, oil, and gas.
- c. Research the up-to-date performance of the three types of power plants.
- d. Prepare a list of 10 questions for interview with the Consumers Powers personnel and the DNR personnel concerning the following areas:
 - (1). Cost
 - (2). Safety
 - (3). Pollution
 - (4). Efficiency of fission vs. fusion vs. fossil fuels power outputs
- e. Interview Consumers Power people about existing nuclear power plants and fossil fuel installations, and projected plants.
- f. Visit one site of each type.
- g. Take pictures, where permitted, of the installations and environments.
- h. Interview with DNR personnel.
- i. Day 3: Back in classroom, compile figures and make a ditto master copy.
- j. Groups of five should discuss their views on the responses to the interviews and compare them to the information found in preparatory research.
- k. Day 4: Group results should be discussed and pictures presented where appropriate.
- l. Graphs should then be constructed.
- m. A general class consensus should be arrived at as to whether the advantages of the two new forms of power source, fission and fusion, outweigh the disadvantages, and outweigh the advantages of fossil fuels, coal, oil and gas.

6. Discussion Questions:

- a. Does the data given by the representatives of each side correspond to the data found in the research?

- b. If not, what are possible sources of discrepancy? Are the sources significant? Discuss. Are the discrepancies significant? Discuss.
- c. What do the pictures show of the relationship of fossil fuel installations to the environment?
- d. What do the pictures show of the relationship of a fission power plant to the environment?
- e. What advantages do the projected values of each graph show? What disadvantages?
- f. Do the graphs illustrate environmental pollution-free plausibility?
- g. How do the data on the graphs relate in relationship to using the two new energy sources as a workable solution to the assumed-diminishing fossil fuel supplies?
- h. What are some possible alternatives?

7. References:

(A cross-section of represented sides)

- a. ABC, Understanding the Atom Series, (diagrams of nuclear fission and fusion process)
- b. Consumers' Powers public relations materials, Environmental Quality, A curriculum series.
- c. Detroit Edison - Nuclear Power Plant
- d. National Wildlife, on energy. Feb.-March, 1973.
- e. Poisoned Power. Gofman.
- f. Environmental Action Bulletin, Rodale's, March 1974, Energy Issue.
- g. Environmental Action Bulletin, Rodale's, May 1974, Nuclear Power, Parts I and II.

Senior High

Glen Erickson

The Politics of Resource Consumption

1. Concept to be Developed: Population
2. Understanding to be Developed: As long as a few countries consume a disproportionate quantity of the earth's resources, while other countries need these resources, there will be political instability in the world.
3. Time: 1 week or more
4. Materials: Introductory remarks: International political instability results where a few countries (developed countries) are consuming the majority of the world's resources to increase their standard of living well beyond meeting their basic needs, while other countries (developing countries) are still trying to provide their people with adequate food, shelter, and medicine to live. In most cases, the developed nations have built their high standards of living by importing resources they wanted, but didn't have in their country from developing countries which had resources (aluminum ore, tin, lead, etc.), but were not industrialized enough to use them. The United States consumes almost 50% of the resources used in the world (37% of all the energy used), yet, has only 6% of the world's population (210 million of the total of 3.7 billion people in the world). Population experts estimate that our "spaceship earth" can support only 1/2 to 1 billion people at the North America standard of living without major technological breakthroughs in food production, energy production, and mineral extraction. More efficient utilization of the earth's resources, along with major recycling and reclaiming of resources would allow many more people in the world a standard of living comparable to that of North America. The problems arising from disproportionate resource consumption increases rapidly as the number of people consuming these limited, non-renewable resources increases, the world population grows 2% each year.
 - a. ditto
 - b. pencil, paper
 - c. library
5. Procedure:
 - a. Have the class discuss ways of finding out:
 1. Who consumes the earth's resources, and their amounts.
 2. Which countries have resources, and how they are being used.

3. Varying standards of living in developed and developing countries.
 4. How the varying standards of living require different amounts of resources.
 5. Key countries which disproportionate world resource consumption may be a political issue.
 6. Key resource items, such as oil, which are presently or will become major, worldwide political issues.
 7. Ways to avoid political instability caused by countries consuming much more of the world's resources than other countries (assuming these other countries desire more industrial growth and higher standards of living).
- b. These are some of the topics that would be valuable to look at in understanding this concept. The students should be encouraged to think of other topics.
- c. Possible information sources are:
1. Encyclopedia
 2. Library
 3. Newspapers, radio, television
 4. Magazines (Atlantic, National Wildlife, Foreign Affairs, etc.)
 5. Local environmental groups
- d. The topics decided upon to be researched can be divided among groups.
- e. Also, each topic can be examined by having groups look at how different information sources (magazines, radio, etc.) consider the various topics. Most media sources have interests in supporting certain viewpoints about world topics.
- f. After the groups have become informed about their chosen topic and media source have the class discuss the topics from their varying viewpoints.
- g. It would be helpful to have the class, or each group, make posters or charts showing resources used, resources exported, standards of living, etc. for their particular country, or topic.
- h. Other viewpoints concerning world and societal resource use could also be examined, such as:
1. Henry Thoreau's writings
 2. Mao Tse Tung's writings
 3. Findings from Human Environment Conference held in Stockholm in 1971.
- i. These topics could form the basis for class debate, also.

6. Discussion Questions:

- a. How does your life-style differ from the life-style found in the countries your class examined?
- b. Do you see your standard of living increasing in the next ten years? In what ways might this increase be visible or recognizable?
- c. What common indicators of standard of living did you find (the class could list these indicators for all the countries examined to evaluate and compare the different standards of living in the world) among the countries?
- d. Does "standard of living" and "quality of life" mean the same? If not, how do these ideas differ?
- e. Why is the U. S. so interested in peace in the Middle East?
- f. Do developed countries, that became industrialized by utilizing resources from non-industrialized countries, have a responsibility to aid those countries when they want (if they do) to become industrialized also?
- g. When a population increases its standard of living well beyond meeting basic needs of the population, does the population "pay" for the increase in ways other than direct monetary ways? What are these ways?
- h. Is it right for any population to establish as high (or as consumptive) a standard of living as they can because any problems brought about by this standard are their own problems and do not affect other populations?
- i. The oceans are becoming a major source of food for the world's populations, but the larger developed nations are the only nations with the technology to harvest the sea on a large scale. These countries don't need the ocean's food as much as other less developed countries. How might the oceans be better utilized (and not exploited) to feed the people who need the oceans' food the most?

7. Reference:

"World EQ Index," National Wildlife Federation, 1412 16th N.W., Washington, D.C. 1973.

6. Discussion Questions:

- a. Why did you trade?
- b. How do you feel about the trades you made?
- c. Why did you trade with the "countries" you traded with?
- d. Why did you not trade with any particular country?
- e. Do you think trading is a stabilizing factor for the peoples of all countries concerned? Why?
- f. How do you feel about the sudden accumulation and excess consumption of the resources?
- g. Is this a stable situation? Why or why not?
- h. Which country do you think your group represented?

Access To What We Need

1. Concept to be developed: Population.
2. Understanding to be developed. Different sectors of populations have varying degrees of access to the natural resources they need in order to survive.
3. Time: 3-4 class periods
4. Materials. Introductory remarks. Access to resources can be dependent upon physical (transportation) or monetary or racial constraints. Identifying the distribution of income in a community can tell a person a great deal about different person's access to a resource they need.
 - a. Public library
 - b. City clerk (optional)
 - c. City Plan (optional)
 - d. pencil and paper
 - e. blackboard
5. Procedure:
 - a. Divide the class into research groups of 5 or 6 to investigate the following:
 - 1) The income distribution of your community (or state or nation) obtainable from U.S. Census Bureau information in Public Library.
 - 2) The distribution of persons with the same general income in your community (where people with certain incomes live), obtainable from City Plan.
 - 3) Percentage of your community with access to an automobile, obtainable possibly from the City Clerk.
 - 4) Location of recreational areas in and around your city, along with regional or state recreational areas within a day's drive of your community, obtainable from Public Library or City Plan.
 - 5) Location of major shopping center complexes in and around your community also obtainable from City Plan.
 - b. After the groups have researched their areas, have them compile their information on the board or on a chart:
 - 1) Draw a map of the city and region or state, placing on it the recreational areas and the major shopping complexes. Also include the general locations of persons with similar income levels in your community.
 - 2) List the income distribution on the board.
 - 3) List the percentage of people in your community with access to an automobile (if not obtainable you can use or adjust to your community the figure for most large cities in the U.S.; 42% of a major city's population does not have access to a car.

- c. Based on the groups' pooled information have the class discuss the following discussion questions.

6. Discussion questions:

- a. What sectors of your community's population has the greatest and the least access to your major shopping complexes?
- b. What people have the greatest, and the least access to the local recreational facilities (think about the elderly, the young, minority groups, low income and high income groups)? What about access to regional and state recreational facilities?
- c. How does an elderly person unable to drive get to the grocery store? Where do you think this person would normally shop; nearby grocery store or distant shopping center chain store?
- d. Which stores have the highest and lowest prices, local independent grocery stores or chain stores? What sectors of the population have a choice where to shop?
- e. Are any local recreational facilities exclusive to certain income levels or racial groups? Which people are excluded?
- f. What sectors of a population have access to clean water, clean air? How do rural families get their water?
- g. Do sectors of population with easy access to essential resources tend to conserve or to waste their resources (think about people living in a desert climate)?
- h. What types of transportation are available to a person or family living in an inner city, with a limited income, and no access to a car? How are this person's choices diminished concerning shopping, recreation, job?
- i. Huge amounts of money from taxes are spent in our population for highways. Which sectors of the population are able to use the highways, and to what degree?

Senior High

Marge Gnau

The Hunger Gap

1. Concept to be developed: Population
2. Understanding to be developed: Different sectors of populations have varying degrees of access to natural resources they need to survive.
3. Time: 4 days - day 1 - Discuss concept; prepare your menu
day 2 - Compare your intake to world intake and discuss
day 3 - Film on Hunger and discuss.
day 4 - Research deficiency diseases
4. Materials: a. World map of countries by name
b. World map: The Geography of Hunger (fig. 4.4 Ehrlich)
c. Daily per capita total protein, 43 countries (Fig. 4.5 Ehrlich)
d. Daily per capita animal protein, (Fig. 4.5 Ehrlich)
e. Basic food wheel
f. Free Film from the Dairy Council, Inc.
"FOOD FOR A MODERN WORLD" (22 minutes)
5. Procedure:
 - a. Although some of our natural resources include oil, coal, natural gas, nuclear fuel, metal, wood, water and productive soil, the following lesson will highlight FOOD. Hopefully you could proceed with any of the above in like manner.
 - b. List your individual daily intake of food.
Breakfast:
Lunch:
Dinner:
Compare this to the basic 7 requirements needed daily.
 - c. Discuss the countries in the map and their protein intake. Relate the underdevelopment of the country to the malnourishment of the people.
 - d. Collect pictures from magazines using the present Biafran situation as an example. Discuss not only the resulting starvation but also the political upheaval that resulted.
 - e. Relate some of the deficiency diseases which are a result of starvation.
 1. Vitamin A. deficiency
 2. Beriberi
 3. Anemia
 4. Scurvy
 5. Pellagra
 6. Rickets

- f. Prepare reports on these relating the vitamin deficiency to the resulting condition.

6. Discussion Questions:

- a. Throughout human history the famines which have existed have generally been short-term events. How does the present hunger problem compare?
- b. Some national and international organizations like WHO, FAO, UNESCO have been attempting to alleviate the problem of hunger. Collect some facts about what they are doing.
- c. How would you feel about eating things like
 1. Yeast protein
 2. Soybean or algae hamburgers
 3. Fish protein concentrate
- d. Do you think of such food as fake?
- e. How do you react to vegetables and fruit that ripen in railroad cars or have coloring added to make them more attractive?
- f. Have you ever eaten squirrel, rabbit or muskrat? Why or Why not?
- g. The film Soylent Green portrays an unusual source of food. What was it? How do you feel about it?
- h. What is it like to starve?
- i. Do you think starvation affects the observer of the starving? Explain.
- j. Do you feel any personal responsibility for this problem? Explain?

7. References:

Parson, Ruben. Conserving American Resources.
Prentice Hall, Inc., Englewood Cliffs, N.J. 1972.

Millard, Reed. Natural Resources.
Julian Messner, New York, 1973.

Ehrlich, Paul and Anne. Population Resources Environment.
W.H. Freeman and Co., San Francisco, CA. 1970

Population Policies

1. Concept to be developed: Population
2. Understanding to be developed: Any position on human population policy has personal, social, ecological, political, and economic implications.
3. Time: 1-2 hours.
4. Materials: dittos, pencils.
5. Procedure:
 - a. Prepare 3 dittos with 4 questions on each.
 - (1) Group One:
 - (a) Do you plan on having children someday? If so, how many (average for group)? How do you feel about adoption?
 - (b) Consider the fact that China has over 3 times (750 million) as many people as the U.S. (200 million). How could the U.S. cope with 3 times its present population? How could our political system have to adjust or change to adequately function for the expanded population (think about what China has done)?
 - (c) A prominent biochemist has stated that the earth can support only 1 billion people at the present standard of living in North America. The world population, as of 1970, was 3.6 billion. How long do you think you can have the present life-style you now have in the U.S., with so many other people desiring similar standards of living? What ways might we adjust our life-styles to keep our present quality of life (not the same as standard of living) for the future?
 - (d) Do you feel population control is unfair to some people, in particular, minority groups? If so, in what ways, and who then should control their population? Is the U.S. right in trying to help developing countries control their population growth? Does the old phrase, "clean up your own backyard, first", apply to the U.S., when dealing with other nations?
 - (2) Group Two:
 - (a) Should all people have the freedom to have as many children as they want? What happens if everyone wants 10 children?

- (b) How does the expanding world population (3.6 billion in 1970; 7 billion by 2000 at present growth rates) affect yourself now, and in the future?
 - (c) With the U.S. consuming 50% of the resources used in the world, how do you see developing countries reacting to the U.S. in the future? How does this imbalance lead to political instability in the world?
 - (d) If everyone continues to live just as they do today, what kind of world can your children look forward to? Will there always be "enough" to go around?
- (3) Group Three:
- (a) Are birth control policies morally right, only when decided by an individual? Is there such a thing as societal morality?
 - (b) Do you see human population as a central issue underlying other environmental problems? What is meant by population applying a magnifying effect upon environmental problems?
 - (c) Some people feel that wars, disease, and natural disasters will control population surplus. However, in five years of terrible war in Vietnam, the population on North and South Vietnam has grown more than 3 million. A giant tidal wave killed more than 500,000 people in East Pakistan in 1970, but this number was replaced in just 35 days. Have human populations gone beyond natural controls as we know them now? What kinds of future controls will the world population suffer if we continue to grow at the present rate (doubling every 30-35 years)? Remember, the world has only finite resources and population control will occur sometime, either by ourselves or in spite of ourselves.
 - (d) As population increases, family ties generally weaken. Old people used to be the most respected and most honored members of families, especially in populations such as the Japanese, and the Native Americans. But now the life of the aged is becoming very difficult, particularly if they don't have a healthy pension or savings. Is the current trend towards family disintegration inevitable as populations increase? Do the aged have the same rights to a quality environment as everyone else? How is the quality of life different today for the aged than for younger people in our population?
- b. Divide the class into the 3 groups, and have them write answers to their questions (writing their responses can be omitted), followed by a group discussion of their questions. Some record should be kept in each group to list important points to remember for the class discussion.

- c. After group discussions (anywhere from 20-60 minutes), bring the class together to discuss the 12 questions, sharing out each group's initial discussions.

6. Discussion Questions:

- a. Was your class or group able to come to an agreement over any of all of the questions? If not, think about how difficult it is for governments to ever reach equitable or just decisions for their society.
- b. Is it necessary for students your age to consider questions like in this activity? If it isn't, when will it be necessary?
- c. If you were given 1 million dollars tomorrow (tax free), would you feel it necessary to consider questions like the ones in this activity, or would you feel right in doing as you please, not thinking about the world of tomorrow?
- d. Do you feel population should not be considered in schools, for it is simply too personal?

7. Reference:

"The World EQ Index". National Wildlife Federation, 1412 16th St., NW, Washington, D.C. 1973.

Senior High

Joseph G. Konzer

STUDY: MONETARY COST OF HAVING A CHILD

1. Concept to be developed: Population
2. Understanding to be developed. Any position on human population policy has personal, social, ecological, political and economic implications.
3. Time: Day 1 - Introduce and assign surveys
One week later - Report on surveys and discuss
4. Materials:
 - a. Survey to be answered by physician (gynecologist)
 - b. Survey to be answered by hospital official
 - c. Survey to be answered by recent parents (within 1 year)
5. Procedure:
 - a. Discuss in class what makes people decide when to have a baby.
 - b. Work toward the idea of economic decision - whether or not the parents can afford it.
 - c. Then work toward the idea - How much does a baby cost? Let's find out.
 - d. Assign someone to report on the estimated cost of raising a child today.
 - e. Distribute the surveys (one each) to three volunteers to be filled out and reported on in one week.
 - 1) Survey #1 - To be answered by a Physician (gynecologist)
 - a. How much are your fees for pre-natal care? Total cost
 - b. How much is your fee for delivery?
 - c. Do you have any other fees that an expectant woman might have?
 - d. Can you think of any other expenses that a pregnant woman would have? Other than through you?
 - 2) Survey #2 - To be Answered by a Hospital Official
 - a. What is the cost for a semi-private room on the maternity ward?
 - b. How long do mothers usually stay here?
 - c. What other hospital expenses might occur during such a woman's stay? Please explain as to the amount and nature of expense.
 - d. Can you add any expenses that an expectant woman would have, hospital or otherwise?
 - 3) Survey #3 - To be Answered by Recent Parents (Within 1 Year)
 - a. What would you estimate as being the amount you spend on feeding your baby? Do you expect the amount to get higher as the baby gets older?
 - b. About how much do you spend on your baby's clothes? Do you expect that to get higher?
 - c. Did your insurance rates change as a result of your having a baby?
 - d. What medical bills and hospital bills were not covered by your insurance? How much were they?
 - e. Can you give an estimate as to how much you expect to spend on your child this year?
 - f. Did you expect your child to cost so much?
 - f. In one week collect the data and discuss the results.
 3. Lead into the idea that the decision of having a child is a very important economic issue for a family and society.

6. Discussion Questions:

- a. What is the estimated cost of having a baby? Figure it out.
- b. What is the estimated cost of raising a child to maturity?
- c. Is it likely for the cost to raise a child to remain the same? What do you think will happen?
- d. What happens if the woman works? What will happen to the money she's bringing in?
- e. What happens if the child needs special medical help throughout his or her life?
- f. Will the parents have as much money to spend on themselves after the baby is born than before? Is it important?
- g. Should the mother return to work after having the baby? When? As soon as possible? Five years? Never?
- h. Does the birth of a child in a family have economic implications within that family? Other implications - ecological, social or political?
- i. What should a couple consider before deciding to have a baby?

Economic System Comparison

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed: Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.
3. Time: Two days day 1 - research assignments.
day 2 - discussion.
4. Materials:
 - a. Access to your school's and/or community's library.
 - b. Paper and pen for each student.
 - c. Slip of paper for each student, suitable for use in a name-drawing.
 - d. Shoebox or similar-sized container.
 - e. Blackboard and chalk.
5. Procedures:
 - a. Have each student write his or her name on a slip of paper.
 - b. Place the slips in the shoebox, and by drawing out names randomly, divide the class into four groups of equal size.
 - c. Explain to all four groups that their tasks will be to perform research using the library, to answer questions about four "kinds" of economic systems. When each group has completed its research, it should incorporate its findings into a "group paper" which it will present to the entire class on the following day.
 - d. Assign one group the task of researching a "pure free market economy" (such as Japan's resembles).
 - e. Assign the second group the task of researching the workings of a tightly "controlled economy" (such as the Soviet Union's resembles).
 - f. Assign the third group the task of researching the workings of an economy based on the principals of "social democracy" (such as Sweden's economy resembles).
 - g. Assign the fourth group the task of researching the working of "feudal" economy. (such as Columbia's economy resembles).
 - h. On the blackboard, list the following points:
 - 1) Definition of the assigned economy-type.
 - 2) Names of at least three countries whose economic systems closely exemplify the type assigned your group.

- 3) Major imports and exports of those countries.
- 4) Average annual per capita income of citizens in those countries.
- 5) Major economic goals of those countries.
- 6) Kinds of Political systems operative in those countries.
- 7) Level of industrialization in those countries.
- 8) Environmental quality for the average citizen in those countries.
- 9) Degree of apparent citizen-satisfaction with the economic system of those countries.
- 10) Apparent responsiveness of those countries' governments to changing citizen needs and desires.
Etc.

1. Allow the students to determine who will do research on which of the above points, and to develop their own strategies for completing the assignment on schedule.

6. Discussion questions:

- a. On the basis of your research, does it appear that certain political systems seem associated with certain types of economics?
- b. Is apparent citizen satisfaction ever associated with a given kind of economic system?
- c. Of the four systems you studied, which one would you judge to have the greatest negative impact upon the world environment? Why?
- d. Of the four systems under which one does the greatest number of people live?
- e. Of the four systems, in which does the advertising of consumer goods play the greatest role?
- f. Under which of the four economic systems would you choose to live if you had to make the choice?
- g. Which of the four systems would you expect to be most often associated with an unstable government?
- h. How do political and economic goals differ between countries exemplifying each of the four systems.
- i. How do the four systems differ in the ways they meet consumer demand for goods and services?
- j. How do the four systems differ with respect to the priority they place on individual wellbeing vs. collective well being?

DEBATE:
Economic Effects on the Environment

1. Concept to be developed: Economics and Technology
2. Understanding to be developed: Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.
3. Time: 3 days:
 - Day 1: Debate
 - Day 2: Continue the debate
 - Day 3: Discussion and application of the understanding
4. Materials:

chalk, eraser, board, debate items listed in bold print
5. Procedure:
 - a. Relate the following to their effects on the environment:

FREE ENTERPRISE VS. CENTRALIZED GOVERNMENT CONTROL

AUTOMATION VS. INDIVIDUAL LABORS .

AGRARIAN VS. INDUSTRIALIZED LABORERS

DEVELOPMENT OF NATURAL RESOURCES VS. IMPORTATION OF FOREIGN GOODS
6. Discussion Questions:

(REACTION TO THE DEBATE)

 - a. How does selfishness degrade the free enterprize concept?
 - b. How is strong governmental control an invitation to sloppiness?
 - c. How is a bureaucracy apt to become a target for free enterprize?
 - d. Can any nation successfully survive with an economic system which is totally free enterprize or totally centralized by the government?
 - e. Apply the same question to agrarian vs. industrialism.

- f. How can automation be detrimental to an individual?
- g. What procedures or measures can be taken to minimize these detriments?
- h. What political implications result when a country depends on other countries for importation of goods?
- i. How can this principle cause the small nations to be the real powers in world politics?

7. References:

- a. Ehrlich, Paul and Anne. Population, Resources and Environment. W. H. Freeman and Co., San Francisco, 1970.
- b. Von Neumann, John. Theory of Games and Economic Behavior. Princeton University Press, 1953.
- c. Piel, E.J. Man and His Technology. Mc Graw-Hill Book Co., N.Y. 1973.
- d. Meadows, Donella and Dennis. The Limits To Growth. Universe Books, N.Y. 1972.
- e. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program. Tilton, New Hampshire, 1970.
- f. Chute, Robert M. Environmental Insight. Harper & Row, Publishers, N.Y. 1971.

The Social Cost of Water Pollution

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed: Some businesses and industrial plants in the process of producing marketable products pass on social costs (i.e., air, water and noise pollution) to society.
3. Time: 3 days - day 1 - field trip
day 2 - compile data, draw graphs.
day 3 - discussion of findings.
4. Materials:
 - a. Access to a nearby stream or river.
 - b. Glass or clear plastic collecting jars.
 - c. Masking tape.
 - d. Felt ink markers.
 - e. Secchi disc and cord (see appendix).
 - f. Hack dissolved oxygen test kit (optional).
 - g. Plankton net (see appendix).
 - h. Bottom sediment scoop (see appendix).
5. Procedure:
 - a. Have the students construct and collect together any of the above materials which are not already available (see appendix).
 - b. Choose a stream or river for examination that runs through or past your community.
 - c. Travel as far upstream as time permits and take samples at intervals of 1/2 mile for as far downstream as time permits.
 - d. At each sampling location, have each student keep a record of:
 - (1). Degree of water turbidity.
 - (2). Results of dissolved oxygen test (if used).
 - (3). Odor of water sample.
 - (4). Amount and kind of predominant shore vegetation.
 - (5). Kind of human activity taking place in the area (housing, industrial, farms, woodlot, etc.,).
 - (6). Amount and kind of aquatic vegetation ("water weed", algae, etc.) present.
 - (7). Observable aquatic animal life present.
 - (8). Overall aesthetic quality of the water.

- e. Obtain a sample of the water and the bottom sediment at each location. Label these carefully according to location with masking tape and a marking pen.
 - f. Upon returning, make up a large "river quality" table showing results of the tests and observations from site to site going downstream.
 - g. Arrange the water and sediment samples on a table in the order in which they were taken.
 - h. Have the students make careful observations about each water and sediment sample on the following inputs:
 - (1). Odor.
 - (2). Overall clarity of water.
 - (3). Amount and kind of animal life present in water and sediment sample.
 - i. Have the students graph dissolved oxygen test results (if used) with dissolved oxygen content at test sites on the vertical axis and distance from the first test site on the horizontal axis.
 - j. Have them graph Secchi disc results with disc measurement on the vertical, and distance from first test site on the horizontal axis.
6. Discussion questions:
- a. How did the Secchi disc and dissolved oxygen test results change as they were taken farther downstream?
 - b. What makes water turbid?
 - c. Which of those turbidity causes can be attributed directly to human activity?
 - d. What is the relationship between degree of turbidity and aquatic plant growth?
 - e. If dissolved oxygen test results differed from point to point, how can you account for the differences?
 - f. What effect would varying degrees of dissolved oxygen have upon aquatic animal life?
 - g. Did the variety of animal life in the water change as you went downstream? Why or why not?
 - h. Does the sediment appear to change in some ways as one goes downstream?

- i. At any one test site, did the quality of the water appear to change significantly? Why or why not?
- j. Identify the points along your tested area of the river where industry or other human activity might alter water quality.
- k. Do your tests and observations suggest any relationship between human activity and altered water quality?
- l. What businesses or industries along your river can be identified as having a significant impact upon local water quality?
- m. In what ways does the recreational value of the river increase or decrease as it flows along?
- n. In what ways does your community make use of the river?
- o. Are some of those uses in conflict with others? Which use dominates?
- p. Does your community have a policy regarding water quality standards?
- q. Are those standards enforced? Why or why not?
- r. What is coliform bacteria? How is it used as an index of water quality?
- s. What is meant by "passing along the social cost?" of industrial pollution?

7. Reference:

Eichert, Russel E., Snooks, Emerson, L; Outdoor Education Equipment; Interstate Printers and Publishers, Inc; Danville, Illinois, 1974.

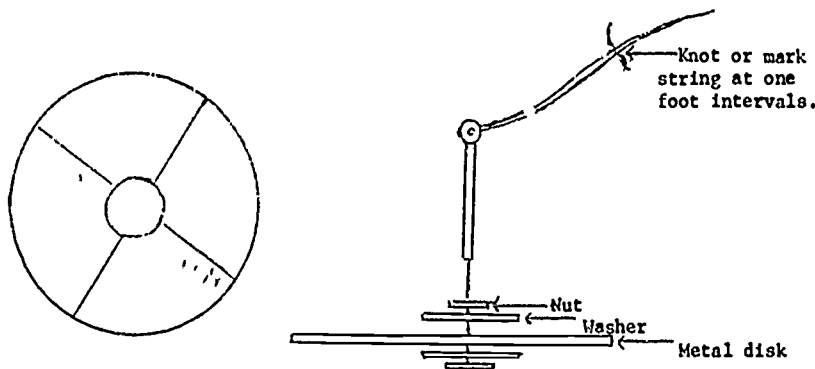
Appendix

1. Secchi Disk

Materials: metal disc 5-6" in diameter cut from light sheet metal, metal washers, heavy string, black paint, white paint, eyebolt, nuts.

Procedure:

- a. Cut disk from lightweight metal.
- b. Drill hole in center for the eyebolt.
- c. Place a metal washer and nut on the eyebolt on both sides of the disk. Add more washers if extra weight is needed.
- d. Paint disk black and white for contrast.
- e. Attach a heavy string to eyebolt and mark it at one foot intervals.
- f. Lower the disk into water until it disappears and take a depth reading at this point. Lower it a few feet deeper, then raise it until it becomes visible. Take a depth reading at this point. Average these two readings. This is called the limit of visibility.



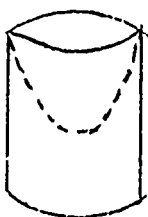
- g. The Secchi Disk can be lowered into streams from a boat, an overhanging branch, or a bridge.

2. Sediment Scoop

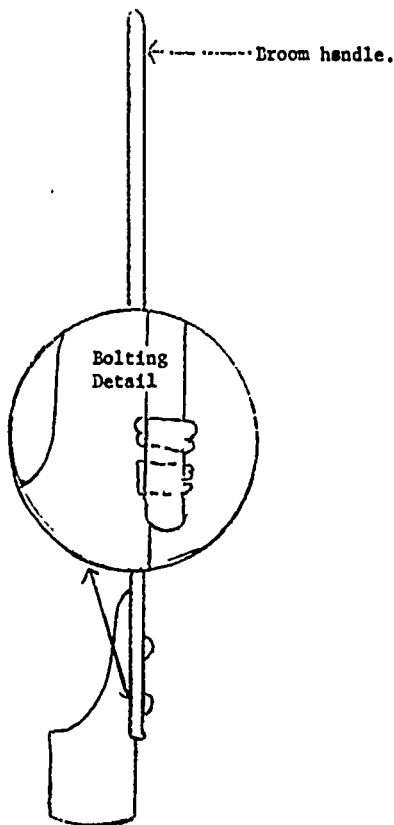
Materials: no. 10 can, broom handle, nuts and bolts, hammer and nails, drill.

Procedure:

- a. Using tin shears, cut a no. 10 can into a scoop as shown.
- b. Punch several small nail holes in bottom of can to allow water to drain.
- c. Drill two holes through the broom handle and can.
- d. Bolt can securely to the end of the handle.



Cut no. 10 can to scoop form.



City-Industry Pollution Comparison

1. Concept to be developed: Economics and Technology
2. Understanding to be developed: Some businesses and Industrial plants in the process of producing marketable products pass on social costs (i.e. air, water and noise pollution) to society.
3. Time needed: 6 days - 2 days to determine base level of pollutants in city
2. days to determine base level of pollutants in industrial areas
1 day to compile data
1 day to discuss problems and write up report for city and industrial areas.
4. Materials needed: City hall with access to sewage treatment plant and to local sewage collection areas
12 to 24 dishes of uniform size
Glycerin- 1 pint
Water test unit to include tests for Oxygen content
Nitrogen level
Phosphate level
Mineral content

Filter paper and funnels
Noise meter or use of level meter on tape recorder
Microscopes for examination of levels of micro organisms
Beakers
Titration tubes
Litmus paper and water mister
5. Procedures: a. Tests for air pollution.
 - 1) Using dishes to collect particulate matter- Glycerin water mixture used so as to not allow water to evaporate (2 days for both city and Industrial area)
 - 2) Collect mixture and filter through for gross amounts of particulate matter and other materials which might have been collected.
 - 3) Using a mister and litmus paper determine the pH of the air surrounding the community and the industrial area (Done on minimum of 2 days)

b. Tests for noise pollution.

 - 1) General tape recordings of areas around city and Industrial areas at all times during day and when both city and industrial area are in minimal use.
 - 2) Determine level of these noises by using either decibel meter or sound level meter on tape recorder.

- c. Water Pollution tests
- 1) if river flows through or around town test river before it comes near town and after it leaves town, also test river immediately after it leaves or goes near industrial area.
 - 2) Using water test kit establish levels of materials in water.
 - 3) Go to sewage treatment plant and test sewage as it is being treated and water after it has been treated.
 - 4) Obtain from city kind and type of sewage treatment and levels they expect from their treatment of sewage.
 - 5) Obtain from city amounts of sewage treated for entire city and for the industrial area and find out if it is possible to obtain test results directly from sewage as it comes out of industrial area before it is mixed in with entire city. If possible test sewage at these points.
- d. Gather data from various tests, compile data and bar graph data against each other i.e. complete city against Industrial area.
- e. Write up results of collected data and present copy of data and some possible solutions to problems to city council or mayor and to plants in industrial area being tested.
- f. If more than one class is to be involved more than one area of city can be tested against the entire city to give a total idea as to the areas in the city which add to the problems of the entire city more or less than other areas of the city.
6. Discussion Questions.
- a. What effects could be imposed on the city if we were able to shut down industrial area until pollution levels were lowered.
 - b. How could the city effectively change the pollution levels within the city itself.
 - c. Why are given areas in the city lower in levels of pollution than others.
 - d. What political action committees or stands should we as a group try to influence our parents toward.
7. References and Resources:
- a. Chemistry Teacher
 - b. City Hall-Mayor or City Manager
 - c. State government to establish pollutant limits for state control
 - d. Zoning controls on pollutants.

Senior High

Ann P. Sibole

Needs vs. Wants

1. Concept to be developed: Economics and Technology
2. Understanding to be developed: Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by the economic system.
3. Time: 2 class periods
4. Materials: old magazines (beauty, housekeeper, man's magazines)
Task cards-

Discuss the following in groups of 3:

- a. Which list is longer, wants or needs?
- b. Who or what creates our wants? List 5.
- c. Go through several magazines in the classroom. Find ads which make you interested in having the product. Give the product name on paper then opposite the name, the kind of appeal the advertiser used on you to make you want his product. Was it sex appeal? Convenience appeal?
- d. Pay special attention to ads which might use the environmental bandwagon as a selling point. Cut out these ads - they will be used for a bulletin board display, later.

Article: "I Have 7 Children" by Ellen Peck (from New York Times) - make ditto for students.

'I Have 7 Children' She Said to Wild Applause

By Ellen Peck

Susan, on "As the World Turns," has just had a baby. She is not the only one. Turning the daytime dial, we see that Chris, on "Where the Heart Is," has just had a baby, too. Within the past year, babies have also been born to Janet on "Search for Tomorrow," Meredith on "One Life to Live," Edie on "All My Children," Angel on "Love Is a Many-Splendored Thing," Diana on "General Hospital," Linda on "Days of Our Lives," Mary on "Where the Heart Is," Carolee on "The Doctors"... and "Another World's" Pat Randolph has twins.

Actually, the birth rate on daytime TV seems to rival that of Latin America!

If the pregnancies per se are demographically questionable, the way in which they are presented is often psychologically alarming: pregnancy is shown as woman's way to become the center of attention, retreat from unresolved conflicts, or compete for men.

A classic natlist competition took place recently on "As the World Turns." Susan is married to Dan, who is in love with Liz (and is, in fact, the father of Liz's child). Sensing her husband's attraction to Liz, Susan became pregnant, hoping thus to win Dan's permanent affection.

That pregnancy was planned--at least by Susan--and such planning is rare on the daytime dramas. Most pregnancies are accidental. . . .

Actually, were all pronatalist, glory-of-motherhood-and-reproductive-function comments to be combined and presented to the F.C.C. Fairness Doctrine Committee, daytime TV would owe Planned Parenthood, Zero Population Growth and the National Organization for Non-Parents approximately 18,200 minutes of "equal time" for the past year's shows alone. . . .

Strong impressions are conveyed here: pregnancy will save your marriage; motherhood will fulfill you; bearing a man's child will make you supremely important to that man. Such messages are misleading (the "baby holds man" myth is dispelled by a simple glance at the divorce statistics), nevertheless, 12 of the 16 daytime dramas carry strong reproductive themes.

Daytime quiz and talk shows offer scant relief. Recently on "The Dating Game" a contest question was, "How many children do you want?" (Responses were "three," "three," and "five.") That same week, Garry Moore asked a "To Tell the Truth" contestant, "And what do you do?" She replied, "I'm a housewife and mother of seven children," and the audience applauded mightily...

An episode of last season's "Dick Van Dyke" series also deserves examination. It was called "Off and Running"; I call it "I Didn't Mean Us."

Situation: Dick hosts his own talk show. After interviewing an author and commending a book, "Overpopulation Begins at Home," Dick returns to his own home to learn that another child is on the way. He and Jenny already have a 15-year-old son and a 9-year-old daughter. Sample dialogue:

JENNY: You've always been so outspoken about the dangers of overpopulation and how responsible couples should replace only their own number ...

DICK: Honey...

JENNY: Didn't you mean what you were saying?

DICK: Yes, but...I didn't mean us....

5. Procedure:

- a. Hold a class discussion on what needs and wants are and the differences.
- b. Each student will list those things he needs on one side of a sheet of paper and those things which he wants on the other.
- c. Students will get into groups of 3 and follow the directions on a task card the teacher will hand out.

- d. When groups have completed task cards, hand out "I Have 7 Children", to be read.
- e. Hold class discussion on the article.

6. Discussion Questions:

- a. What wants do the TV quotes in this article support?
- b. List other wants or generally accepted American "ways" of doing things that TV ads or shows might support.
- c. Watch TV tonight (if you have one available), and look for the kind of life style TV is selling the public.
- d. Name some examples of environmentally sound TV ads or shows.
(Example: A local junk yard is advertising that they accept and buy junk.)

7. References:

- a. Options, Population Reference Bureau, Inc. 1973. (\$2.00)
- b. Vogue Magazine, January 15, 1972, Enticers 1970: On TV, Who Do They Think You Are, Stephanie Harrington.

Senior High

Harry Tindall

Letter to the Editor

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed. Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by that economic system.
3. Time: 3 to 5 days - days 1 & 2 - Reading the "Letter from Leningrad" selection of "roles" and formation of groups
Preparation of answering letters
days 3 & 4 - Reading and discussion of answering letters
days 5 (possibly more) discussion
4. Materials: the "letter"
writing paper and pens
5. Procedure:
A "letter" has been printed in the New York Times from a "reader" in Leningrad, criticizing the American economic and social system (The letter was actually composed by the teacher, using familiar arguments and phrases. Such a letter is attached and may be used--or the teacher may wish to compose his own "letter" to fit the ability of the class. In this way he may make the letter as easy to answer as he wishes--or as difficult.
 - a. Read the letter to the class. Answer questions, but do not discuss.
 - b. Assign members of the class "roles" in the American system--a farmer, a lawyer, a doctor, a trucker, a U.A.W. official--any role they wish. Some may wish to work as a group.
 - c. Each individual (or group) will compose a letter in his role, answering the letter to the Times.
 - d. Read letters to class and stand ready to defend your arguments from class.
 - e. Discussion of letters, esp. the "Letter from Leningrad".
6. Discussion questions:
 - a. Who do you think the writer of the Leningrad letter is supposed to be? Is he well educated or a simple peasant?
 - b. Is the writer really concerned about the American people or he merely pretending? Why do you think so?
 - c. He writes that the time for capitalism has passed. Why does he think so? Do you agree?

- d. How do you answer his observation that people are important in the Soviet Union, not profit?
- e. How is price determined in this country? In the Soviet Union? Which is superior.
- f. He says the land, the forests, the natural resources belong to everyone.
- g. Where does our Leningrad correspondent get his information about this country? Discuss its reliability.
- h. Is our present economic system "doomed"? Do large corporations such as General Motors really manipulate price? Discuss.
- i. Why does the writer think pollution will never be solved under our present economic system? Do you agree? How does he say the Soviet Union is fighting pollution? Do you believe his "facts"? Discuss the value of a free press.
- j. How does the writer compare politicians in the U.S. and the Soviet Union? How does a person become a member of Congress? How does a person become a member of the Supreme Soviet? Which method do you favor and why?
- k. Discuss the writer's theories on shortages in the U.S. He calls us "wastrels" and gives examples of waste. Do you agree with him?
- l. Do you agree that eventual shortages will ultimately result in the loss of "freedom as we know it"? What changes do you foresee?
- m. The only certain thing about the future is change. Do you think we shall move toward the Soviet economic system? Discuss.
- n. Read the last paragraph of the Leningrad letter again--aloud. Where do you agree or disagree in his condemnation of the U.S. Discuss his praise for the Soviet Union. How can he call it the "champion of peace and freedom"?
- o. Do you think the people of the U.S. are satisfied with our present economic system? Defend your answer. Are the people of the Soviet Union really satisfied with theirs. Discuss.

A LETTER FROM LENINGRAD

Dear Friends and Comrades in America,

We in the Soviet Union wish you to know that our hearts go out to you in this time of national calamities. We know your problems and we sympathize. We read about them in our national press every day and we see them on our television. But believe me, Comrades, when I say these problems are a natural result of your decadent society and economic system. Perhaps there was a time for capitalism, I am not sure. But that time has passed, and in a world limited in resources, frozen to a single, minor planet, and surrounded by biological and economic absurdities, the socialist state is the world's only hope.

You are troubled by inflation at the same time that many people are unemployed. How can this be, you ask. Comrades, there is no such problem in the Soviet Union. We do not wait for supply and demand to balance out. People are the important thing in our society, not profit. If a man should love his job through technological change, he is immediately trained for another, and he is soon back making a valuable contribution to society again. Prices in the Soviet Union never get out of control. They are set by the government, based upon the value of the goods to society. We the people--the proletariat--own the land, the forests, the mineral resources, the steel mills, the auto plants--and we decide how they shall be used. The only cost worth considering is the labor and the working person is the sole beneficiary. I tell you, Comrades, your economic system is doomed because supply and demand can not much longer be manipulated by the capitalist employers for their own benefit.

You are plagued by pollution--water, air, land. Comrades, so long as you let the capitalist factory owners control the anti-pollution fight, you will never conquer the problem. Your great company--General Motors, what is the sole motive of the men who run the corporation?--Profit! Will installing

costly anti-pollution equipment increase profit? Of course not! It will cut profits, and so they will bend every effort to avoid anti-pollution expenditures. They will procrastinate and rationalize, they will fight it out in the puppet courts, they will buy the votes of your elected officials. Our government assures us that the pollution fight is being won and as soon as new equipment is developed, it is installed. Cost means nothing. It is people who count!

Your newspapers talk only of Watergate these days. Friends, such a thing could not happen in the Soviet Union. The men who run for political office in your country are the tools of the capitalists. They win elections only with the financial support of the big institutions—Big Business, Big Unions, Big Organizations. Winning is all important and your politicians will do anything to win—lie, cheat, steal, spy. This is alien to my country. Here government candidates are carefully chosen by the Communist Party. We vote only for men who are honest, loyal, dedicated people. They believe in our communist system. They have nothing to gain by crookery. No one buys their vote. Their sole concern is the welfare of the people of the Soviet Union.

You have seen an oil shortage develop in your country, and soon, other shortages will appear. Comrades, you must expect this as long as your capitalist system continues. Consider your disgraceful waste in automobiles. For 50 years the capitalist manufacturers have made their autos obsolete with a year by changing the style annually, by making them rot away in two or three years, by waging giant advertising campaigns so that the poor worker is led into squandering his wages on new cars. Think of the tremendous waste of resources. And how those monster cars of yours guzzle gasoline. This too has been by design. How else can your huge monopolistic oil companies swell their profits? You have become a nation of wastrels! But I do not blame you, my American brothers. It is your capitalistic system that is to blame. Here, in the Soviet Union, we produce only goods that are necessary. We do not waste

valuable resources on foolish gadgets, senseless trips, foolish playgrounds such as Disney World. Our resources of coal, oil, iron, and countless others are virtually intact because we refuse to waste them on inconsequential items. Regretfully, I must tell you that some day soon--sooner than you think--you must pay the price of all this wastefulness. That price will be your "freedom"--at least, freedom as you know it.

When the history of the world is being written a thousand years hence, America will have an important place in history. You have given the world much. But you have destroyed as much as you have built; you have wasted as much as you have saved; you have desecrated as much as you have immortalized. The Soviet Union too will have an important place in history, for we shall be known as the saviors of the earth, rescuers of a decadent society, champions of peace and freedom.

With love and concern for the people of
America

Igor Ulanovich

- (2). You are the ruler of Bungo. Bungo's people are also poor, the farming land is not rich, and there are not enough people in Bungo to farm it anyway. Bungo does not even have enough malodium to trade for enough food to go around from those countries with a surplus of food to sell.
- (3). You are the ruler of Lunawasi. This country has always been able to feed itself. They have no malodium, but most of Lunawasi's people now make a living by repairing worn-out wigit batteries.
- (4). You are the ruler of Yoniland. Nearly everyone in Yoniland is prosperous. Yoniland manufactures nearly all of the wigits the world can buy. Yoniland does not, however, grow all the food it needs.
- (5). You are the ruler of Lampto. Lampto is a country of intellectuals whose sole duty is to govern the trade relations of the other countries, besides governing itself. Lampto has no malodium, makes no wigits, and does not grow enough food to feed itself. The other countries pay Lampto for its good economic advice by giving it food and wigits. Lampto places final judgement upon the trade relations of the other countries and that judgement cannot be vetoed.

g. "Situation" cards:

- (1). Someone in Bungo has found a substitute for wigits which is cheaper to build and makes crops grow even faster. They sell this to the other countries for more food for themselves.
- (2). Someone else learns that this substitute for wigits can be made without malodium for its batteries.
- (3). Crops fail world-wide, in the worst agricultural disaster of the century.
- (4). Bungo and Hunza unite in a religious war against the other three countries. Trade between these two nations and the other three has stopped as a result.

h. Clock or watch.

5. Procedure:

- a. Previous to the exercise, have sets of "country" cards typed, dittoed, and cut so that you have enough five-country sets to distribute to your class if it were to be divided into groups of five students each.

- b. Also previous to the exercise, have "game overview" and "situation" cards typed, dittoed, and cut so that one of each could be given to each five-member group of your class.
- c. Have each student write his or her name on equal-sized slips of paper suitable for a name drawing.
- d. Place these slips in the shoebox.
- e. Draw five names at a time from the shoebox so that the class is randomly divided into groups of five.
- f. Distribute a "game overview" card to each of the five groups.
- g. Distribute a set of "country cards" to each group, so that each group member gets a different "country card".
- h. Explain to the students that either directly or indirectly, all countries trade food for wigits or wigits for food. As each class member is the ruler of one country, how would he negotiate with the other countries if the trade balance was upset?
- i. Allow all groups 10 minutes to read, describe, and discuss their "overview" and "country" cards.
- j. Pass out the first "situation" card to each group.
- k. Fifteen minutes after the first "situation" card has been distributed, pass out the second.
- l. Allow fifteen more minutes until the third "situation" card is distributed to the groups, and fifteen minutes after this before the final "situation" card is distributed.

6. Discussion Questions:

- a. At first, how did the rich country leader feel?
- b. How did it feel to be the ruler of a poor country at first?
- c. If all countries traded food for wigits in some way, how was trade affected when someone in Bungo discovered a wigit substitute?
- d. How was world trade affected when it was discovered that the substitute did not require "malodium"?
- e. What would happen if the worldwide supply of "malodium" was exhausted before a wigit substitute was found?
- f. What was the effect of a world-wide crop failure upon each country?

- g. Which country would have felt the "pinch" first?
- h. What was the effect upon the other three countries when Bungo and Hunza united in war against them?
- i. Could any of the countries have been totally self-sufficient? How or why not?
- j. Would self-sufficiency on the part of one country affected another country adversely? How or why not?
- k. What is the purpose of this game?
- l. Does this game have any analogies in the world of present-day international politics? How or why not?
- m. How does a country that is always poor deal with its rich neighbors?
- n. How does a country that is always rich deal with its poorer neighbors?
- o. In the game, was it ever possible or a good thing to cut the governmental country off altogether? Why or why not?
- p. What are some real world resource trade-relations between countries which could be viewed in a similar way to this game simulation?

Senior High

James Seurnyck

Trade Balances

1. Concept to be developed: Economics and Technology
2. Understanding to be developed: Each country has its own particular economic system, but all countries' economic systems are tied together through world markets of raw materials, food, and manufactured goods. Thus economic events that occur in one country affect other countries (i.e. crop failures).
3. Time: 4 - 5 days
4. Materials: A resource center for necessary research.
5. Procedure:
 - a. Take a manufactured item (car) and determine the raw materials used in the manufacturing process.
 - b. Using chemistry, economic geology and other source books, determine which country is the source of the raw materials.
 - c. Diagram the item being researched, identifying the raw materials and their sources.
 - d. Give a brief report on the technology of production of raw materials.
6. Discussion questions:
 - a. How important is foreign trade to our economy?
 - b. What are the major imports and exports of our country?
 - c. What is meant by a balance of trade and why is it important to our economy?
 - d. What is the common market and how has it affected our economy?
 - e. What are the political and social effects on countries who are the major suppliers of natural resources?
 - f. Does economic stability have an effect on whether a country is recognized as a "world power" or not?

- g. Who do you think should regulate prices of natural resources? Example: Mid-east oil.
- h. Do you see a relationship between the stability of an ecosystem and its technological development? Explain, using two different countries as examples.
- i. One of our major exports is wheat. How has inflation of our economy affected those countries that rely on us for this basic food?

7. References:

- a. Next Hundred Years; Man's Natural and Technological Resources, by Brown, Harrison et. al., Viking, 1963.
- b. Wood: World Trends and Prospects, by Food and Agriculture Organization.
- c. Coal, by L. Hunter, International Publications Service, 1961.
- d. Natural Resources for U.S. Growth; A Look Ahead to the Year 2000, by Hans Landsberg. Johns Hopkins Press, 1964.
- e. Mineral Resources of the U.S., by E. Willard Miller, Rand McNally and Co., 1967.
- f. Resources and Man, by Nat. Academy of Sciences. W. H. Freeman and Co., 1969.
- g. Defense Against Famine, by A. V. Stack. Doubleday and Co. Inc., 1970.
- h. New World of Aluminum, by E. B. Tracy. Dodd, Mead and Co., 1967.

Films:

- a. Europa; 10 min. (ICF). Explains history of the concept "the common market".
- b. Productivity: Key to America's Economic Growth, 20 min. (EBF)
- c. Food for a Modern World, 22 min. \$7.50. U. of Mich.
- d. Food Crisis, 60 min. b/w, \$12.00. Indiana University.

Ecological Trade-off Survey

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed. Three major ecological trade-offs are 1) between population growth and environmental quality, 2) between levels of production and environmental quality, and 3) between the degree of urbanization and environmental quality.
3. Time: Four days
 day 1 - preparation of questionnaire.
 day 2 & 3 - distribution and collection of questionnaire.
 day 4 - questionnaire-response analysis, discussion.
4. Materials:
 - a. Ditto masters & ditto paper.
 - b. Access to typewriter and ditto copying machine.
 - c. Large sheet of poster paper.
 - d. Paper and pencil for each student.
 - e. A questionnaire designed to sample attitudes on population, production of consumer goods and urbanization, such as the following:

Environmental Attitudes Questionnaire

This questionnaire was developed to help our class learn more about peoples' reactions to the environmental crisis. To assist us, please answer the following questions as sincerely as you can, based on the way each question or statement is worded.

The first two questions can be answered by entering a number in the blank spaces.

You can respond to the next eight statements by placing an 'x' above that number on the five-point scale which best represents your reaction to the statement. Although individual responses will remain anonymous, each class' average response to each question or statement will be posted after the questionnaires have been returned.

1. In my present family there are _____ (number) children.
2. As an adult I would like to have _____ (number children) in my future family.
3. As an adult I would be willing to limit the number of children in my family to just two.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
strongly agree	agree somewhat	neutral	disagree somewhat	strongly disagree

4. As an adult I would like to be able to afford a higher material standard of living than my own parents now have.

(scale)

- 5. In order to help alleviate environmental problems I would be willing to make sacrifices in the way I live, i.e., use car pools or mass-transit instead of drive a personal car to work, reduce the number of my electric appliances, etc.

(scale)

- 6. Future changes in the technology of producing consumer goods will probably eliminate most causes of pollution by the time I am an adult.

(scale)

- 7. I would rather live in the country than in the city as an adult.

(scale)

- 8. One good way to help alleviate environmental problems would be to allow the prices of goods to rise so that everyone consumes less energy and fewer resources.

(scale)

- 9. Everyone suffers from the effects of pollution to the same degree.

(scale)

- 10. I would be willing to pay higher prices for goods if they could be produced so as to have less negative effects upon environmental quality, i.e., "pollution free" cars, containers, electricity and other magical things.

Thank you for taking time to complete this questionnaire.

- f. Table for posting questionnaire responses:

Environmental Attitudes of (your school's name)

Questions	1	2	3	4	5	6	7	8	9	10
Class A										
Class B										
Class C										
Etc.										
Average for entire sample										

- g. Ink markers of different colors.
- h. Shoebox or similar-sized container.
- i. Scissors.

5. Procedure:

- a. Develop with the students a questionnaire designed to sample attitudes about urbanization, or use the one suggested above in 4e.

- b. Have this typed on a ditto master and duplicated in sufficient numbers to be distributed to as many classes in your school as you will have time to sample.
- c. Have each student write his or her name on a strip of paper such as would be suitable for a name-drawing.
- d. Place the strips in the shoebox and by randomly drawing out names, divide the class into groups of three.
- e. Obtain permission from other teachers for students in your class to distribute the questionnaires to students in their classes.
- f. Have the students go in groups of three to the other classes in your school to explain the questionnaires, distribute them and collect them when complete. Ten minutes per class is sufficient.
- g. Be sure to keep all the classes' questionnaires separate from those of other classes.
- h. After all completed questionnaires have been collected and returned to your room, have the students calculate each class' average (mean) and then the entire sample's response to each question.
- i. Post these on a table (such as shown under 4.f.) which the students have prepared on the sheet of poster paper for ease of reading, use a different color ink marker to post each class' average responses.
- j. After discussing the responses, place the poster where everyone in the school can see it, along with a blank sample questionnaire.

6. Discussion questions:

- a. On the basis of responses to questions 1 and 2, does it appear that the people you sampled desire more, fewer or the same number of children as are in their present families?
- b. Does the difference between the numbers given in response to 1 and 2 vary with the grade levels of the classes you sampled?
- c. How can you account for differences between the responses to 1 and 2?
- d. Do the respondents generally seem willing or unwilling to limit their family size to two children (the replacement level)?
- e. Does this willingness or unwillingness vary across class age levels? Why or why not?
- f. How do answers to 4 and 5 compare? Are the answers in conflict with each other?
- g. How is environmental quality affected by increased population and a general desire for a higher material standard of living (i.e., increased population)?

- h. In the light of your answer to "g", how do you view responses to questions 2, 3, and 10? Are the response in conflict or are they consistent with one another?
- i. Since everyone rich or poor must have food, shelter and maintain adequate health, which income level suffers the most from overall price increases of these commodities?
- j. In the light of your answer to "i", how do you interpret responses to questions 3 and 9?
- k. Are responses to questions 4 and 5 in conflict or are they consistent with each other?
- l. How did respondents tend to answer question 7? How can you account for such tendencies?
- m. Are responses to questions 4 and 5 generally consistent with or in conflict with responses to question 7? Why or why not?
- n. Is it possible for everyone who wants to, to "live in the country"? Why or why not?
- o. What is the effect upon areas surrounding an urban center, when some people become able to "move to the country" while working in the city?
- p. On the basis of the responses to the questionnaires what guesses can you make about the way environmental quality is changed when populations grow?
- q. How is environmental quality affected by widespread desires for increased material wealth?
- r. Are people's reasons for wanting to live outside the city in conflict or consistent with the effects which their desired lifestyle will have upon environmental quality?
- s. Is people's willingness to make personal sacrifices, as outlined in question 5, in conflict or consistent with their desires for a high-quality environment? Why or why not?
- t. How can you account for varying responses to question 6?

Senior High

John L. Adams

Trade-offs

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed: Three major ecological trade-offs are: 1.) between population growth and environmental quality, 2.) between levels of production and environmental quality, 3.) between the degree of urbanization and environmental quality.
3. Time: 1-2 class periods
4. Materials:
 - 1 chart, duplicated
 - encyclopedias or other source books.
5. Procedure:
 - a. On board list: 1.) Population Growth, 2.) Levels of Production, 3.) Degree of urbanization.
 - b. Draw attention to the fact that each of these areas has a rate: i.e. growth, level, and degree.
 - c. Suggest that each of these affects our environment, the effect depending not only on the rate, but also on the policies used in governing or controlling these areas.
 - d. Divide class into thirds - each third assigned to one of the three areas listed on the board.
 - e. Using encyclopedias, students are to look up the assigned area and read to find out the results of an increase in rate in each area.
 - f. Groups can select a reader and have others take turns recording answers. Suggest that as the recorders are listening, if they think of a result not mentioned, they may list it.
 - g. Pass out chart (rates and effects) 1 chart per group. Have each group fill in the area assigned to them.
 - h. Each group selects one or two spokesman (mon) to present its findings to the other two groups.

i. Someone compiles a master chart, filling in all three areas.

6. Discussion Questions:

- a. How is the concept of "more is better" a bad one?
- b. As society advanced, how did each area change in quality in relation to quantity?
- c. At what time in history, did these areas begin to snowball, or increase at a rate that was much greater than before.
- d. What evidence is there that things got out of hand? What? When?
- e. To prove that these areas are not isolated, briefly explain how each affects the other:

Population growth
Population growth
Level of Production

levels of production
degree of urbanization
degree of urbanization

7. References:

- a. The Hungry Planet, Georg Borgstrom, 1967.
- b. Circle of the World; Felanders, 1971.

1.) Population Growth	
little or none	great expansion
2.) Levels of Production	
little or none	great level
3.) Degree of Urbanization	
mostly rural	large cities.

Effect of these on Ecology

A Comparative Study of Sudsing Agents

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: Decisions not carefully thought through frequently have unwanted results.
3. Time: Pre Lab - 10 minutes
Lab - 30 minutes
Post Lab- Comparison of sudsing 24 hrs later. Discussion.
4. Materials. Three large test tubes, three rubber stoppers, handsoap, washing machine detergent, dishwashing liquid, balance, metric ruler, distilled H₂O, marking crayon.
5. Procedure:
 - a. Fill each of three test tubes with 25 ml. of distilled water.
 - b. Mark the test tube H, W, and D for handsoap, washing machine detergent, and dishwashing liquid.
 - c. Fill test tube H with 5 grams of handsoap, fill test tube W with 5 grams of washing machine detergent, and test tube D with 5 grams of dishwashing liquid.
 - d. Stopper each test tube and shake it for one minute.
 - e. Measure the height of suds in each test tube.
 - 1) tube H _____ mm.
 - 2) tube W _____ mm.
 - 3) tube D _____ mm.
 - f. Twenty-four hours later measure the height of the suds in each test tube.
 - 1) tube H _____ mm.
 - 2) tube W _____ mm.
 - 3) tube D _____ mm.
6. Discussion Questions:
 - a. Why did we measure suds height both after the activity and 24 hrs later?
 - b. Advertisers try to sell us detergents that "keep on sudsing". Is that necessary for washing hands? for washing clothes? for washing dishes?
 - c. Where does the water go that we pour down the drain in our area?
 - d. People on the lower Mississippi River complain that they get a "head of foam" on a glass of drinking water, What causes the "foam"?
 - e. Would you enjoy foam on your glass of water? If not, what could be done about it?
7. Resources: Local soil conservation district officer.

Shopping Center Analysis

1. Concept to be developed: Environmental Decisions.
2. Understanding to be developed: Decisions not carefully thought through frequently have unwanted results.
3. Time: 2 days - 1 week.
4. Materials: Introductory Remarks: Shopping centers are frequently built with a minimal amount of planning, responding to consumer pressures and needs, and often create needs in people that were not present before. Environmental considerations are all but forgotten in the planning for a shopping center, but surface as problems later on. We, as a class, will look at a constructed shopping center (or if possible, one in construction) to see what environmental considerations were accounted for in the planning, what problems have already surfaced, and the impact on the neighboring residents.
 - a. Field trip to local shopping center, as a class, or individually.
 - b. Student-designed questionnaire for neighboring residents.
 - c. Evaluation form for looking at shopping center.
 - d. Ditto for questionnaire and evaluation form.
 - e. Pens or pencils.
5. Procedure:
 - a. Identify a local shopping center.
 - b. Develop a questionnaire to give to neighboring residents of the shopping center, with questions such as:
 1. Did you live in this area before the shopping center was constructed? If so, what was the area like before the shopping center was built?
 2. What problems do you notice associated with the shopping center (noise, traffic, etc.)?
 3. What do you like about having a shopping center nearby?
 4. Is the shopping center aesthetically pleasing (interior, exterior)?

5. Do you feel crime in your neighborhood has changed with the construction of the neighborhood?
 6. Were you consulted in any way before the shopping center was built? If so, in what way, and by whom?
- c. The students should divide into two groups; one group will design the questionnaire and conduct the survey of the residents, and one group will develop the evaluation form and conduct the survey of the shopping center and adjacent areas.
- d. The evaluation form should include such information as:
1. Make an estimate of the total area of impervious surface (impervious being any surface water cannot seep through: buildings, parking lot) for the shopping center.
 2. Note the number and average sizes of any trees on the shopping center.
 3. How are the trees or shrubs planted; in boxes, in areas filled over with stones or wood chips, or in bed-type areas?
 4. Estimate the maximum parking area ever used at one time.
 5. Check for drainage, sewers, ditches, holding ponds, nearby stream. Where does all the water go that falls on the impervious surfaces of the parking lot, and buildings?
 6. Is the area aesthetically pleasing or not, and why?
 7. Note the roads leading to the shopping center. Were they there before the shopping center, or were they widened or constructed because of the shopping center?
 8. What kinds of stores are at the shopping center? Are there any small shops or unique stores or just large chain stores?
 9. Do you think people use the shopping center for convenience, lower prices, specialty shops, atmosphere?
 10. Is there evidence that the shopping center was constructed where a farm used to be, or a residential area, or an open field?
 11. Is there evidence that large trees were removed for the shopping center? If so, how could they have been integrated into the shopping center complex, rather than being removed?
- e. After both the questionnaires and the evaluation forms are completed, the results should be compiled and given to the whole class.

- f. Contacting a local planning official or a knowledgeable person (maybe from a local citizen group) about the shopping, and inviting them to speak to the class could provide valuable insight for the class.
 - g. The class should now make recommendations on how this shopping center could be better, and also ways of constructing such centers considering the environmental aspects of its construction.
 - h. A model shopping center could be constructed by the class.
6. Discussion questions:
- a. What functions do shopping centers play in your community?
 - b. Do they only meet existing consumer demands, such as: convenience variety of merchandise, lower prices, or do they create needs in people that didn't exist before, such as: driving to the store, doing all your shopping at once. etc?
 - c. Community shopping areas are present throughout history, market places, plazas, public congregating and socializing areas. Do shopping centers today offer any of the pleasant aspects of shopping areas in the past? Are they friendly places to congregate and meet and talk with people?
 - d. Would you go to a shopping center if you didn't intend to purchase something?
 - e. Are several small shopping centers better than one large one?
 - f. Do zoning practices change when a shopping center is built, such as changing the zoning from residential only to commercial or industrial zoning?
 - g. How does the presence of a shopping center affect the neighboring area? Do more businesses, or apartments, or gas stations come into the area?
 - h. What role does the construction of shopping center play on the decay of the central business district of the city, the downtown?

Pay More - Get Less

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: People most often affected by Environmental abuses may be least able to bring about affective action to correct them.
3. Time: 2-3 days (Note: advanced time to complete preliminary assignments)
4. Materials:
 - a. Map of the Metropolitan area for each student.
 - b. Film depicting primarily urban environmental problems such as DON'T CROWD ME (16 min.)
5. Procedures:
 - a. Several days in advance of the classwork, make the following assignment to each student:
 - (1) Get a map of the metropolitan area of Detroit and mark the location of four different industries or other enterprises that would be undesirable for you to live near, such as: a steel mill, auto plant, sewage treatment plant or any other you can think of. The phone book will aid you in finding them.
 - (2) For each industry or other enterprise you have located list all the disadvantages of living close to them as you can think of.
 - (3) For each industry or other enterprise you have located try to determine the type of housing near each. Classify housing as OLD (25 yrs and older) or NEW. Also indicate whether it is single, two family or multiple family dwelling. You can get your information by personal observation or by asking someone familiar with the area.
 - b. The day classwork on this understanding is to begin, show a film dealing with urban environmental problems such as: Don't Crowd Me. Have students add to their list of disadvantages of living near the industries they chose.
 - c. After the film, select several students to mark the location of the industries they have selected on a map placed in the front of the room.
 - d. Discuss the type of housing and disadvantages of living near each location.
6. Discussion questions:
 - a. Why do people live near industries or other enterprises which might affect the quality of their lives?
 - b. What economic segment of the population generally live in the locations identified?
 - c. What educational level is generally found in this group of people?

- d. Why are these people limited in the ways they can improve the quality of their lives?
- e. Are these people the ones most likely to share in the affluence our modern society has produced?
- f. In what ways do these people pay a greater cost for our way of life than others living farther away from these offending industries?
- g. What are some possible ways to quality of life in these areas can be improved?

7. References:

- a. Population Resources Environment. (Issues in Human Ecology) Erhlich and Erlich. p. 117-148.
- b. Self Review in Introduction to Environmental Science, Phillips W. Foster, p. 110-34.
- c. Man and His Technology - Problems and Issues. E. J. Piel, J. G. Turxal, p. 74, 79.

Community Problem Solving

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed. People most often affected by environmental abuses may be the least able to bring about effective action to correct them.
3. Time: 30 minutes.
4. Materials. Task cards with the following information should be made up ahead of time: (You may want to use local issues.)

Pick one of the following problems which occurs in communities;

- a. mosquito control problem
- b. where to locate a housing development
- c. locating a new freeway through an existing urban area
- d. locating land for a new recreation area near a city
- e. where to build a solid waste plant for a large city
- f. conflicting use controversy of local body of water (dumping mine wastes, recreation or wildlife?)

The following people are available to help with the community problem you have chosen. On paper, explain what each of them might be able to contribute to solving the problem the most beneficial way to the community:

artist	engineer	philosopher
economist	sociologist	agriculture expert
lawyer	doctor	recreation specialist
ecologist	chemist	city council person

5. Procedure:
 - a. Pass out task cards to groups of three students. Use local community problems if possible.
 - b. Groups follow directions on the cards. Have one person be the secretary.
 - c. Ask them to add 2 more people to the list and tell what their role would be.
 - d. Call groups together for general discussion during which someone from each group should explain what they did.

6. Discussion Questions:

- a. Did you find people on the list that did not play a role in the problem solving?
- b. Did some people listed play the same role in several problems different groups worked on?
- c. Who played a different role, depending on the problem the group picked?
- d. What part would you most like to play? Do you think you would enjoy doing it for a living?
- e. What about the ordinary citizen? He isn't listed. How do you feel about this - Should he be? Does he have anything to do with making decisions or is it all in the hands of the experts? Explain.

Senior High

Glen Erickson

Who Benefits, and Who Pays ?

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: Environmental decisions should seek to improve the lives of people from all socio-economic classes.
3. Time: 2 hours
4. Materials: Introductory remarks: Many decisions are made under pressure from lobbies (interest groups) representing select people, for instance: oil lobbies, industrial lobbies, and farm lobbies. Government expenditures often follow the interests of the most powerful lobby and directly benefit only that interest group, while being paid for by the general populace who receive minimal or no benefit from the expenditure. This activity is designed to help students evaluate decisions to see who benefits from them, and who ends up paying for them.
 - a. Large file cards
 - b. Blackboard and chalk
 - c. Paper and pencil
5. Procedure:
 - a. Make up information cards with the following pieces of information on them (one piece per card):
 - (1). SST(s) (Super Sonic Transports - airplanes) can fly much faster than present commercial airplanes. Passengers on an SST could fly from the United States to Europe three to four hours faster than on present airplanes.
 - (2). Building an SST in the U.S. would enable the U.S. to keep pace with other large countries (Russia, France, England) in future air transport. Other countries are already building SST(s) and will take over the market from the U.S. in rapid-air-transportation.
 - (3). Construction of SST(s) will provide thousands of jobs for people. The U.S. economy will benefit directly, especially when other countries begin buying our SST(s).
 - (4). The SST generates less pollutants per passenger mile than most other transportation alternatives.
 - (5). SST(s) cause sonic booms (when airplane travels faster than speed of sound) all along their routes.

- (6). Most experts feel that SST exhausts will disrupt the fragile layer of ozone gas surrounding the earth. Ozone prevents damaging ultra-violet light from reaching the Earth.
 - (7). Only a small number of people will benefit directly from SST construction:
 - (a). Only six states will benefit economically from SST construction. Forty-four states will lose money from SST construction.
 - (b). Only people in higher economic classes can afford to fly on an SST. Poorer groups of people will probably not be able to use them.
 - (8). The SST will use twice as much fuel as the larger capacity Jumbo Jets (like 747(s)) for the same distance flight.
 - (9). Building the SST-prototypes will cost nearly $1\frac{1}{2}$ billion dollars. These are just the test models.
 - (10). The newly constructed British SST, CONCORDE, is not selling. Presently, there is little or no market for the SST.
- b. Give one information card to each of 10 groups of students.
 - c. Have the class discuss what they have heard about the SST (Presently, the U.S. has stopped construction of an SST, mainly through the efforts of environmental groups). During the discussion, have the groups offer their piece of information when the discussion begins to focus on their piece of information.
 - d. After all 10 information cards have been presented, along with other opinions and pieces of information from the class, have the class list on the board the pros and cons of approving the construction of an SST for the U.S. to use and sell.
 - e. The class should now list alternative ways for the U.S. to spend $1\frac{1}{2}$ billion dollars to benefit more people than building an SST (such as, mass transit, housing, more recreational areas in cities, etc.).
 - f. Now have the class vote on the issue of building an SST, or using the money for something else.
 - g. Directly following this activity, or at some later date, research and discuss an issue directly relevant to your situation, considering who will benefit from the decision, and who will pay for the decision.

6. Discussion Questions:

- a. Who do you feel least, most benefits from construction of an SST?
- b. If an SST were built today, do you feel you would ever be in a position to use one? If so, how long do you think it would be before you did use one?
- c. Who do you think was pushing the strongest for an SST? Who opposed it most strongly?
- d. Is it important for the U.S. to compete with other large countries all the time?
- e. Should the U.S. try to have the fastest, most luxurious, mode of air transportation simply to be able to say we have such an aircraft?
- f. Realizing that 40 percent of the people who live in large cities (New York, Detroit, Chicago) don't have access to an automobile, how could the U.S. government more justly spend tax monies on something like an SST?
- g. Which people have the least power in influencing major decisions (like the SST) and who have the most power? Compare these with who you felt benefit least and most from major decisions.
- h. What kinds of employment can you think of in which the workers never or rarely use or benefit (other than their job pay) the product they make?

Senior High

Debbie Springer

Equality of Recreational Facilities

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: Environmental decisions should seek to improve the lives of people from all socio-economic classes.
3. Time: 2 days - day 1 - introduction and group decision
day 2 - class discussion.
4. Materials: Chart of possible state alternatives for each student. Students should be given the information that 70% of the population of Michigan lives in the South Eastern section.
5. Procedure:

a. Students should be presented with the following information:

- 1) The State of Michigan is holding a public hearing to determine how funds from a recently passed State bonding issue for acquiring outdoor recreation land is to be allotted.
- 2) The bonding issue provides 100 million dollars.
- 3) The present state alternatives are as follows:

	Land in and around South East Michigan	Land in Northern Lower Michigan	Land in the Upper Peninsula
1)	34%	32%	34%
2)	10%	30%	60%
3)	30%	60%	10%
4)	60%	10%	30%

- b. Your school has been asked to send a representative to the public hearing.
- c. Students must reach a decision on the stated alternatives for allotment of recreation land.
- d. Students spend class time of day 1 in group decision making.
- e. The class will reach a joint decision through discussion on day 2.

6. Discussion Questions:

- a. Do you feel that other alternatives should be considered?
- b. Does your decision improve the lives of people from all socio-economic classes?
- c. Do all socio-economic classes have access to the proposed recreation facilities?
- d. Does your decision take into account differing property values throughout the State of Michigan?
- e. What recreation facilities would be most appropriate for each area?
- f. What facilities are most needed in each of the three areas?
- g. What age group would most benefit from your proposed recreation facilities?
- h. Does your decision take into account future population growth?
- i. What effect will the development of a recreation facility have on the surrounding community?
- j. Will your decision affect the ecological balance of the proposed areas?
- k. Should State recreation funds be used to acquire land within city limits?

Senior High

Jeannine Bosma
Sally Sharp

Snowmobile Use Study

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: Some people and organizations have more power to influence decisions than others.
3. Time: 2 days - Day 1 - Values clarification
Day 2 - Speakers pro and con (example: pro - Michigan Snowmobilers Association member or dealer; con - Sierra Club, or M.U.C.C., or farmers)
Additional time for research
4. Materials: a. Pencil and paper
b. Continuum Sheet:

Value Related Questions: Snowmobiling	
1. All snowmobiles should be banned from forested areas to preserve wildlife.	SA A N D SD
2. It is possible to use snowmobiles without infringing on the rights of others.	SA A N D SD
3. Snowmobile regulations should be placed in the hands of the people who use snowmobiles.	SA A N D SD
4. It is prestigious to own a snowmobile.	SA A N D SD
5. More snowmobile trails should be built on state lands.	SA A N D SD
6. Much revenue is brought into the state because of snowmobiling.	SA A N D SD

5. Procedure:
 - a. Class as a whole defines the issue of whether or not snowmobiles should be restricted or unrestricted in use.
 - b. Using the continuum sheet, have students individually record their own feeling about snowmobile use.
 - c. Take each question and discuss opposing views and possible alternatives and implications of their choices.
 - d. Formulate questions, using the arguments discussed above to ask the speakers tomorrow.
 - e. Students do own research and gather material to make decisions.
 - f. Student makes his own choice after hearing different arguments presented by the two speakers.
6. Discussion Questions:
 - a. Is it necessary to have restrictions of any type on recreational vehicles? Why?
 - b. Could you use the same arguments about trail-bikes as you did with snowmobiles?
 - c. Why should everyone be familiar with the regulations we now have concernin' snowmobiles? Should we add or subtract any laws?
 - d. Keeping in mind the arguments you have heard, pro and con, which group has influenced our legislature the most?

Senior High

Ann P. Sibole

Transportation Policies - Riding with Reason

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed: Some people and organizations have more power to influence decisions than others.
3. Time: class period
4. Materials: Introductory remarks: Although advanced technology continues to respond to changing transportation needs, the problem of moving people is essentially a social, not an engineering issue. When making transportation policy we must balance personal needs, particular group interests, and the needs of the community as a whole. In class, we will attempt to simulate a Congressional hearing on the Highway Trust Fund. The issue is whether or not to make highway funds available for the construction of new mass transit systems and for the improvement of existing rail and mass transit facilities.

Questions for discussion should be put on the board:

- a. What different means of transportation are available?
- b. Who uses the various means and why? Consider characteristics of the population such as age, income level, and type and location of employment.
- c. What are the characteristics the user looks for in choosing a particular mode of transportation? Does the user always have a choice?
- d. How does the size, density and location of the population alter a region's transportation needs - especially in terms of cost, comfort, convenience, efficiency and reliability?
- e. What is the impact of each transportation mode on the community, considering questions of noise, air pollution, land use, energy requirements, safety, and service benefits?

Position Statements: These should be on 5 X 7 index cards.

- a. Congressman A: from Washington state - wife is a staunch leader of the Sierra Club.
- b. Congressman B: from Oklahoma - former Standard Oil executive.

- c. **Congressman C:** from New York - co-owner of largest construction company in the northeast, specializing in low cost housing construction.
- d. **City Planner:** Construction of additional roads to accommodate community growth has only contributed to urban sprawl and has not reduced congestion. In the past, funds have been used not for widening streets, but for lengthening them, which only increases the geographic area covered and the number of people using the roads. Since roads can't accommodate unlimited numbers of autos, we should use these funds to develop alternative transportation systems that relieve highway congestion and promote more rational suburban development. Ours is not the only community that is grappling with problems aggravated by changing population distribution and density. But right now, we should be spending available funds on a mass transportation system that eventually will limit and shape future residential and industrial development.
- e. **Lobbyist for the Highway Trust Fund:** The Fund should be used for highway maintenance and construction only. After all, the people using the roads are paying for their use through taxes on trucks, buses, gasoline, tires, and many other goods related to cars. All this talk of limiting future highway construction and use of cars is fine, but what about transportation requirements of the less developed rural areas? The enormous cost of building and maintaining rural roads to improve access to these isolated areas cannot be underestimated.
- f. **Environmentalist:** The social cost of car use in terms of both noise and air pollution is sufficient reason for redirecting this money toward developing alternative modes of transportation and for improving existing systems in order to move more people more efficiently. The entire community is now obliged to pay for the privileges of those who can afford auto travel. In many cities, about 40% are without car transportation. Rail transit is potentially faster, less expensive, and far less damaging to the environment. In fact, six times less energy is required to move a ton of freight by train than by truck. Despite a severe oil and gas shortage, car ownership and use continue to climb.
- g. **Housing Developer:** Suburban development has occurred for no other reason than that people want the benefits of living in a less densely settled neighborhood. They've moved to get away from crowding, to find more open space, cleaner air, less noise, etc. If mass transit is extended to the suburbs, an undesirable, but certain

result will be high-density development along the transit routes. Also consider that highways provide the greatest route flexibility of all existing systems of transportation. Why should we put more money into rail systems when ridership is declining? Even modern subways offer no guarantee of luring people away from their cars. Public transit systems lock us into predetermined routes that may not follow the distribution and flow of people 15 to 25 years from now.

- h. Citizens' Committee: Citizen A: Daily commuting from the suburbs to the city by car is an increasing hassle not only in terms of time, but because the parking shortage is more and more severe - just think of the cost of all the policemen needed to control parking violations! But what alternatives do commuters have? Bus and train service is far from adequate. Actually it is not hard to see why so little has been done to develop balanced regional mass transportation systems if you consider the lopsided allocation of transportation funds from government sources; 5% for rails and 3% for mass transit.

Citizen B: As a city-to-suburb commuter, dependent on existing public transit, I have to change buses three times in a one and one-half hour trip to reach the suburban industrial plant where I work. Owning a car would ease this trip, but the costs involved are simply too great. And moving to the suburbs is no solution; who can afford it these days? Frankly, I see a number of social injustices in the present transportation system in this country. Of families with incomes below \$3,000 in 1970, 58% had no car. Of heads of households aged 65 and over, 45% had no car. Without a better and cheaper mass transit system, how are these people to gain access to opportunities available in the mainstream of society?

1. Representative of a Motor Company: The economic effects of reducing dependence on the auto would be disastrous to the health of the economy. Just think of the many businesses and services that are related to the auto industry. At a time when the unemployment level is about 8%, we cannot afford to alter a consumption pattern in a way that would result in robbing more people of already scarce jobs. In addition it takes from 8 to 15 years lead time for planning and constructing a mass transit system. In a decade technological advances could make existing plans completely outdated. The automobile industry is sensitive to the changing needs and requirements of our growing, dispersing population and we are spending millions of dollars annually on research to make cars safer and less polluting!!

5. Procedure:

- a. Introductory remarks or equivalent on how environmental decisions should be made.
- b. Ask for volunteers, or pick 10 students who will speak out in the hearing at some point - 3 congressmen
7 spokesmen in the hearing
- c. Give each of them a 5 X 7 index card with their position and/or speech.
- d. Arrange the classroom in a different manner for the hearing. Explain to the remainder of the class that they will be other non-speaking members of Congress.
- e. Allow 10 minutes for the actors to get into their role and r. over the card.
- f. Each speaker will make a statement.
- g. Congressmen A - C will state how they feel about the issue, after hearing all the statements, in response to the teacher interviewing them. Be sure you ask about their "special interest"?
- h. Class discussion should follow - use questions on the board to bring the discussion local.

6. Discussion Questions: (in addition to board questions)

- a. What is the purpose of a congressional hearing? Is it to make a decision at that time?
- b. What is the purpose of a local public hearing?
- c. Have any been held lately in Toledo? Have you attended one?
- d. Do you think government officials make use of the information brought out in a public hearing? Do they have to by law?
- e. What kinds of pressures might cause the public officials to ignore public opinion in a decision?
- f. Does this make you feel helpless, or is there some way of having a stronger effect on decision makers?
- g. Who do you think ought to make environmental decisions? Government? Industry? Consumers?

Who should make the decisions on these issues:

- 1) the kind of transportation to be funded.
- 2) how large a family should be.
- 3) what kind of fuel we should use in the future for electric power source.
- 4) how safe is nuclear power for the American public.

7. References:

- a. Interchange (newsletter). Vol. 2; No. 2. Population Reference bureau, Inc.

Investigating Pesticide Problems

1. Concept to be developed: Environmental Ethics
2. Understanding to be developed: Only when each of us lives a life guided by respect for the earth and all living things, now and in the future, will we be able to live in harmony with each other and our environment.
3. Time: Several days.
4. Materials needed:
 - a. Cameras.
 - b. Cassette tape recorders.
 - c. Poster board and paint.
 - d. Filmstrip series: Using Natural Resources; Popular Science Audio Visuals, Inc., Times Mirror, 5235 Ravenswood Ave., Chicago, Ill.
 - e. Chart paper and magic markers.
5. Recommended procedure:
 - a. Visit two or three garden supply outlets to determine what pesticides are available for sale. Have students record on tape and pictures the available pesticides.
 - b. Discuss and determine the amounts of most commonly used spray and dust compounds sold from these outlets within a given growing season.
 - c. Have students gather information on the reasons why these particular pesticides are purchased.
 - d. Have students obtain data on the possible lethal side effects these pesticides have on plant and animal life.
 - e. Have students obtain information on the possible available alternative solutions to replace the toxic compounds in use. Have them find out the cost of such alternatives.

- f. Contact those individuals responsible for promoting and enforcing legislation regarding the use of pesticides; ask if someone could come out and talk to your class about this legislation.
 - g. Develop a plan of action to disseminate information on the use of alternatives to the use of persistent pesticides; have students put on an environmental ad campaign in the school by displaying creative and informative posters around the building.
 1. Have students present a slide show to school's P.T.A. on the data collected on pesticide use in the community.
6. Discussion questions:
- a. Who is primarily responsible for the development of legislation on the use of pesticides?
 - b. Who is primarily responsible for the enforcement of legislation on the use of pesticides?
 - c. What is the cost of using alternative forms of pest controls other than toxic compounds?
 - d. What and how many different kinds of pesticides are available for sale?

Housing and Social Justice

1. Concept to be developed: Environmental Ethics.
2. Understanding to be developed: An essential part of our environmental ethic is a human ethic based on social justice for all individuals and groups.
3. Time: Several days.
4. Materials needed:
 - a. Slide projector.
 - b. Cassette tape recorder.
 - c. Cameras.
 - d. Newspapers & magazines.
 - e. Poster board.
 - f. Chart paper and magic markers.
5. Recommended procedure:
 - a. Have the students in the class do a survey on the number of students there are in the building and find out the average number of students each teacher has during a period.
 - b. After the data has been gathered break up the students in teams of 5 and have them evaluate the information to see if there is any over crowding in classrooms in the building by the standards the class develops.
(e.g. 38 students per teacher constitutes overcrowding.)
 - c. Discuss the possible reasons for the overcrowded conditions, ask them whether its fair to the students to be cramped in an atmosphere that isn't good for their educational growth.
 - d. Ask students if the problem of inadequate and overcrowded conditions expanded beyond the walls of the school. During this activity record each of the groups responses on chart paper and hang them around the room. Ask them to explain the reasons for the over crowding and inadequate housing in the neighborhood.

- e. Take students for a walk through the neighborhood surrounding the school have the students:
1. Identify the population makeup of the community.
(e.g. all ---culture, multi-culture, or pockets, of mon-culture and multi-cultures, etc.)
 2. Have students identify the types of housing in the community.
(e.g. single dwellings, duplexes, apartments.)
 3. Have students note the number of people on the streets; look for signs of children.
(e.g. toys, bikes, etc.)
 4. Have students note the number of cars (moving, parked, or abandoned), found on the streets.
 5. Have students take pictures of the quality of the housing, yards and streets in the community.
 6. Have a group of students recording the sounds in the neighborhood.
- f. Before any evaluation of the data collected ask the students to write their interpretations of the whole experience. Allow an 1/2 hour for the completion of this assignment. Have each student discuss his/her views.
- g. Using the slides taken of the community assist a group of students put together a media presentation for the rest of the class discussing the housing and living environments in the neighborhood. Have students make charts and drawings of these conditions for display, also have a group of students list and draw some alternatives to the present housing issues.
- h. Have students prepare a list of major concerns created as a result of their investigations, have a person representing the housing authority and some community leaders visit the class to discuss and answer questions about the conditions of the neighborhood.
- i. Using the newspapers and magazines have students cut out ads that are specifically designed to sell or rent housing in the city. Have students create a large collage of these ads for display when giving their presentation to housing officials and parents.

6. Discussion Questions?

- a. What is justice? Equal housing? Racism? Poverty?
- b. Have you seen elements of social justice in the school? In the community?

Senior-High

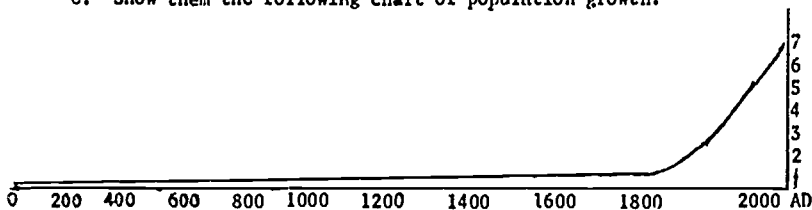
John L. Adams

What Went Wrong?

1. Concept to be developed: Environmental Ethics.
2. Understanding to be developed: An essential part of an environmental ethic is a human ethic based on social justice for all individuals and groups.
3. Time: 1 1/2-2 days
4. Materials:

- Copies of 1.) Statement on the change in environment
- 2.) Population growth chart.

5. Procedure:
 - a. Introduce the concept of an ethic, and apply results to the environment.
 - b. Supply students with the following statement: When man first came on the scene, the environment was "right" and supported him and his "lower" neighbors, something went wrong.
 - c. Have them list the things they feel "went wrong."
 - d. Then ask them to list the reasons why the wrong things were allowed to "go wrong."
 - e. Show them the following chart of population growth.



- f. Have them write down their general reactions to the chart.

6. Discussion Questions:

- a. Discussion of reactions to chart as well as written responses to the original statement.
- b. Around the year 1800 and following, what was responsible for the increase in the birth rate? (Suggest, if they do not, the "progress" resulting from the industrial revolution in technology, medicine, and industry.)
- c. What portion of the world's population is classified as starving or suffering from malnutrition? (2/3 is)
- d. Where do you suppose the most serious conditions exist?
- e. Do any of these conditions exist here in the United States?
- f. If so, then how can we afford to send our own resources both natural and monetary, to other nations?
- g. Going back to letter "b," talk about the industrial revolution, technology, medical improvements, etc. which occurred around 1800.
- h. What direct reversals came out of each area?
Suggest some of the following:
 1. Industrial Revolution: Unfair working standards, raping the land, pollution, increased technology, larger families more desirable. Modern warfare techniques.
 2. Medical improvements: decrease in death rate due to control of disease, moral questions of abortion - etc., to control the growth of population.
- i. In what ways has "progress" justified our mistreatment of the environment?
- j. How does money affect man's use of "progress"?
- k. Is there sense in "The rich get rich and the poor get poorer?"
- l. What proposals can you make that would ensure a more equitable distribution of the world's resources to all groups?

7. References:

- a. The Hungry Planet, Georg Borgstrom, 1967, Revised Edition.
- b. Environmental Ethics, Donald R. Scoby, Ed., 1971.
- c. Circle of the World, vol. 1, 1971, Flanders.

Section II

Senior High School Skill Developing Activities

101/102

SECTION II

Introduction to Skill Developing Activities

The development of problem solving skills is essential if students are going to actively participate in environmental problem solving as responsible citizens.

Eight skills have been identified as being essential to the environmental problem solving process and for each of the eight skills, skill developing activities have been designed for each of the following grade categories: early elementary (K-2); middle elementary (3-4); upper elementary (5-6); junior high; and senior high.

The eight problem solving skills are the ability to:

1. listen with comprehension;
2. recognize environmental problems;
3. define environmental problems;
4. collect information;
5. organize information;
6. analyze information;
7. generate alternative solutions; and
8. develop a plan of action.

After becoming acquainted with the following skill developing activities, you may want to develop some of your own, keeping in mind that they should be designed to be integrated into and coordinated with your existing curriculum rather than be used as units by themselves.

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Senior High

William B. Stapp
Talbert Spence

Listening Triads
(Agree, Disagree, Questions)

1. Skill areas to be developed:

- a. The ability to listen with comprehension.
- b. The ability to distinguish fact from fiction from statements discussed in Triads.

2. Time involved: 40 minutes.

3. Material needed: 8 Topic Cards.

a. Card #1

1.

Human population increases throughout the world are serious. Science and technology cannot provide means for survival without limiting population growth.

b. Card #2

2.

The burden of the price of eliminating pollution should fall on industry, rather than on the government, or the consumer.

c. Card #3

3.

Responsibility for the West's neglect of the environment is to be found in the Judeo-Christian tradition with its axiom that nature exists to serve man.

d. Card #4

4.

A goal of society should be equitable distribution of socio-economic costs and benefits.

e. Card #5

5.

America's population poses a greater threat to the world ecosystem than India's.

f. Card #6

6.

The labor movement and the ecology movement are facing a showdown.

g. Card #7

7.

Human values and behavior are not easily changed. An "order model perspective" holds more potential for changing human values than a "conflict model perspective."

I Thought I Saw a _____ ?

1. Skill area to be developed:
 - a. The ability to collect data accurately.
2. Time involved: 30 minutes
3. Materials needed: the following displays
 - a. One beaker of water (temperature approximately 98.6°F). The beaker should be large enough to submerge your hand in. In front of the display there should be written on a small piece of paper the question: What temperature is the water (cool, warm, etc.)?
 - b. One study lamp with a red bulb or filter pointed at a yellow object. Question on paper in front: What color is the object?
 - c. One study lamp with a blue bulb or filter pointed at a white object. Question: What color is the object?
 - d. A piece of paper with a quoted statement such as: "Atoms are blue." Question: What color are atoms?
 - e. See attached illustration marked E. Question: Which line(s) (is, are) longer?
 - f. See attached illustration marked F. Question: What is the picture?
 - g. A card bearing the following equation: $1 + 1 = 5$. Question: How much are one plus one?
 - h. A large double convex lens an inch or more in diameter. Question: While looking through the lens, what do you see differently?
 - i. A piece of unfinished wood and a piece of metal. Question: Which is cooler?
 - j. A tray of many small items, include four paper clips. Question to come later.
4. Recommended procedure:
 - a. Prepare three sets of the listed displays (for 30 students) and put each set of (a) through (j) in separate areas of the classroom.

- b. Divide the class into three groups of ten each. Put each student in front of a display, allowing ten seconds to answer the question and then rotating until each student has seen displays (a) through (j).
- c. Have the students return to their desks and write their answers for each question on the board. (When question (j) comes up, write on the board: How many paper clips were on the tray? and then take answers.

5. Discussion questions:

- a. Why do answers vary?
- b. What would help to collect data more accurately? (Notations in parentheses refer to the displays that most likely illustrate the point.)
 - 1. More time (j, 10 sec. time limit).
 - 2. Standard conditions (b, c).
 - 3. Standards of measurement
 - a. thermometer (a, i).
 - b. ruler (e)
 - 4. Supporting evidence (d, g).
 - 5. Viewpoint (h).
 - 6. Personal opinions (f).
 - 7. More specific questions.

Illustration E

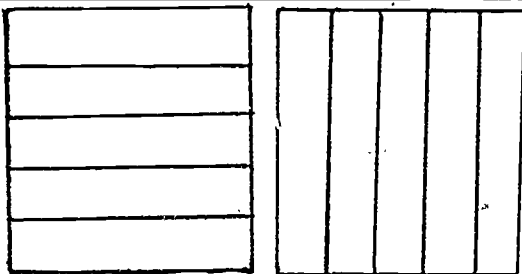
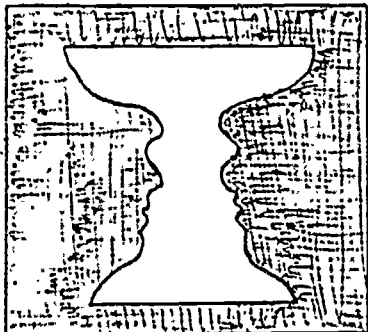


Illustration F



Star Trek Terrarium

1. Skill area to be developed:
 - a. The ability to collect data.
2. Time involved: 1 hour
3. Materials needed: Vegetation key, insect key, meter stick, tape measure, thermometer, string, specimen jars, compass, light meter (camera), watch paper.
4. Recommended procedure:
 - a. Introduce unit by stating objective
 1. Amount of data to be collected
 - (a) A minimum of 30 different facts
 - (b) The teacher or student may decide upon a different amount of data.
 2. Set up standards of measurement
 - (a) Use of Metric measurements, American measurements.
 - (b) Diameter of tree measured at shoulder height, etc.
 - b. Develop example
 1. Give the idea of precisely reproducing the area on another planet from the data obtained from given areas.
 2. Give a few problems which may arise
 - (a) Problem of counting all plants, and insects, estimating numbers.
 - (b) What each person will do in the group; let them decide.
 3. Allow questions and answers.

- c. Form groups of four to six students.
- d. Make all materials readily available to the students
 1. Students will not be told what materials to use, they will select their own.
 2. Students will also be encouraged to think of other materials they might want to use.
- e. Allow 30 minutes of data collecting.
- f. Collect group data sheets.
 1. Check data and hand back the next day.
 2. Discussion and questions
 - (a) Was more information needed?
 - (b) Did everybody collect data in each group?
 - (c) What was the most important data needed to meet the objective?
 - (d) How efficiently did each group collect its data?
 - (e) How might each group have functioned more effectively?

Population Trends

1. Skill area to be developed:
 - a. The ability to organize data.
2. Time involved: 30 minutes.
3. Material needed: Each student is asked to bring in the following information about his own family:
 - a. Number of children in his family including all first cousins.
 - b. Number of children in his mother's family.
 - c. Number of children in his father's family.
 - d. Number of children in his maternal grandfather's family.
 - e. Number of children in his paternal grandfather's family.
 - f. Number of children in his maternal grandmother's family.
 - g. Number of children in his paternal grandmother's family.
 - h. How many of these reached age 5?
 - i. How many of these reached age 18?
 - j. How many of these reached age 50?
 - k. Oldest living?
4. Recommended procedure:
 - a. Form the class into groups of four.
 - b. Have graph paper available but don't volunteer it.
 - c. Give the following directions:
 1. Pool information so that all statistics represent group totals for each category.
 2. Compile data so that a comparison of family size can be made, i.e., grandparents, parents, children.
 - d. Following compilation of data, ask some or all these questions:
 1. What is the trend in family size in the three generations?
 2. What could account for the sameness or differences in size?
 3. What comparison can be made regarding infant deaths in the last 50 years?

4. What is happening to the family unit?
5. Why were big families once necessary?
6. What economic factors are affected by lowering family size (possibly amount of mfgd. goods, schools, etc.).
7. How can the population size be increasing when the family size is decreasing?

5. Discussion questions:

- a. How did the group compile the data? (by graph or verbal)
- b. Did they organize data well enough to be able to use the information to answer the questions readily?
- c. Was there cooperation in putting the information together or did one person do the arithmetic?
- d. Were the answers apparent to the members or did one or two individuals have to interpret the results for the group?

Variation: ask for report to include the identification of the number of girls and boys in each family so that number of survivals and longevity can be compared by sex.

Western Uranium Mining Company

1. Skill areas to be developed:
 - a. Ability to organize data.
2. Time involved: one or preferably two hours.
3. Material needed: map of present community and outline map of area for development, fact sheet on present community.

Facts:

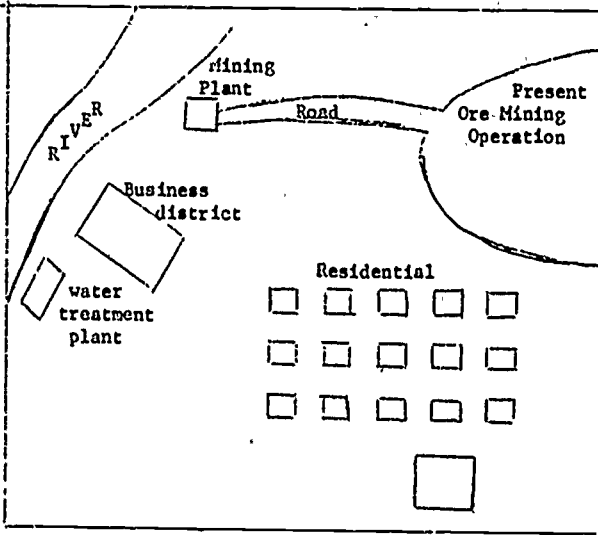
- a. Western Uranium Mining Company a small corporation has been bought by a group of environmentally concerned businessmen whose aim is to double the uranium extraction while providing the best possible community development.
 - b. Included on Company property is a town, population 3,000, all of whom are directly or indirectly involved in the mining operation.
 - c. Rich uranium deposits exist near the surface of the entire area; strip mining is the most efficient way of extracting the ore.
 - d. The company owns all the land; it leases land for employees homes, stores, etc.
 - e. The uranium extraction plant is situated near the river which supplies water for all purposes.
 - f. The plant generates acid waste as well as expended rock.
 - g. The new owners want to double the amount of land under mining operation.
 - h. You are part of a planning group responsible for a ten year planning of the growth of the entire community: the mining, business, residential, recreational, etc.
 - i. Your job is to plan for the increased needs for the population as well as proper environmental practices in the mining operation.
4. Recommended Procedure:
 - a. Divide class into groups of six.

- b. Give each group one map of the present community; several copies of an outline map with only the river on it; a fact sheet about the town and mining company.
- c. Ask each group to design a ten year plan for doubling community and mining growth.
- d. You might want to have a discussion on general considerations involved in planning.
- e. Give them one or two (preferably) hours to come up with a design.

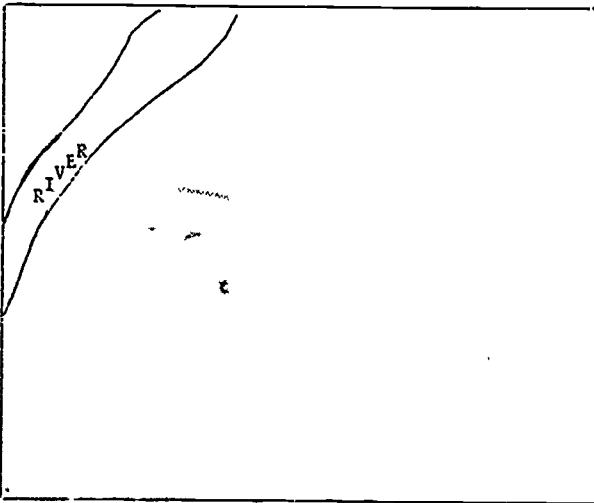
5. Discussion:

- a. Did the members cooperate in deciding how the town should be organized?
- b. Was there input from all members or did one or two make the decisions.
- c. Did their plans reflect good environmental principles: adequate water treatment, pollution prevention measures; proper land use planning, reclamation of land after mining, school and recreational facilities, etc.
- d. How did the final town plans differ from one group to another? Comparison of plans can be a lesson in values and alternatives.

Map of Present Town



Outline Map for use in Designing Future



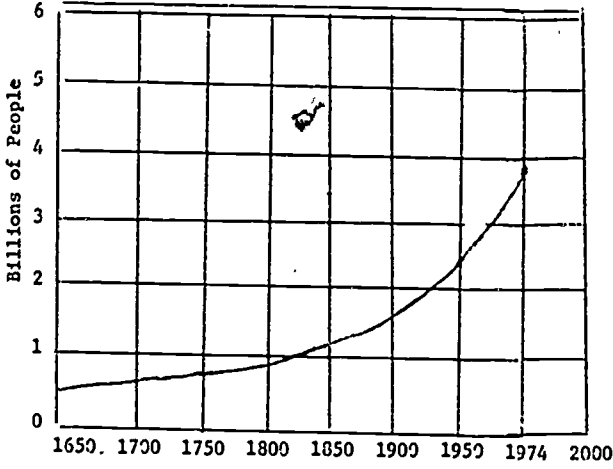
Population & Land Perspectives

1. Skill areas to be developed:
 - a. The ability to listen.
 - b. The ability to organize data.
 - c. The ability to analyze data.
 - d. The ability to draw conclusions.

2. Time involved: 40-50 minutes.

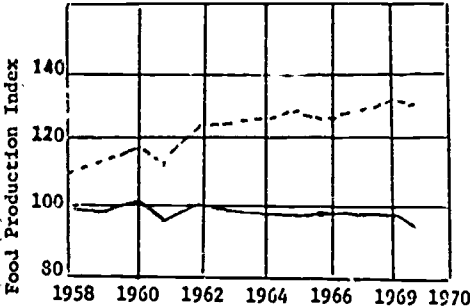
3. Material needed: 4 data charts.

a. World Population since 1650. Group 1

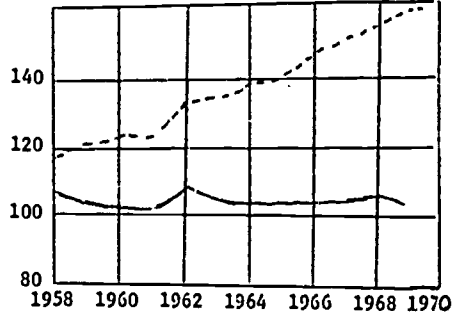


Food Production

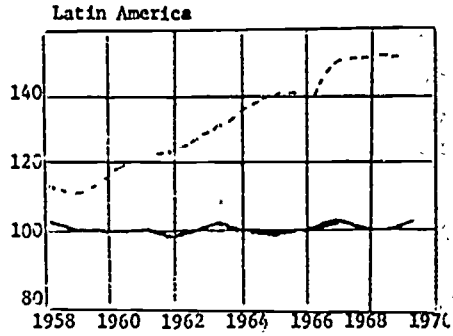
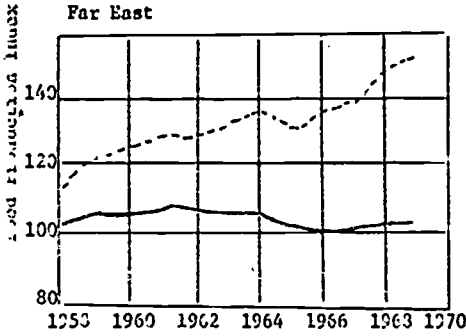
Africa



Near East



Food Production



CAN YOU ANALYZE THIS DATA?

It may be helpful to analyze the population graph first. You may want to complete the population curve from 1970 to 2000.

After analyzing your graphs you may want to list the implications of the various curves.

Total food production - - - - -
Per capita food production: _____

b. Land Area of the Earth

	Area in 100 km ²	Hectarea per person 1970	
Planet Earth	135,767	3.76	
Poor Countries	79,040	3.05	
Africa	30,313	8.61	CAN YOU ANALYZE THIS DATA
Asia (except Japan)	27,162	1.41	You may want to compare
Latin America	20,565	7.27	countries as well as groups of countries.
Rich Countries	57,727	5.49	Could the values of
Europe	4,929	1.06	this data be somewhat
Japan	307	9.36	misleading?
North America	21,515	9.52	km ² = square kilometers
Oceania	8,511	44.79	Hectare = 2.47 acres
USSR	22,402	9.26	

c. Population Estimates by Major Areas.

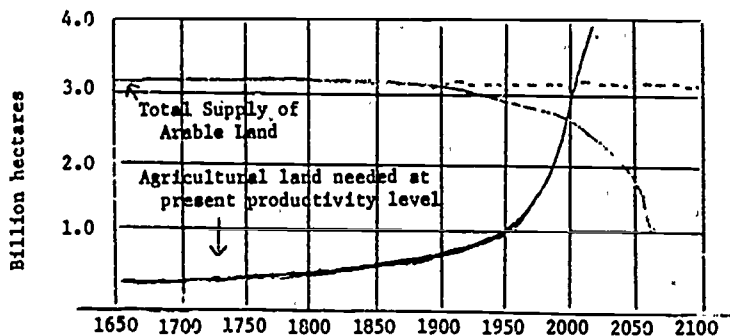
Area	1965	1970	1975	1980	1985
World Total	3209	3632	4022	4457	4933
More developed regions	1037	1090	1147	1210	1275
Less developed regions	2252	2541	2874	3247	3658
East Asia	852	930	1011	1095	1182
South Asia	981	1126	1296	1486	1693
Europe	445	462	479	497	515
USSR	231	243	256	271	287
North America	214	228	243	261	280
Latin America	246	283	327	377	435
Oceania	13	19	22	24	27

CAN YOU ANALYZE THIS DATA?

After analyzing your data you might want to list the implications of this type of growth curve.

d. Arable Land.

Group 4



CAN YOU ANALYZE THIS GRAPH?

Arable land is land which can be cultivated.

Hectare = 2.47 acres.

About 0.4 hectares per person of arable land are needed at present productivity.

Could the labeled values of this graph be somewhat misleading? After analyzing your graph you might want to list the implications of this land use curve.

4. Recommended procedure:

- a. Divide the class into four groups.
- b. Pass out one type of graph or table to each group. (each member of the group should have the same table or graph).
- c. Give the following directions for the exercise:
 - (1) Each group has a different graph or table relating to population land or food.
 - (2) Each group is to analyze their information and record their findings. For example: You may find trends or significant differences in various groups of data.
 - (3) One person in the group should record your ideas and findings.
 - (4) You will have approximately 10-15 minutes to analyze your data and generate ideas.

- d. The teacher should circulate among the groups. After allowing the groups sufficient time to generate their own ideas, the teacher may suggest one or more of the "idea stimulators", if necessary.
- e. After the individual group analysis, combine groups 1&2 and 3&4. Each half of the group should explain their data and findings to the other half of the group. Example: 1 explains to 2 and vice versa. Then the group should discuss the relationships of their information and record their findings.
- f. The teacher should allow 15 minutes or so for idea formulation.
- g. If there is still time available, the teacher may have a representative or two from each group present their findings. A class discussion could follow.
- h. Analysis of this data should bring forth these ideas:
 - (1) The earth ecosystem is an interacting and interdependent complex.
 - (2) Population is increasing at an exponential rate.
 - (3) Arable land is a finite resource.
 - (4) As population increases each year, we are losing more arable land to development.
 - (5) The poorest countries and sections of the world seem to have the largest populations and the least amount of land.
 - (6) Total food production in the non-industrial regions of the world has risen at about the same rate as the population. Thus food production per capita has remained nearly constant, at a low level.
 - (7) The problems of population growth, food production, and land use are extremely difficult and complex.

5. Discussion questions:

- a. What type of growth rate does the graph suggest? Linear? Exponential?
- b. Why is the curve sloped so sharply upward?
- c. What are the implications of an exponential growth curve?
- d. How is the population distributed?
- e. What are the implications of this type of population distribution? Is the population evenly distributed?
- f. How does human population growth relate to the rest of the earth ecosystem?
- g. Is land evenly distributed according to the population distribution?
- h. Is all of the land listed in the table available for human use? Explain. 17% Desert Regions, 12% Mt. Regions, 29% Ice Caps and Tundra.
- i. Will the total supply of arable land (3.2 billion hectares) always remain the same? Explain.
- j. What does the line "agricultural land needed" also represent?
- k. What are the implications of this kind of arable land use curve?
- l. Has food production remained constant?
- m. Has food production per capita remained fairly constant? Why?
- n. How does food production, population growth and distribution; and land use and distribution interact within the earth ecosystem?

6. References:

- Meadows, Donella H. & Dennis L. The Limits to Growth. Potomac Associates, Washington D.C., 1972.
- Hurdock, William W. Environment. Sinauer Associates, Inc., Stamford, Conn., 1971.

The Colonization of Aquarius
(person, age, sex, nationality, ethnic-class job-skills)

1. Skill areas to be developed.
 - a. The ability to listen carefully.
 - b. The ability to analyze data.
 - c. The ability to work with a group (decision making).
 - d. The ability to make group decisions.
2. Time involved: 40 minutes.
3. Recommended procedure:
 - a. Group students in team 5-6 members to work together on solving the colonizations of Aquarius.
 - b. Give each team member a copy of the endorsed handout.
 - c. Have each student take 10 minutes to make individual selections.
 - d. Read the following statement to the group:

Instructions:

This is an exercise in group decision-making. Your group is to employ the method of group consensus in reaching its decision. This means that the placement under level of intensity for each of the twelve grievances must be agreed upon by each group member before it becomes a part of the group decision. Consensus is difficult to reach. Therefore, not every ranking will meet with everyone's complete approval. Try, as a group, to make each ranking one with which all group members can at least partially agree. Here are some guides to use in reaching consensus:

1. Avoid arguing for your own individual judgements. Approach the task on the basis of logic.

2. Avoid changing your mind only in order to reach agreement and avoid conflict. Support only solutions with which you are able to agree somewhat, at least.
 3. Avoid "conflict-reducing" techniques such as majority vote, averaging, or trading, in reaching your decision.
 4. View differences of opinion as helpful rather than as a hindrance in decision-making.
- e. Have the groups take about 15 minutes to make a group ranking and decision as to whom will make the trip to Aquarius.
 - f. Have each group determine differences between individual and group ranking.
4. Materials needed:
- a. The Handout on "Colonization of Aquarius"
5. Discussion questions:
- a. Who took the leadership position in your group?
 - b. Were you a good listener?
 - c. Was there any statements or actions by group members that gave you the feeling that the group was being sexist?
 - d. How did your group arrive at their decision?
 - e. During the selection process was there any racism — consciously or unconsciously by group members?
 - f. Who had the most influence over your decision? The groups total decision?

THE COLONIZATION OF AQUARIUS

Aquarius is the name given to a small planet that orbits a Sol-type sun, just to the right and a little beyond Polaris, the North Star. Discovered in the year 2073 by the Caselton Expedition, Aquarius is reported to be a bit smaller than Earth. Like Earth, the planet's surface is mostly water, with two large land masses and three smaller ones, all of them large enough to be considered continents.

Aquarius has abundant plant and animal life on its surface and in its waters, but no traces of intelligent life have been discovered by the previous exploratory parties.

Because Aquarius is very much like Earth with good air and water and soil, it has frequently been considered for colonization. After much preparation, the colony is about to be established. The supplies have been gathered and are waiting on the ship. The only question is who will be the colonizers?

Directions:

1. Your group is the committee that will decide which persons will go to Aquarius. Below is a list of 15 short descriptions of persons who have applied and are considered suitable. But, because of space limitations not all will be able to go. (There appears to be room for only 10 persons, however, it is unknown exactly how many persons will be going.) The colonists will be supplied from Earth regularly, but there will be NO additional personnel added to the colony for at least 20 years.
2. It will be up to you to make the selections following the guidelines:
 - a. Each individual is to take about 10 minutes to make his own selections by ranking the persons 1 through 15 in the space provided. Number 1 is your first choice for colonization, etc.
 - b. After the individual rankings are finished, your group will meet for 15 minutes to make its final decision. The group is to rank each person in the spaces provided. **ALL MEMBERS OF THE GROUP MUST AGREE ON EACH RANKING.**
 - c. It is permissible to attempt to influence the rest of your group, but try to avoid arguing for your own rankings, look for alternatives, avoid changing your mind only in order to avoid conflict, avoid conflict reducing techniques such as majority vote or averaging.

THE COLONIZERS:	INDIVIDUAL GROUP RANKING RANK		DIF.
Dave Doleson, 36 yrs, auto and truck mechanic and amateur archeologist American, white.	---	---	---
.Laura Lee, 26, physical therapist, expert on coral formations. Chinese-American from Hawaii,	---	---	---
Charles Dubois, 41, architect and City planner, French,	---	---	---
Michael Rech, 34, Prize winning Journalist, author, TV newsman, Israeli.	---	---	---
Richard Lee, M.D. 48, general practitioner, American-Black.	---	---	---
Evelyn Ansell, 50, dietician and home economist, British.	---	---	---
Doris Eberly, 37, Electronic engineer, Australian.	---	---	---
Fred Davison, 41, carpenter and plumber, Danish.	---	---	---
Dr. Cynthia Phillips, 32, Micro-Biologist and ecologist, American.	---	---	---
William Jamison, 47, millionaire, president of a large corporation, sportsman, and big game hunter, American.	---	---	---
Henry Bortner, 36, dairyman and farmer, German.	---	---	---
Emily Payne, 27, High School English & history teacher, British.	---	---	---
Peter Michelson, 20, University student & amateur skin diver, Swedish.	---	---	---
Henry Banks, 50, surveyor-construction supervisor, British.	---	---	---
Marlene Richardson, 26, concert violinist and guitarist, American-Black.	---	---	---

Ten Questions

1. Skill to be developed:
 - a. The ability to generate alternative solutions.
 - b. The ability to recognize useful data.
 - c. The ability to analyze data.
 - d. The ability to draw conclusions.
2. Time involved: one class period.
3. Material needed. Ten Environmental Problem Cards.
 - a. Card #1
Decay of inner city housing
 - b. Card #2
Air pollution caused by automobiles.
 - c. Card #3
Pollution of water by farm runoff.
 - d. Card #4
Pollution of air caused by factory waste.
 - e. Card #5
Littering of landscape by debris thrown from cars.
 - f. Card #6
Accumulation of junk cars.
 - g. Card #7
Pollution of water from factory waste.
 - h. Card #8
Disposal of throw-away containers.
 - i. Card #9
Littering of yards and alleys by trash.

j. Card #10

Noise caused by large airliners.

4. Recommended procedure:

- a. Post the six solutions on the board.
 1. Pass a law to help solve the problem.
 2. Pass a local tax to pay for elimination of problem.
 3. Make each individual pay for and eliminate the problem himself.
 4. Receive federal assistance to solve the problem.
 5. Forget about it - it's not a serious problem anyway.
 6. Enforce present laws.
- b. Place each card in an overhead projector. Have each student read the card and choose the solution which they think is best. Give them one minute on each problem.
- c. After this is done, take each problem individually and compare and discuss the alternatives. Make a chart to indicate the percentage of each solution chosen for each problem.

5. Discussion questions:

- a. Is there only one solution to each problem?
- b. What factors must be considered when developing alternative solutions to a problem (i.e., social, economics, technological)?

Mass Transit

1. Skill areas to be developed:

- a. The ability to collect data.
- b. The ability to organize data.
- c. The ability to analyze data.
- d. The ability to generate alternative solutions.
- e. The ability to draw warranted conclusions.

2. Time involved: 40 minutes

3. Materials needed: Maps (samples attached)

4. Recommended procedure:

- a. Form groups of four or of any appropriate working size for your classroom.
- b. Pass out one set of maps to each group.
- c. Explain the exercise:
 1. Each group is to consider the feasibility of a land mass transport system for the country.
 2. Tell the students to study the maps.
 3. Have each group draw what they think is the best land mass transit system on a given blank map. They should consider:

Where should the terminals be and why?

Where should the routes go and why?

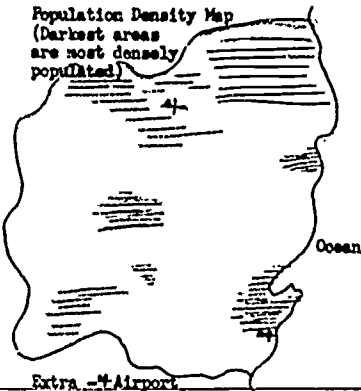
What problems will arise for each route?

What information is available concerning each possible route?
- d. After 20 minutes have a few groups report their chosen routes. Open a discussion to debate the routes among the groups.

5. Discussion questions:

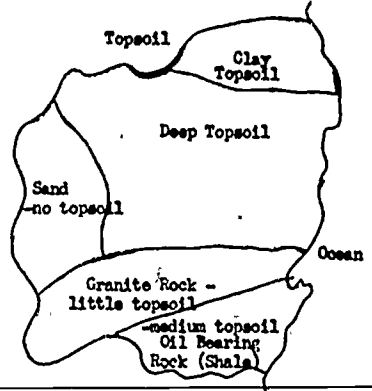
- a. What maps were of the most use and why?
- b. What maps were of the least use and why?
- c. How were decisions made?

Population Density Map
(Darkest areas
are most densely
populated)

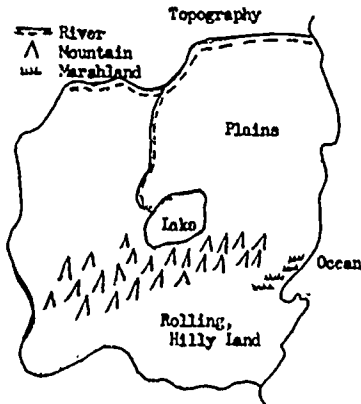


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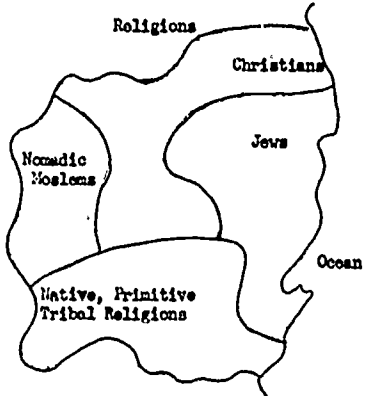
Topsoil
Clay
Topsoil



River
Mountain
Marshland



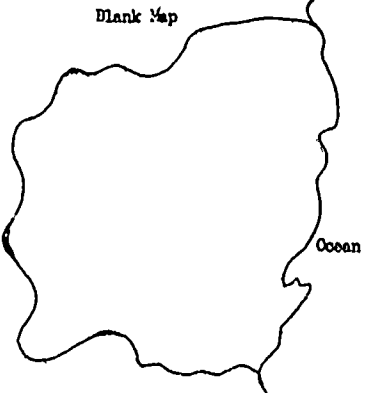
Religions



Vegetation



Blank Map



Exercise in Alternatives

1. Skill area to be developed:

- a. The ability to generate alternative solutions.

2. Time involved: 45 minutes

3. Material needed: Pen and one copy of "Exercises in Alternatives"

- a. Mrs. Biddle is an elderly widow who lives by herself. The city refuse department has decreed that the collectors will pick up only three garbage cans and that they must be carried to the curb. She has tried but can not possibly get all her garbage in three cans. She has appealed to the city that she is not strong enough to carry out the cans. Their reply was that that was her problem. Can you make several suggestions that might help Mrs. Biddle?
- b. You are lost in the Rocky Mountains and after two days you have run out of food. You have only a knife with you and a canteen of water. List three ways in which you could obtain food and water on which to survive.
- c. Smoking in the school restrooms has become a serious problem. Last semester two small fires were discovered in the lavatories believed to be caused by discarded cigarettes. The school board has issued an edict to put a stop to the smoking. A rule against smoking has been passed, but it still persists. Can you suggest three methods of overcoming this problem?
- d. Farmer Jones lived on an island seven miles out in Lake Michigan. The electric cable leading to his island that supplied power to run his appliances and lights was severed and could not be repaired for three months because of the ice. He tried using gasoline powered generators to supply his electrical needs but found it too expensive. Can you list two possibilities which Farmer Jones could turn to in his time of need?
- e. In the year 1980, all of the low areas in and around your community that can possibly be used for landfill have been completely filled. The use of incinerators was examined to take care of the refuse, but was found to be too expensive and also a detriment to the quality of the air. What would you suggest as an alternate means of disposing of all the debris and garbage produced by the more than half a million people who live in this metropolitan area?

4. Recommended procedure:

- a. Pass out one copy of the problems to be solved.
- b. Each person is to work alone.

- c. Give the students 30 minutes to develop alternatives.
- d. Suggest that they try to come up with practical and workable solutions.
- e. Compare and discuss the alternatives after 30 minutes.

5. Discussion Questions:

- a. How did you approach the topics? Go around the circle giving each participant a designated amount of time. Brainstorm the alternatives.
- b. Did all members participate in the activity?
- c. Were members of the group that had experienced the situation more helpful to the group?

The Disappearance of the Tigris-Euphrates Civilizations

1. Skill areas to be developed:
 - a. The ability to listen with comprehension.
 - b. The ability to recognize a problem.
 - c. The ability to organize data.
 - d. The ability to analyze data.
 - e. The ability to draw warranted conclusions.
2. Time involved: 20 minutes.
3. Materials needed: Six information cards

Card 1.

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Opening statement-- The Tigris-Euphrates valley was once a land suggestive of the Garden of Eden, a rich, productive land whose people lived well, built flourishing cities, established governments, and developed the arts.

Lands formerly occupied by Semitic peoples are now mostly desert.

The famous hanging gardens of Babylon were probably terraced slopes.

The Mesopotamians gradually died out or became nomads. .

(Some of the information provided may be irrelevant.)

Card 2

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Gradually the fertility of the valley deteriorated because of forest cutting, erosion, quick runoff and overgrazing.

It takes 300-1000 years for one inch of topsoil to be created by nature.

Agricultural land was in a state of high use.

The Cradle of Civilization became a desert.

(Some of the information provided may be irrelevant.)

Card 3

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The valley inhabitants introduced a complex and extensive system of irrigation works about 2000-1700 B.C.

Hammurabi's Code required a 2 shekel fine and restoration if an irrigation ditch was allowed to fall into disrepair death on the second offence.

Terraces require much labor to maintain in a state of fertility and to minimize erosion.

It was a mistake to build terraces because a break on the upper levels is magnified on the lower levels.

(Some of the information provided may be irrelevant.)

Card 4

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The Babylonian economy was basically agricultural.

Irrigation improved the production of the valley.

For several centuries after 1525 B.C. civil war was constant and the armies destroyed, plundered and deforested the region.

Babylon fell to invaders with superior weapons.

(Some of the information provided may be irrelevant.)

Card 5

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The Sumerians and Babylonians developed an advanced agriculture.

Hammurabi's Code had an extensive section devoted to irrigation and agriculture.

Armies blocked water supplies to urban areas.

Grains, vegetables and fruits were raised plentifully in this fertile region.

(Some of the information provided may be irrelevant.)

Card 6

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Sumerians apparently took better care of their land than the Semitic Babylonians.

Enemies such as the Mittites (1600 B.C.) and Kossites (c. 1525 B.C.) wrecked and blocked the vital irrigation canals.

Deforested hilly land was preserved, as early as 2000-1700 B.C. by a system of terraces (similar to contour plowing), replenishment by organic materials and control of water to all levels.

Wars and invasions took a toll of the labor supply.

(Some of the information provided may be irrelevant.)

4. Recommended procedure:

- a. Form the class into groups of six.
- b. Pass out the cards to each group (one to each student).
- c. Give the following directions for the exercise.
 1. Participants may not show their cards to anyone.
 2. Participants may read the information on the card to anyone in their group.
 3. Some of the information may be irrelevant.
 4. The holder of card one begins the exercise with the "opening statement".

5. Discussion questions:

- a. How might the Tigris-Euphrates valley have been a lush, fertile area yet today?
- b. Could the fate of America be the fate of the Tigris-Euphrates valley?
- c. Were there any non-natural causes involved in the destruction of the valley?

Sources: Our Plundered Planet, Fairfield Osborn, Little, Brown & Co., Boston, 1948
Story of Mankind, Toledo History text.

Senior High

William B. Stapp
Talbert Spence

A Micro-urban Investigation

1. Skill areas to be developed:
 - a. The ability to recognize and define a community environmental problem.
 - b. The ability to listen carefully and accurately.
 - c. The ability to collect and organize data.
 - d. The ability to analyze compiled data.
 - e. The ability to develop a plan of action.
2. Time involved: Two hours or as much time needed to do an accurate study.
3. Materials needed:
 - a. Camera
 - b. Cassette tape recorders
 - c. Chart paper and magic markers.
 - d. City directory listing all social services and their facilities.
4. Recommended procedures:
 - a. An inventory in the local community investigating available public facilities and services provided for the urban population.
 - b. Have student group into research teams investigating and listing relevant and essential public facilities and services in the area.
(e.g. Health Services; Senior Citizen groups; Recreation Centers, Welfare; Waste Disposal; police, fire, etc.)
 - c. Have students group the various facilities and services listed during brainstorming session into appropriate categories.
 - d. Delegate to each research team one of the categories created to do an investigation dealing with what actually goes on at the various facilities also what specific services are provided by these social agencies.

- e. Have students identify and hopefully interview some of the public who use the various public facilities and services being studied.
 - f. Have students collect data and prepare a 10 minute oral presentation about their findings, touching on the following points.
 1. What is the basic philosophy of these organizations?
 2. Are these facilities and services designed for one segment of the population/ or multiracial?
 3. What are the advantages and disadvantages to facilities and services of this nature?
 4. Who makes the administrative decisions for these facilities and services. (city government, private foundation, community chest, etc.).
 5. Suggestions for improvements in the present administrative structure and decision making of these facilities and services.
 6. Possible suggestions for new facilities and services that will meet the unmet needs of the urban communities.
5. Discussion questions:
- a. What reasons can you give for the locations of each of the community facilities and services listed?
 - b. What basic needs of people are being met by the existing community facilities and services?
 - c. What basic needs are not being met by existing community facilities and services?
 - d. What problems are associated with the quantity and quality of community facilities and services in this area?
 - e. Which of the problems are related to regional environmental problems?

- f. Which of the problems are related to just city environmental issues? To state, national, and international environmental problems?
- g. What was your initial feeling about your visit to the community agency? (warm-friendly, or cold detached?)
- h. Are there any advantages or disadvantages in doing a survey of this nature? (understanding the limited time and materials)
- i. What kind of interactions did you have with other members of your research teams? Was it easier to work together than alone on this project? Did you feel unimportant at any time during the course of the teams' investigation?

Senior High

William B. Stapp
Talbert Spence

Force Field Analysis

1. Skill areas to be developed:
 - a. The ability to recognize and define a problem.
 - b. The ability to recognize a central issue of a problem.
 - c. The ability to collect data.
 - d. The ability to analyze data.
 - e. The ability to develop alternatives.
 - f. The ability to evaluate alternatives.
 - g. The ability to develop a plan of action.
2. Time involved: 45-60 minutes.
3. Materials needed: Handout sheets on
"Force Field Analysis"
4. Recommended procedure:
 - a. Divide the class into groups of four or five.
 - b. Have students identify a problem and a goal on a force field analysis sheet.
 - c. Have groups identify the driving forces related to their goal.
(e.g. self, others and situation)
 - d. Have each group identify restraining forces, (self, others and situation) related to their goal.
 - e. Have groups determine possible actions that can be taken.
 - f. Have each group identify the resources that are available and have access to and in need of.
5. Discussion questions:
 - a. What are the possible advantages of using a strategy of this type in solving everyday problems? What disadvantages?
 - b. Who assumed the leadership role in your group? Did this cause you to participate more freely? Why? or why not?

- c. How did your group decide upon a topic for the problem during this activity? Was everyone in agreement with the selection and its major goal?
- d. Did you have a sense of security while being a member of your group? Why or why not?
- e. What were the major issues thrown around during the brainstorming period that your groups came up with?
- e. Were you able to communicate your thoughts clearly?
- f. Was there any difficulty in listening to other members of the group? Why?

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Force Field
ANALYSIS SHEET

Problem

Goal

Major Environmental Crisis:
High School students total
disregard for the conservation
of the urban environment

to develop and help urban high
school students acquire a basic
understanding of the biophysical
environment of urban environments
in order to save the urban ecology.

Driving Forces

Restraining Forces

My dedication to the preserva-
tion of urban environments -- and the
instructing of young and old alike in
the understandings and importance of
maintaining the urban ecology.

Self

Societies -- acceptance of the
throwaway-philosophy -- societies
close-minded view to change.

Others

Community leaders who share the
same basic understandings, that
in order for the quality of life
and environment of urban poor
people to improve they must take
part in the revitalizing and
change of the urban communities.

Many individuals in the urban
communities don't want to become
included because they feel it's
not their duty to take part in
the uplift of the urban poor.

Situation

Urban environmentalist working
in a major urban community

lack of financial aid to
implement education programs.

Possible Actions

Form student coalitions to start defining and
correcting the behavior of most young people
about urban environments and the wealth they
obtain. - Massive re-education efforts by public schools.-

Have Access To:
Model City Booklets

Resources

Needed:
Community Planning Booklets.
Additional Names of Community
Leaders.

Section III

Values Clarification Activities

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SECTION III

VALUES CLARIFICATION ACTIVITIES

Children and youth of today are confronted by many more choices than in previous generations and will soon be required to make many more environmental decisions affecting their community, nation and world.

The complexity of our times and of environmental decisions has made the act of choosing exceedingly difficult. Ideally, choices are made on the basis of one's underlying values; however, frequently persons (especially young people) are not clear about their own values.

The Values Clarification Process is concerned with trying to help students to become more aware of their own beliefs, attitudes and values; to consider and weigh the pros and cons and consequences of various alternatives; to consider whether their actions match their stated beliefs and if not, how to bring the two into closer harmony; and finally, to try to give students options, in and out of class, for it is only when students begin to make their own choices and evaluate the actual consequences, do they develop their own set of values.

The following are sample Values Clarification strategies that teachers have found helpful in assisting students to clarify their values regarding environmental issues. Though some strategies are recommended as being more appropriate for particular age groups, feel free to change and adapt them for your own uses.

As you become more familiar and comfortable with using the Values Clarification process, you will find that it can easily be included into any kind of teaching unit.

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Name Card

1. Time involved: five - ten minutes.
2. Materials needed:
 - a. 3 x 5 notecards, one per person.
 - b. Pen or pencil.
3. Recommended procedure:
 - a. Have participants write their name in center of the card.
 - b. Have participants write in the four corners the following information:
 1. Upper left - list 3 things you really value.
 2. Lower left - list 3 figures (alive or dead) that you really admire.
 3. Upper right - list 3 things that you would like to be remembered for after you die.
 4. Lower right - what do you feel are the 3 most serious environmental problems.
 - c. Have participants break into groups of 3 and discuss one corner of their cards.
 - d. After 2 or 3 minutes, rotate people to other groups, have them then discuss another corner of their cards.
4. Debriefing:
 - a. Name Card is a mixer-type activity, used to get participants acquainted.
 - b. Helps participants publicly affirm their values.
5. References:

Simon, Sidney, Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

Voting Questions

1. Time involved: 10-30 minutes.
2. Materials needed: none
3. Recommended procedure:
 - a. The teacher reads aloud each question by asking "Are you someone who...?"
 - b. After each question is read the students take a position by a show of hands:
 1. Those who strongly agree raise the hand high.
 2. Those who agree raise their hand slightly.
 3. Those who disagree lower their hand slightly.
 4. Those who strongly disagree lower the hand fully.
 - c. Discussion can follow either each question or after several questions.
 - d. This activity can also be written down on a worksheet.
4. Sample valuing questions: Examples for Lower and Middle Elementary grades. Are you someone who:
 - a. Would like to live on a farm?*
 - b. Likes to go on long car trips?*
 - c. Would like to live in a different city someday?*
 - d. Thinks you will smoke cigarettes someday?*
 - e. Has a private place to go when you want to be alone?*
 - f. Would like to plant something and watch it grow?

Examples for Upper Elementary - Junior High grades. Are you someone who:

- g. Could live happily without electricity?
- h. Could enjoy living in a rural setting?
- i. Would go to school if you didn't have to?*
- j. Would like to change something about this school?*
- k. Would like to live in another country?*
- l. Would ask your parents or someone else you care about to stop smoking?*
- m. Likes to walk or ride a bicycle to a place rather than be driven?
- n. Would like to ride a motorcycle?*

Examples for Secondary Grades. Are you someone who:

- o. Would buy only returnable bottles if both returnable and nonreturnable bottles were present in a store?
- p. Feels modern technology will enable man to continue to enjoy the present standards of living for many decades to come?
- q. Feels as long as we have to go through democratic processes to make changes, there is no chance of our moving fast enough to save the environment?
- r. Feels that the population problem has a powerful magnifying effect on all our environmental problems?
- s. Would prepare your glass, cans and paper for recycling if it were available?
- t. Thinks that we should have spent all that money to go to the moon?*
- u. Would like to own a snowmobile?
- v. Uses a spray deodorant?

5. Debriefing:

- a. Voting questions call for public affirmation of one's values.
- b. Discussion is very important. You can discuss male and female differences.
- c. Example debriefing for spray deodorant issue: The first spray deodorant came out about 12 years ago. Now 90% of the population uses spray deodorant. How could we change school or the race issue as quickly?
- d. Just ask each question and go on unless students want to discuss.

6. References:

Simon, Sidney, Leland Howe and Howard Kirschenbaum, Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., Inc., 1972.

* Procedure 3b and Sample valuing questions a,b,c,d,e,i,j,k,l,n and t have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Physical Continuum

1. Time involved: 10 - 20 minutes.
2. Materials needed.
 - a. Two blackboards or large pieces of paper.
 - b. Can also be done with two projectors and appropriate slides.
3. Recommended Procedures:
 - a. Place blackboards on opposite sides of room.
 - b. Clear area between blackboards.
 - c. Write pairs of issues on boards.

Example City (on one board) - Country (on other board).
 - d. Explain to group the choices involved, noting that choices exist from one board to the other board.
 - e. Have participants place themselves along the imaginary line between the two boards which have opposite values listed on them.
 - f. It is best if you eliminate the possibility of someone standing half-way between boards, so participants must make a choice.
 - g. After people have aligned themselves, have them discuss amongst those adjacent to them, their reasons for placing themselves where they did along the physical continuum.
 - h. Have people readjust their position, with respect to those people nearest them, to more accurately associate their position on the continuum with their personal value.
 - i. Select individuals to relate to the group their reasons for their physical position on the continuum.
 - j. Go on to next pair of values and repeat procedure.
4. Sample valuing questions:
 - a. City - Country

Which place would you rather live in?
Which place would you rather work in?

b. Powerboat - sailboat

Which would you rather own? (both items identical in price.)

c. Snowmobile - cross country skiing.

Which would rather do?

d. Have group suggest other contrasting value statements.

5. Debriefing:

- a. Note the importance of people, physically and publicly affirming their values to better clarify them.
- b. Participants can physically see how their values relate to the values of other group members.
- c. No position is right or wrong.
- d. Sharing out reasons for individual positions among group members important in clarifying individual positions.
- e. Any two contrasting value statements can be used that apply to the group.

6. References.

Simon, Sidney, Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

Values Continuum

1. Time involved: 20 - 30 minutes
2. Materials needed: 5 chairs or desks
3. Recommended procedure:
 - a. Arrange 5 chairs or desks in a row, leaving several feet in between each so as to form 4 separate areas along a line.
 - b. Explain to the class that you are going to read several value-related statements for which they are to respond by walking to the area which represents their position on the statements.
 - 1) The spaces should symbolize, left to right, strongly agree, agree, disagree, strongly disagree.
 - 2) Of course, any student may pass, and not respond.
 - c. After each question, have a few students share out their reasons for the particular positions.
 - d. Continue this same procedure for other statements.
 - e. Let the class or yourself suggest other value statements.
4. Sample valuing questions:
 - a. More emphasis should be given to problems of environmental nature which are caused by the individual citizen instead of problems which are caused by industrialists.
 - b. The concept of cycles is encountered frequently in ecology. Yet, modern society is ignoring this basic law in its uses of natural resources.
 - c. It is primarily the responsibility of the government to control air pollution.
 - d. The environmental crisis cannot be solved in the context of our present political and economic system.
 - e. Any pollution act of a person is an infringement on the rights of another and should be so regarded in the courts.
 - f. Local organization is the key to effective environmental action, that is, battles on big national issues are ultimately based on grassroots supports.

- g. As long as we have to go through democratic processes to make changes, there is no chance of our moving fast enough to save the environment.
- h. There should be commuter taxes levied on persons who live in the suburbs and work in the central city, and the money used for the construction and improvement of public transit.
- i. Modern technology will enable man to continue to enjoy the present standards of living for many decades to come.
- j. The younger generation in America really does not want to change the basic way of life in this country.

5. Debriefing:

- a. If students tend to cluster together because of peer pressure, you can have the students answer the statements on paper.
- b. A wide spread of positions usually indicates a good continuum statement, which causes critical thinking.
- c. This activity is good for introducing a particular unit by making statements pertaining to that unit.

6. References

Simo., Sidney; Leland Howe and Howard Kirschenbaum. Value Clarification: A Handbook of Practical Strategies for Teacher's and Students. New York, Hart Publishing Co., 1972.

All Grade Levels

Glen Erickson

Twenty Questions

1. Time Involved: 15 minutes
2. Materials Needed:
 - a. pencil and paper
 - b. blackboard
3. Recommended Procedures:
 - a. Ask the students to write on a piece of paper the number 1-20.
 - b. Now have them list twenty things they enjoy to do.
 - c. Have students evaluate their list according to the code explained in Debriefing.
4. Sample Valuing Questions:
 - a. These can be "big" things in life, or "little" things.*
 - b. The students might want to think in terms of the seasons of the year.*
5. Debriefing:
 - a. Put the following code on the blackboard for the students to use in evaluating their 20 things.

\$ -- anything that costs over \$20 to do
S -- things you learned in school
P -- things that pollute or degrade the environment
N -- things you do in the natural environment
A -- things you do alone
Pa-- things you do or did with your parents
Sy-- things you didn't do five years ago
R -- things that involve risk
F -- things that you do with your friends
 - b. Several code items may be used for each of the twenty things.
 - c. The code provides a way to evaluate the types of things you like to do.

- d. The code also gives you an idea of the trends you are following in doing enjoyable things.
- e. It is a good idea to do this activity at different times in the year to show the students how they might have changed during the year.
- f. Declaring the things you enjoy doing provides you with a way of identifying and clarifying what you enjoy.

6. References:

Simon, Sidney; Leland Howe and Howard Kirschenbaum

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

*Sample Valuing Questions a and b in #4 have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

All Grade Levels

Glen Erickson

Rank Order

1. Time Involved: 10-20 minutes
2. Materials Needed:
 - a. pencil and paper
 - b. blackboard
3. Recommended Procedure:
 - a. Explain to class that you will be reading some questions to them, which they will rank order according to their own value perspective. Each question will consist of 3 or 4 alternative choices.
 - b. Read a question, and write the alternative responses on the board.
 - c. Have the students write down their rank orders (1 for first choice, 2 for second choice, etc.) for that question on a piece of paper.
 - d. After everyone has completed their rank ordering for the first question, allow several students to share out their rank orders and their reasons with the class.
 - e. Continue this same procedure for all the questions you wish to use.
4. Sample Valuing Questions:
 - a.* Which would you least like to be?
 1. Deaf
 2. Blind
 3. Paralyzed from waist down
 - b. Would you rather be a
 1. Flower
 2. Tree
 3. Boulder
 - c.* Where would you rather be on a Saturday afternoon?
 1. At the beach
 2. In the woods
 3. In a discount store

d.* Which is most important in a friendship?

1. Loyalty
2. Generosity
3. Honesty

e.* Where would you rather live?

1. On a farm
2. In the suburbs
3. In an inner city

f. Which is the least important to you?

1. A horse
2. A dog
3. A deer

g. How many children would you like to have?

1. 0
2. 1
3. 3

h.* What would it be hardest for you to be?

1. A prison guard
2. A welfare inspector
3. An assembly line worker

i. What is the most serious problem facing society today?

1. Education
2. Pollution
3. Racism

j. Rank the following environmental problems in order of their critical nature.

1. Energy
2. Air and water pollution
3. Housing

k.* Which pet would you rather have?

1. A cat
2. A dog
3. A parakeet
4. A turtle

l.* If you were President, which would you give the highest priority?

1. Space program

2. Poverty program
3. Defense program

m. Which method of transportation do you like the most?

1. Riding in a car
2. Riding a bicycle
3. Walking
4. Flying on an airplane

n.* Which do you like best?

1. Ice cream
2. Pudding
3. Jello

o.* Which would you like to do most?

1. Learn to skin dive
2. Learn to ride a horse
3. Learn to ride a mini-bike

p. Which do we need to train more of? Each group to be ranked separately.

Group I

Lawyers
Doctors
Teachers

Group II

Skilled Labor
Professional
Management

q. Which would you rather own?

1. A motorcycle
2. A backpack
3. A TV set

r. You are hiring for a sales position in a chain store. You have three applicants. Which one would you choose?

1. An exconvict
2. Unmarried pregnant female
3. A released mental patient

s. The largest industry (employer) in town is destroying the main river. What action?

1. Arson (violent protest)
2. Boycotting
3. Petitioning city hall

t. What is the most influential factor of social change?

1. Family
2. Peer group
3. Governmental laws

u. You witness a mugging. Which action would you take?

1. Direct assistance
2. Call police
3. Ignore

v. Have the class make up own rank orders.

5. Debriefing:

- a. Publicly affirming one's values helps in clarifying those values.
- b. No order is right or wrong
- c. Sharing out students' reasons for their rank orders helps other students clarify their own values by listening to other alternative rankings, along with the students' reasons.
- d. Helps students understand that many issues require more careful consideration than we normally give them.
- e. Helps demonstrate that to make a decision about an issue requires one to make a choice.

6. Reference:

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

* The Sample Valuing Questions c,d,e,k,l,o,n and part of a and h have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

• Upper Elementary
Junior High
High School

Glen Erickson

Baker's Dozen

1. Time Involved: 10-15 minutes
2. Materials Needed:
 - a. pencil and paper
3. Recommended Procedures:
 - a. Have each student list 13 electrical appliances they use at home (lights, TV, radio, etc.).
 - b. After everyone has completed their list, have each student cross out 3 things he or she can do without.
 - c. Next have the students check 3 things they feel they couldn't do without.
 - d. Now, have each student circle the items which they obtained within the last 5 years (3 things which would not have been on their list 5 years ago).
 - e. Allow the students to share their lists and reasons with the class (you can pick several students or just ask for volunteers).
4. Sample Valuing Questions:
 - a. The class could list 13 records they own, identifying the 3 most important and the 3 least important records.
 - b. The class could list 13 items they have purchased or been given (bicycle, watch, new clothes, book, etc.) identifying the 3 items they would be most willing to give up, and the 3 items they would least like to give up.
5. Debriefing:
 - a. Identifying one's priorities is necessary when considering among various alternatives.
 - b. Many electrical appliances are luxury items, which are seldom used, and are not very important to one's life style. Perhaps these items might not be purchased if a person thought about whether the item was very important, or just another thing to buy.

- c. The U.S. has doubled its energy consumption in the last 20-25 years. With only 6% of the world's population, the U.S. consumes 37% of all the energy used in the world. A large portion of this increased energy consumption is due directly to the purchasing (it takes energy to produce an electrical appliance, as well as, energy to use it) and use of non-essential or luxury appliances.
- d. Identifying those items obtained within the past 5 years indicate personal trends in purchasing and consuming behaviors.
- e. Looking at the items crossed out as non-essential, the students can begin to think how easy it is to stop using those items once they have identified them.

6. Reference:

Simon, Sidney; Leland Hove and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

Junior High
High School

Glen Erickson

Brand Names

1. Time Involved:

- a. 20-30 minutes class time
- b. 20 minutes homework

2. Materials Needed:

- a. ditto
- b. pencil

3. Recommended Procedures:

- a. Prepare a ditto:
 - 1. Divide it lengthwise into 2 sections.
 - 2. Number 1-10 on left margin, and on the top of the left half write: All the Brand Names in Our Bathroom.
 - 3. Divide the right half into 3 columns:
 - (a) Column I, to be used to answer: Who brought the item or article in to the house?
 - (b) Column II, to be used to answer: What motivated you or another member of the house to purchase the item?
 - (c) Column III, to be used to answer: Was the item selected carefully from among alternatives?
- b. Have the students take the ditto home and record the brand names from the bathroom.
- c. The students should also fill in Columns I and II at home.
- d. After all the students have brought back their completed lists, they can complete Column III by answering its question after referring to the debriefing questions that you place on the board. Column III is for the items purchased or selected by the student.

4. Sample Valuing Questions:

none

5. Debriefing:

a. Why did you purchase the various brands?

1. You heard about it from a friend?
2. Did you choose the item of your own free will?
3. Did TV or radio influence your choice?
4. Do you truly believe in the article?
5. Was the article on sale?
6. Do you associate any prestige with the brand (over another)?
7. Did your parents use this brand?

b. Everyone is influenced in some way by advertising, so students shouldn't feel too bad if most of their Column III responses are negative. What is important is what they do once they realize their choices were not made freely by selecting from alternatives.

c. A fourth column could be added concerning Column III. The students can answer by using the code letters for each statement:

- K I'll keep it or keep buying it.
- E I'll eliminate it or stop buying it.
- C I'll change to another brand name.
- T I'll have to think more about whether I'll keep it, or eliminate it, or change to another brand name.*

6. Reference:

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

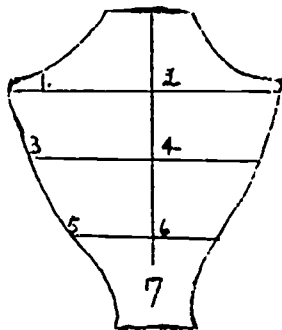
* The code description in 5c has been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Junior High
High School

Glen Erickson

Coat of Arms

1. Time Involved:
 - a. one hour
2. Materials Needed:
 - a. pencil and paper, or ditto
 - b. blackboard
3. Recommended Procedures:
 - a. Either make a ditto or have students draw their own coat of arms like the following:



- b. The students are to answer the following questions by drawing a picture or design to illustrate their response for each question in the appropriate space.
 1. One value to which you are deeply committed (value from which you would never budge).
 2. How would your life be different if you won \$1 million in a lottery?
 3. Your greatest sacrifice for the environment in the last year.
 4. Your material possession of most value.
 5. Your greatest success symbol.
 6. Something you are striving to obtain (material, personality trait, abstract).
 7. One thing you are thankful for.

- c. The students can then share their coat of arms with others (if they wish to), or could be displayed. Art work is not important, as long as the student can recognize his own symbol.

4. Sample Valuing Questions:

- a. Draw 3 things you are good at.
- b. What one thing would you want to accomplish by the time you are 65?
- c. What would you do if you had one year to live, and were guaranteed success in whatever you attempted?
- d. What do you admire most in others?

5. Debriefing:

- a. This activity is an enjoyable way of helping students think about some important value questions, such as:
 - 1. What am I doing with my life?
 - 2. Am I just reacting to others, or am I in control of the direction of my life?
 - 3. Is my life making any difference?
- b. Illustrating values with symbols helps a student to clarify and think about his or her values.

6. Reference:

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

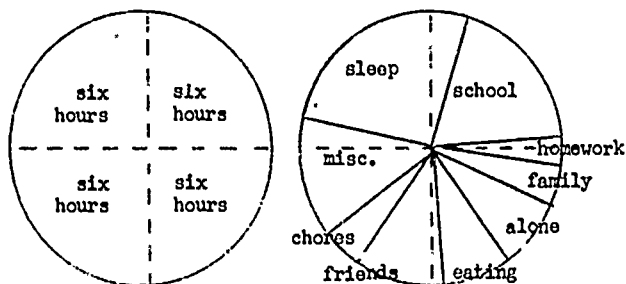
Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

* The Sample Valuing Questions in #4 a,b,c have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

The Pie of Life

1. Time involved: 45 - 50 minutes
2. Materials needed:
 - a. Blackboard or chart paper
 - b. Worksheets (for Upper Elementary, Junior High, Senior High) with drawing of a large circle to be used in diagraming a "pie of life" (see example in 3g).
3. Recommended procedure:
 - a. Explain to students that this activity is designed to have them investigate our individual lives - to see how we actually do spend our time, our money, etc.*
 - b. Group class into teams of 4-5 students. Explain that these teams are for the purpose of having individual and group decisions on how our time, money, etc. can be used more efficiently.
 - c. Ground rules: Teacher draws on blackboard/chartpaper or on worksheets a large circle and says, "This circle represents a part of your life".* Explain that the group will be doing several such pies of life.
 - d. Have students divide their circles into four quarters using dotted lines. Note: For lower elementary and middle elementary this portion of the activity should be done by the teacher at the blackboard.
 - e. Explain that each slice represents six hours. Discuss with groups that they are now going to try to estimate how many hours or parts of an hour are spent on the following:
 - (1). On sleep? *
 - (2). On school? *
 - (3). On eating?
 - (4). With friends, socializing, playing sports, etc.? *
 - (5). Alone, playing, reading, etc.? *
 - (6). On homework? *
 - (7). Etc. (Any others you can think of)?

- f. Have students divide up the time spent in their individual pies of life. Explain that their allotted times will differ from one another. Have them draw slices in their pies to represent proportionately the part of the day they spend on each category. An example might be:



- g. After students have completed individual pies (about 10-15 minutes) have the group work toward a group pie of life with the same categories. Have students take about 10 minutes to do this and then have groups share out their results to the rest of the teams.
- h. Discuss the importance of using time wisely and efficiently. Emphasize that a large majority of our time spent in a 24 hour period is wasted time; most by sleeping (a reasonable amount is needed) and by doing nothing.
- i. Have students develop a list of ways to use their time, money, etc. more wisely and efficiently.
- j. Examples of other categories that could be used in the Pie of Life strategy:
- (1). How does society spend its money?
 - (2). How much time is spent on cleaning up the environment?
 - (3). How much money is spent on cleaning up the environment?
 - (4). How much time is spent by people destroying the environment?
 - (5). How much time is given to students to plan and make decisions?
 - (6). How do urban children spend their time daily?

4. Debriefing:

- a. It is important that students start to evaluate how their time and money are spent by them and by others. Also to think about and develop ways of better utilization of their time and money, etc.
- b. Might be a way to discuss alternative life styles, also a way to clarify individual and societal values on time and money.
- c. For lower and middle elementary levels, this strategy could be a way of strengthening knowledge and skills of telling time and understanding what it is all about.

5. References:

- a. Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

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Either-or Forced Choice

1. Time involved: 45-50 minutes.
2. Materials needed:
 - a. Two blackboards or large pieces of paper.
 - b. Can also be done with two slide projectors and appropriate slides.
3. Recommended procedures:
 - a. Have students arrange their desks/chairs so that there is a wide path from one side of the room to the other.*
 - b. Place blackboards on opposite sides of the room.
 - c. Place an either-or question on the blackboards; and ask
Example: Which do you identify with more
 1. The Four Tops
 2. The Jackson Five
 - d. Explain to the students that they are to select one of alternatives and move to that side of the room where it is posted.
 - e. Have students form triads to explain briefly why they decided on this choice. Allow 2 minutes per student.
 - f. After the 2 minute triads session have students return to the center of the room and ask another either-or question.
 - g. Select a student from each opposing views and have them relate to the entire group why they made their particular choice.
 - h. This exercise has an unlimited range of alternative questions to ask.
4. Sample of Either-or Forced Choice Questions. "Which do you identify with more:"
 - a. Asphalt or grass
 - b. Clean air or dirty air
 - c. Noisy neighborhood or quiet neighborhood
 - d. A clean playground or a littered playground.
 - e. Love and understanding or hatred and distrust
 - f. New housing or old housing.
 - g. Equal rights or no rights
 - h. Trees or telephone poles
 - i. Expressways or bike routes
 - j. Urban community or suburban community
 - k. Strip mining or solar energy
 - l. Nuclear power plants or steam power plants
 - m. Urban farming or high prices
 - n. Cooperative living or independent living
 - o. Have group suggest other Either-or questions.
5. Debriefing
 - a. Note the importance of having individual differences and the fra-

- dom to evaluate all possible alternatives to an issue or situation.
- b. Participants can physically see how their values relate to the values of the group members.
 - c. No position or alternative is right or wrong.
 - d. Sharing out reasons for individual choice among group members is important in clarifying individual position.
 - e. Any two contrasting value statements can be used that apply to the group.

6. References:

Simon, Sidney; Leland Howe, and Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

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Public Interview

1. Time involved: 5-10 minutes per interview.
2. Materials needed: none.
3. Recommended procedure:
 - a. Ask for volunteers who would permit a public interview about some of their personal beliefs, feelings and actions.
 - b. Explain ground rules several times as to safeguard the students personal feelings.
 - (1) The teacher may ask any question about any aspect of his or her life and values.*
 - (2) If student decides to answer question, she or he must answer honestly.
 - (3) The student has the option to decline to answer question.
 - (4) The student can end the interview at any time by simply saying "Thank you for the interview".*
 - (5) At the completion of the interview the student may pose any of the same questions to the teacher that were put to him or her.
 - c. Each interview should be brief. About 5-10 minutes, unless there is a demand by everyone to continue.
 - d. You may want to invite other members of the class to answer any of the questions the interviewee was asked.
 - e. After some practice at public interviewing you may want the students to choose the topic they want to be interviewed about.
 - f. Instead of conducting the interview, you may want to select a student to conduct the interview. It is important to debrief student on ground rules before allowing any interviewing.
4. Sample interview questions: Lower and Middle Elementary grades.
 - a. Do you get an allowance? What kind? Do you work for it?*
 - b. If you could be any age, what age would you like to be?*
 - c. Will you be a cigarette smoker? Why?*
 - d. What about the world around do you wonder about?
 - e. Do you think people should be allowed to live anywhere they want to?
 - f. What are your feelings about people of other races and cultures?
 - g. Do you like living in the neighborhood you are presently living in? Why?
 - h. Would you want to live in an area where the air was unclean? Why or why not?
 - i. Do you like flowers and trees? Why?

Examples for Upper Elementary - Junior High grades.

 - a. What are your feelings about poverty?
 - b. Do you feel comfortable about living in the city?
 - c. What are the major problems facing young people today?

- d. What is your opinion on public welfare?
- e. Is there anything special about family meals at home?
- f. How do you feel about man's exploitation of our valuable natural resources?
- g. What are some of the reasons for environmental pollution in this country?

Examples for Senior High school.

- a. Should your school provide classes dealing with population education?
- b. What are your views about racism and sexism in your school? Home? Neighborhood?
- c. Do you feel that large energy corporations should be allowed to strip mine for coal on Indian lands? Why? Why not?
- d. Do you feel communities should have control of their tax monies which they contribute yearly to the state and federal governments?
- e. How important is it to the survival of space ship earth and its passengers to maintain a clean environment?
- f. Are there some adults outside of school whom you admire intensely? Why?
- g. What are your feelings about a world with universal peace?
- h. What has turned you off to school? Why?
- i. What are some ways students can contribute to their own education?

5. Debriefing

- a. Discussion is very important. You can compare and contrast male and female responses.
- b. Sharing out reasons for individual positions or values is a good way of developing good interpersonal relationships among group members.

6. References:

Simon, Sidney; Leland Howe, and Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

* The Recommended Procedure in 3b (1) and (4) and the Sample Interview Questions in 4a, b, c have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Agree-Disagree-Undecided

1. Time involved: one class period, 40 - 50 minutes.
2. Materials needed:
 - a. ditto
 - b. blackboard
3. Recommended procedures:
 - a. Prepare a ditto with the following suggested statements dealing with population. Put half the statements on each half of the ditto and cut out each "card" with 1 statement on each.
 - 1) Population education concepts should be integrated into all the grades and most of the courses taught in primary and secondary school.
 - 2) Human population increases throughout the world are serious. Even with a rate of four births for every two deaths, science and technology cannot provide means for survival (without limiting population growth).
 - 3) Overpopulation is the basic cause of the environmental crisis.
 - 4) America's population poses a greater threat to the world ecosystem than India's.
 - 5) Generally, families should be limited by law to no more than three children.
 - 6) People should be allowed to have as many children as they want without being told in any way by the government how many they should have.
 - 7) The government should provide tax and welfare benefits and penalties that would discourage childbearing rather than encourage it, as present systems tend to do.
 - 8) Due to the controversy connected with "sex" education, it would be self-defeating to link population education with sex education.
 - b. Divide the class into groups of 3, 4 or 5 and give each group a set of statement cards.
 - c. Have each group decide, as a group, whether their group agrees, disagrees or is undecided for each statement.

- d. Have each group sort their cards into stacks for agreeing, disagreeing, or being undecided.
 - e. After each group has decided on all the statements, tabulate on the board the number of groups agreeing, disagreeing, or being undecided on each statement. Allow about 20 minutes.
 - f. Discussion of the reasons for different groups' positions can then take place.
4. Sample value questions:
- a. Statements concerning a particular issue like housing, pollution costs, or environmental responsibility or ethic.
 - b. Any statements concerning a particular lesson activity the class is doing.
5. Debriefing:
- a. This activity is good to introduce a specific unit, as in the case, population. It helps the class become more sensitive to the unit before doing any encounter or activity.
 - b. Group decision-making is different from individual decision-making, because a consensus must be reached in a group, with people compromising their positions. All the group members benefit by listening to other member's feelings, and attitudes, which helps the individual re-evaluate his or her own position.

Upper Elementary
Junior High
Senior High

Talbert B. Spence

Ways to Live

1. Time involved: 2 sessions of 45 minutes each
2. Materials needed:
 - a. Blackboard or worksheets
 - b. Chart paper and markers
 - c. Pencils
3. Recommended procedure:
 - a. Explain to students that this activity will deal with the formulation of their own philosophy of life by responding to a variety of ways to live.
 - b. Generate a list of 10 - 13 different life style by asking students to describe a kind of life style they now live, have read about, heard about, seen, or possibly dreamed about. Be sure extreme views are represented.
 - c. Expand this list of life styles into philosophy statements by asking questions such as the following:
 - (1). In this life style, does the individual person have a say in how his town is run?
 - (2). Is money important in this life style? How important?
 - (3). Is education important?
 - (4). Do people care about other people?
 - d. List these life style description statements on the blackboard, on chart paper (or on a ditto for a second session). A sample statement might be (complexity depends on the age group):

Way 1: The individual actively participates in the political and social life of the community, to be a primary change agent in altering the present political system of his country. In this life, excessive monetary desires are avoided and moderation or a natural living is sought. Life is marked by physical and mental discipline, love, and friendship. Life is to have clarity, balance, intelligibility and respect for cultural differences.*

- e. Have students respond to the 10 - 13 Ways to Live statements by ranking each statement from first desire to least desire using the following key:

- 7 - I like it very much.
- 6 - I like it quite a lot.
- 5 - I like it slightly.
- 4 - I am indifferent to it.
- 3 - I dislike it slightly.
- 2 - I dislike it quite a lot.
- 1 - I dislike it very much.*

Be sure students understand that their ranking does not depend on what kind of life they lead now, or the kind of life they think is unnatural to live in our society, but simply the kind of life that they personally would like to live.

- f. After students have completed their ranking, about 10-15 minutes, have students team up with another student and discuss their individual rankings. Allow about 5 minutes for this discussion.
- g. Ask volunteers to give their individual rankings and record their responses on the chart paper.
- h. Group students into teams of 5-6 individuals. Instruct them that within a 15 minute period they must come up with a group decision on the ranking of the 10 - 13 ways to live. Have each group record their rankings on chart paper.
- i. Have students write out their own way of life statement. This should reflect their philosophy of life at this point in their lives.
- j. Finally, have students think and list ten things they have done in the last week that are consistent with their philosophy of life (e) or the way they live described in (i).*

5. Debriefing:

- a. Do you think there is any one life style that is right for all people?
- b. Are you satisfied with your life style?
- c. Did the group find it difficult or easy to agree on ranking?
- d. Did the group decide your way? or did you give in to the group?
- e. What did you learn about yourself?

- f. Add any other observations or questions about the dynamics going on during the group decision-making session.
- g. Discussion on alternative life styles is important because the student is exposed to other cultural and noncultural ways of living.

6. References:

- a. Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

* The Recommended Procedures #4d (a condensation of Way 1), e and j have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Panel

1. Time involved: 20 - 30 minutes
2. Materials needed:
 - a. Eight chairs
 - b. Blackboard
3. Recommended procedure:
 - a. Place 8 chairs in front of the class, facing the class.
 - b. Explain that 8 volunteers are needed to sit on a panel and decide where they stand individually on a series of issue questions and to defend their positions before the class.
 - c. After 8 volunteers have seated themselves, ask 4 students one question, and the other 4 another question.
 - d. After each panel member (4) has stated his or her position allow the class to question the panel member's position.
 - e. Continue the same procedure for both Agree-Disagree questions and for continuum questions.
4. Sample valuing questions:
 - a. The following are Agree (hand up) or Disagree (Hand down) questions:
 - 1) Do you enjoy a rural environment more than an urban environment?
 - 2) Do you feel you can make an impact on political decisions?
 - 3) Do you feel comfortable or unthreatened?
 - 4) Do you think a terminal patient should have the option of euthuasia (mercy killing).
 - 5) Laws banning non-returnable bottles should be declared unconstitutional?
 - b. The following questions are continuum questions answered by having each panel member state where his or her position is on a certain issue question. Place the following on the board:

Almost always	sometimes -- not usually	almost never
or	or	or
Strongly agree	agree neutral disagree	strongly disagree

 - 1) Do you wear seat belts (almost always, sometimes, etc.).
 - 2) Do you feel that additional monies earmarked for highway construction and improvement should be directed to mass transit?

- 3) Do you believe in legalized abortion?
- 4) How do you feel industrial abatement devices should be financed?
 - a) Government paying a large share (place on left of continuum).
 - b) Decrease dividend to stockholders (place in middle of continuum).
 - c) Increase price of the product (place on right of continuum).

(Second part of 4) One of the big 3 auto manufacturers recently announced record sales for 1972 (12% above 1971 and 2% over previous alltime high). This will result in stockholder receiving largest dividend ever - \$7.51 per share.

Does this have any effect on your previous answer?

- 5) Do you feel that the percentage of state recreation funds to rural areas should be reduced in order to provide more money for urban recreation?

5. Debriefing:

- a. Publicly affirming and defending one's position before peers helps clarify and strengthen one's values.
- b. This activity allows students who don't feel strongly in their own values to listen to other's values and to question them, providing the non-volunteers a way of sorting through their ideas and values.

6. References:

Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

Who's To Blame

1. Time Involved: 30 minutes
2. Materials Needed: Paper and pencil
3. Recommended Procedure:

- a. Read the following story to the class:

Frank was recently arrested trying to set fire to the new pharmaceutical plant in his town. He explained that he did it because the plant caused him to lose his job as a fisherman by polluting the local lake.

The factory produces an experimental cancer drug that has shown great promise in curing this disease. Unfortunately the chemical process produces mercury wastes. To date no way of removing these contaminants from the waste water the plant dumps in the lake has been found.

The local representative from the Department of Natural Resources would not allow Frank to sell his fish because in his opinion they contained dangerously high levels of mercury.

Frank went to his friends and asked them to sign a petition requesting that the plant be forced to stop pollution or cease operating. Because most of his friends had gotten jobs with the pharmaceutical plant however, they refused to sign for fear of losing their jobs even though they admitted this was probably the "right" thing to do.

Frank felt very much alone and frustrated. He had tried to work through the system and had been rejected. The only alternative he could see was to stop the factory on his own.

- b. Have students divide themselves in groups of 6-8.
 - c. Individual students should rank order the characters in the story from the person or some institution they feel is most to blame to the least to blame.
 - d. Have groups reach a consensus rank order.
 - e. Have groups share final rankings.
4. Debriefing:
 - a. How did your ranking compare with the group rankings?
 - b. Did the group discussion cause you to change your thinking or ranking?
 - c. Do you feel that any character is completely right or wrong?

Section IV

Senior High School Environmental Encounters

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SECTION IV

Environmental Encounters

This section contains a series of sample school-community environmental problem solving activities (Environmental Encounters). In these environmental encounters students (with guidance from the teachers) actively become involved in exploring and critically evaluating their environment and existing environmental problems. The students may then begin to develop alternatives and plans of action for solving environmental problems. As students become actively involved in environmental problem solving they gain the opportunity to acquire both knowledge and skills necessary to deal with current and future environmental problems.

Included are sample environmental encounters relating to all grade levels and disciplines starting with early elementary encounters, which concentrate mainly on developing a basic awareness and appreciation for the environment, and ending with senior high encounters, in which students may actually become involved in the political process in trying to implement the designed plans of environmental action.

You may find it helpful to adapt some of the sample encounters for use in your particular classes. However, you will probably find that the "best" environmental encounters are ones jointly developed with your students around their environmental interest and concerns.

Environmental encounters are included for each of the five grade levels. Within each level there are sample encounters for the following topics:

1. Ecology and Pesticides
2. Water Quality
3. Air Pollution

4. Recreation
5. Policy and Planning (soils, land use, planning, and environmental law)
6. School Site Development
7. Transportation

The encounters represent a wide diversity, so that some are applicable to inner city, and some to suburban and rural situations.

AIR POLLUTION IN YOUR COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify (number) sources of air pollution in the community.
2. Identify (number) resources at the local, state and national level, capable of providing factual and accurate information on air pollution.
3. Illustrate (number) ways local pollution sources contribute to air pollution.
4. Illustrate (number) types of pollutants found in the local air supply.
5. Illustrate (number) ways these pollutants affect the community.
6. Describe, in writing, what local industries and organizations are doing to control their air pollution.
7. Identify the power structure in the community as it relates to air pollution.
8. Determine the appropriate individuals or committees responsible for enforcing air pollution control in the community.
9. Identify the local laws governing the control of pollution.
10. Describe, in writing, what is being done to enforce the existing pollution control laws.
11. Describe, in writing, the future plans for improving the control of air pollution in the community.
12. Develop a plan of action for informing the local citizens concerning air pollution in the community.

ACTIVITIES:

1. Plan a field trip in your community to determine the sources of air pollution. Consider the following in your plans:
 - a. areas to visit
 - b. signs of pollution to look for
 - c. visible effects of pollution
 - d. others
2. Design a check list that will help you thoroughly investigate your community. Example:

2. (continued)

- a. SIGNS OF POLLUTION
 - smoke
 - odors
 - others
- b. SOURCES OF POLLUTION
 - industry
 - open burning
 - electric power plants
 - autos, trucks
 - others
- c. VISIBLE EFFECTS OF POLLUTION
 - discoloration
 - vegetation
 - building stone
 - building paint, esp. white
 - others
 - deterioration
 - building stone
 - statues
 - others
 - dying or dead vegetation
 - particulate matter in the air
- d. OTHERS

- 3. Use the check list on your field trip as a means of investigating pollution in your community.
- 4. On a map of your community, pin point the areas and sources of air pollution. (This map could be used as a part of a display on pollution in the community.)
- 5. Identify appropriate individuals and organizations at the local, state and national level that will be able to provide you with a variety of materials on air pollution. Example:
 - a. Doctors
 - b. Health Department
 - c. Lung Association
 - d. Others
- 6. Interview appropriate resource people at the local level to help you obtain accurate information concerning your own community.
Discuss:
 - a. Ways local sources of pollution contribute to air pollution.
 - b. Types of pollutants found in the local air supply.
 - c. Effects of these pollutants on the community.
- 7. Design "eye catching" posters that illustrate:
 - a. Ways local pollution sources contribute to air pollution.
 - b. Types of pollutants found in the local air supply.
 - c. Effects of these pollutants on the community.

8. Visit local industries and other organizations in the community who are polluting the air and find out what they are doing to control their pollution. (Make them aware this information will be shared with the community.)
9. Identify the power structure in your community and determine the appropriate individuals or committees responsible for enforcing air pollution control in the area.
10. Interview these individuals and committees to find out what is being done to control local air pollution. Inquire about:
 - a. What air pollution control laws exist
 - b. How these laws are being informed
 - c. What the fine is for breaking the laws
 - d. What future plans are being considered for controlling local air pollution
11. Using all the information you have obtained, design an air pollution display that will inform your community concerning:
 - a. Local sources of air pollution (Map)
 - b. How these sources contribute to air pollution (Posters)
 - c. Types of pollutants found in the local air supply (Posters)
 - d. Effects of these pollutants on the community (Posters)
 - e. Existing local air pollution control laws
 - f. What is being done to control local air pollution
by industries
by others
 - g. Future plans concerning local air pollution control
 - h. What individuals can do to help control air pollution
make a hand-out sheet of suggestions
12. Develop a plan of action for bringing this display to the communities' attention. Consider taking your display to:
 - a. PTO Meetings (individual schools)
 - b. Local community meetings
 - c. School Assemblies (individual schools)
 - d. Shopping centers
 - e. Others.

INVESTIGATING THE RELATIONSHIP OF AN URBAN COMMUNITY TO
CERTAIN BIRDS AND SMALL ANIMALS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter the student should be able to:

1. Identify (number) types of ecological communities within the study area.
2. Identify (number) species of birds and numerous small animals within each of the ecological communities mentioned in objective number one.
3. Describe the interrelationship of one of the animals (identified in Behavioral Objective number one) to his environment.
4. Describe how unbalanced environmental conditions can result in the extinction of certain animal species, and the over-production of others.
5. List (number) ways that man has upset predator-prey relationship within any or all of the ecological communities identified in behavioral objective number one.
6. List (number) ways that small animal life are directly and indirectly beneficial to the total urban community.
7. List (number) ways that urban problems can cause deterioration of small animal life.
8. Identify at least (number) ways that the ecological communities described in behavioral objective number one can be preserved.
9. Identify the land owners and managers and influential citizens of the local community regarding the preservation and maintenance of ecological communities in this local community.
10. Develop a plan of action for preserving and maintaining ecological communities in the local community.

ACTIVITIES:

1. Identify and classify plants found in one of three ecological study areas, i.e., grassland, shrubland, climax forest.
 - a. What seems to be the relationship of these plants to soil type and moisture content of the soil?
2. Prepare a field survey to determine the numbers and varieties of different insect, and lower animal species inhabiting the study areas. Are certain animals confined to certain ecological niches?

3. Prepare a field survey to determine the numbers and varieties of different bird species inhabiting the area. (Concentrate on non-migratory types.)
 - a. Do certain species of birds seem to be confined to certain ecological communities within the study area?
 - b. Are nesting habits directly or indirectly related to the ecological niche - the bird occupies?
4. Construct one food-chain for each ecological community cited in behavioral objective number one.
 - a. Are these food-chains overlapping from one ecological study area to another?
 - b. Have any of these food chain links been altered? If so prepare a chart showing where the links have been altered and how.
5. List (number) different ways that animals in each of the study areas protect themselves.
 - a. Do any depend on each other for protection?
 - b. What are some means of protection employed other than shelter?
 - c. Prepare a list of the ways urban development may have altered the scheme of protection for certain animals.
6. Prepare a list of animals which seem to be over-abundant.
 - a. What is the supply of food for this animal?
 - b. From observation, what does the conditions of the animal appear to be?
 - c. What is one natural enemy of the animal in question?
 - d. Is it found in good numbers in the study area? If not, why?
7. Make a chart showing (number) ways small animals directly and indirectly benefit the ecological community of study area and also the surrounding urban area.
 - a. Compare numbers of insects to numbers of other kinds of animals. What seems to be the relationship, if any?
 - b. Is soil fertility related to the presence or absence of certain animals?
 - c. Aesthetic awareness differs, but list what you think are the types of aesthetic values maintained by having small animal communities within the urban environment.

3. Identify certain environmental problems within the urban area.
 - a. Which one problem or problems seem predominant?
 - b. Do they effect all of the ecological study areas, or just specific ones?
 - c. Do certain animal species seem to be more effected than others?
 - d. What is the relationship between the effected animals and the rest of the ecological community?
9. Outline a plan for active preservation and improvement of ecological environments with the urban community.
 - a. Contact the proper authorities, i.e., city council, township supervisors, planning commissions, zoning commissions, private land owners.
 1. Make them aware of the ecosystems and their benefits.
 2. Clearly present by means of charts, drawings, slides, films, etc. the geographic areas in question.
 3. Outline your plan for preservation or improvement or both for the areas in question.
 - b. Contact civic groups and repeat the procedures outlined in (a.).
 - c. Contact the mass media so that the public can become aware of the action plan so that they may insure the success of the program.
10. Follow-up activities which can be carried out directly by classroom students and other young people.
 - a. Establish new habit areas for certain animal species, i.e., brush piles, artificial nesting areas, etc.
 - b. Cutting, thinning, separation, etc. to insure health of resident species and to encourage arrival of new species.
 - c. Introduction of new (imported) species to balance an area.
 - d. Installation of nature trails to facilitate observation and enjoyment.

FLOOD PLAIN ZONING

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Draw on a map of his community the flood plains (50 year flood line) of the (name) River from (location) to (location) and record accurately how each flood plain is developed.
2. Describe in writing the number of floods and flood damage that has occurred on the flood plains of the (name) River from (location) to (location) over the past 60 years (or over the time that records have been filed).
3. Describe in writing the major provisions in the laws of this state and community regarding flood plain zoning.
4. Identify the power structure (pressure groups, governmental committees, governmental policy makers) of his community regarding who influences and makes policy on flood plain development and zoning.

ACTIVITIES:

1. Take a tour (or illustrate by slides) along the (name) River from (location) to (location) and note the following:
 - a. Are there a series of flood plains?
 - b. How are the flood plains developed?
 - c. Approximately how much damage (dollars, lives, inconveniences) has occurred on the flood plains as a result of flooding over the past 60 years?
 - d. What does your state flood plain ordinance say? If none exists, is it considering an ordinance?
 - e. What does your community flood plain ordinance say? If none exists, is it considering such an ordinance?
 - f. How is the undeveloped land on the flood plain zoned?
3. Are there any current proposals to utilize the undeveloped flood plains of your river for recreational, residential, commercial, or industrial development?
- h. What proposals seem wise or unwise in light of the hazards you have identified?

2. Draw on a map of your community the flood plains (50 year flood line) of the (name) River from (location) to (location) and record how each flood plain is developed.
3. Determine by interviews the points of view of land developers, community citizens, realtors, chamber of commerce officials, planning commission members, city council members, and students of your class regarding the future development of the flood plains of the (name) River from (location) to (location).
4. Based on the information collected, have the class formulate alternative solutions to the development (or preservation) of the flood plains on the (name) River from (location) to (location).
5. Draw a chart of the power structure (pressure groups, governmental committees, governmental policy makers) of your community regarding who influences (underline the influencers) and makes policy (circle the policy makers) on flood plain development zoning.
6. If the solution advocated by the class members is different from the point of view held by the planning commission and policy makers of your community, then develop and implement a plan of action (presentation to the appropriate authority, develop a fact sheet, publicize your position, etc.).

RESOURCES:

(Data should be provided regarding sources of additional information relevant to this topic for your area).

INVESTIGATING TREES AND ORDINANCES IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

- At the completion of a successful encounter, the student should be able to.
1. Identify the need for a street-tree planting program in the community.
 2. Identify (number) sources for obtaining information concerning trees.
 3. Identify (number) resource people capable of giving professional assistance concerning street-tree planting.
 4. List (number) ways trees can benefit a community.
 5. Identify (number) ecological factors influencing the selection of street-trees.
 6. Identify (number) environmental factors influencing the selection of street-trees.
 7. List (number) types of trees recommended for street-tree planting.
 8. Create (number) illustrations depicting the effective use of street-trees in the community.
 9. Design an appropriate street-tree planting plan for the community.
 10. Identify existing laws and ordinances governing community beautification.
 11. Identify (number) ways a tree planting ordinance can benefit a community.
 12. Describe, in writing, the value of a tree planting committee.
 13. Identify (number) responsibilities of a tree planting committee.
 14. Identify (number) influential citizens in the community who are willing to help adopt a tree ordinance in the community.
 15. List (number) provisions that should be included in a tree planting ordinance.
 16. Describe, in writing, the procedure followed for adopting a tree ordinance in the community.
 17. Identify the governmental structure in the community as it relates to tree resources.
 18. Identify the appropriate committee responsible for approving ordinances in the community.

19. Describe in writing, the operation and responsibilities of the local planning commission.
20. Develop a plan of action for adopting a tree ordinance in the community.

ACTIVITIES:

1. Take a field trip in the community and survey the existing trees to determine the need for a street-tree planting program. Observe the following:
 - a. Healthy trees that should be preserved
 - b. Dead trees that should be removed
 - c. Diseased trees that need attention
 - d. Areas where new trees are needed
2. Make a street-tree map of your community and record the following information:
 - a.--Location of various site factor--
 - width of streets
 - width of planting strips
 - set back of buildings
 - location of utilities
 - b.--Location of survey facts--
 - healthy trees that should be preserved
 - dead trees that should be removed
 - diseased trees that need attention
 - areas where new trees are needed
3. Gather a variety of informational materials that will help you become informed concerning trees. Consider the following sources:
 - a. Audubon Society
 - b. Co-operative Extension Service
 - c. Department of Natural Resources
 - d. U.S. Department of Agriculture
 - e. Others
4. Identify professional resource people who are knowledgeable concerning trees. Consider:
 - a. Landscape plan
 - b. Soil Conservationist
 - c. County Extension Agent
 - d. Habitat Biologist
 - e. Others
5. See the help of these professionals and invite them to class to discuss the following topics concerning trees:
 - a. Value of trees in the community
Ex. shade, separation of cars and people, microclimate improvement, beauty, boundary, others.

5. (continued)

- b. Ecological factors influencing the selection of appropriate trees
Ex. soil conditions, climatic conditions, moisture, light, etc.
 - c. Environmental factors influencing the selection of appropriate trees
Ex. conflicts salt splash, pollution, limited space, heat, others.
 - d. Recommended trees for street-tree planting
Ex. Ginkgo, Amer. Hornbeam, Norway Maple, Pin Oak, etc.
3. Design sketches illustrating the effective use of street-trees in the community.
 7. Use these sketches to design an appropriate street-tree planting plan for your community. Consider:
 - a. Location
 - near a building
 - near utilities
 - in a planting strip
 - b. Suitability --
 - size
 - shape
 - growth pattern
 - root system
 - c. Variation of species
 - d. Environmental factors
 - e. Ecological factors
 - f. Width of street
 - g. Aesthetic value and others
 3. Identify any existing laws and ordinances governing community beautification.
 2. Evaluate your findings and determine how a tree planting ordinance might benefit your community. Consider:
 - a. Care and protection needed for existing trees
 - b. The tree planting plan you want to implement
 - c. Proper planting of new sub-divisions
 10. Organize a tree planting committee to serve as an action group for
 - a. Implementing your street-tree planting plan
 - b. Adopting a street-tree ordinance
 - c. Enforcing the ordinance
 11. Determine and carry out the responsibilities of the tree planting committee. Consider:
 - a. Seeking assistance from influential citizens
 - b. Circulating a petition as a means of gaining support for adopting a street-tree ordinance

11. (continued)

- c. Determine the provisions that should be included in a tree planting ordinance. Example:
 - care and protection of existing trees
 - insure new trees will be planted
 - insure sub-divisions will be properly planted
 - hiring of a trained individual as a tree warden
 - insure public hearings when important trees must be cut
 - set standards concerning (size, shape, variety, manner of planting, location, spacing, quality of stock used, care after planting, etc.)
 - observance of regulations (enforcement)
 - others (ex. economic)
12. Identify the power structure in the community and determine the appropriate committee responsible for approving ordinances in the community.
13. Attend a Planning Commission meeting to observe
 - a. Observe the operational structure of the commission
 - b. Determine the responsibilities of the commission
 - c. Determine the part they play in influencing the adaption or rejection of ordinances
14. Based on the knowledge you have gained, develop a plan of action for adopting a tree ordinance in the community that will include your plan for implementing a street-tree planting program.
15. Present your plan to the appropriate individuals and committees for approval.
16. Upon approval, work with the appropriate groups to carry out the plan of action.

INVESTIGATING A PARCEL OF LAND FOR RECREATIONAL USE

BEHAVIORAL OBJECTIVES:

At the end of a successful encounter, the student should be able to:

1. Draw on a map of the community the parcel of land in question, identifying any unusual physical or ecological features.
2. Describe in writing the history of the land use of the areas, bringing it up to the present time.
3. Describe in writing the existing laws governing the use of the land-zoning ordinances, state laws, etc.
4. Draw up a plan for recreational use of the land, and identify reasons for decisions.
5. Determine who influences land policy for area-government officials, realtors, etc.
6. Identify four points that must be considered and accounted for in implementing a land use plan for the area.
7. Describe the major actions (in writing) needed in order to have the desired recreational plan adopted.

ACTIVITIES:

1. Trip to the land area in question.
 - a. Carry out site inventory--size, terrain, ground cover, water availability, soil type, unusual features.
 - b. Take slides of area and features.
2. Obtain information regarding zoning laws and ownership of land from local government unit.
3. Determine who makes laws concerning zoning for area, and how much control residents have over these decisions.
4. Identify community interest groups and determine if their objectives are similar or opposite. Support might be gained by working with another group.
5. Obtain history of land and its use -- library resources, local histories, interviews with long-term residents.

6. Determine regulation size of baseball diamonds, tennis courts, volley ball courts, swing and slide areas, and ice skating rinks to determine what could fit practically into space available.
7. Conduct survey of immediate neighborhood and other close residential areas to determine recreational needs.
8. Draw up plans of recreational development, including placement of trees, shrubs, etc.
9. Determine approximate cost of converting area to suitable recreation area.
10. Interview local government officials to determine who would be responsible for grounds upkeep, replacement of equipment, safety, and enforcement of any necessary regulations.
11. Present plans to local government for consideration.
12. Obtain backing of influential members of community to implement plans -- fund raising campaign, voters' approval on bond issue -- or both.
13. Obtain publicity in local papers to gain voters' approval and general public support.

EXPLORING RECREATIONAL NEEDS OF TWO-WHEELED MOTOR VEHICLE IN AND URBAN AREA

BEHAVIORAL OBJECTIVES:

1. Identify the need for recreational lands for two-wheeled vehicles in the local area.
2. Identify the present recreational use of lands in the local area for two-wheeled vehicles.
3. Determine who owns the land mentioned in behavioral objective 2.
4. Describe the community benefits of having such recreational areas.
5. Determine what conflicts of interest might arise where a land area is proposed for the use mentioned in behavioral objective number 2.
6. List the benefits of such a recreational area, not only to those who own 2 wheel motor vehicles, but to the general citizenry as well.
7. Identify laws and restrictions governing the use of motorcycles in the community and within the State.
8. Identify motorcycle organizations within the local community, the state and the nation which could assist in the development of the type of recreational lands mentioned in behavioral objective 1.
9. Identify the ecological effects of two-wheeled motor vehicles upon the land and surrounding area mentioned in the above behavioral objectives.
10. Prepare a plan for developing more land areas to be used by two wheel motor vehicles.

ACTIVITIES

1. Take a survey to determine who owns motorized cycles in your area.
 - a. What are the age groups involved?
 - b. What percentage of the cycle owners are involved in woods, trail and field riding. (So-called off the road riders.)
 - c. How far must the off the road riders travel in order to find access areas for their cycles?
 - d. What are the future implications involved? Is the trend toward owning motorized cycles? Approximately how many young people are there in your community who aren't of driving age yet?

2. Draw a map showing lands in the local area which are now being used by motorcycles.
 - a. Are these areas legally designated as motorcycle riding areas?
 - b. Who has access to the property?
 - c. Is access to the property through public or private land?
3. Find out who owns and manages the land mentioned in behavioral objective number two.
 - a. What was the intended use of the land originally?
 - b. What are future plans for the area?
 - c. Do the owners or managers ever make improvements or maintain the land?
4. Cite (number) ways that authorized motorcycle riding areas can benefit the entire community.
 - a. Have motorcycles created problems in the community to date?
 - b. Does the community have land which is vacant and desolate?
 - c. Do motorcyclists legally have a place to go in the local area?
5. List (number) ways motorcycles conflict with other recreational pastimes.
 - a. Who has the right to the land use?
 - b. Can the cyclists legitimately justify use of the sites mentioned?
 - c. Why are there so many conflicts with motorcycles in land use?
6. Prepare a pamphlet emphasizing the benefits of having motorcycle recreation areas in the local community.
7. Invite a policeman or some other authority to give a talk or presentation on laws governing motorcycles in the community and the state.
8. Write or contact local, state and national motorcycle organizations concerning the development of recreational motorcycle sites within the community.
 - a. Are these organizations aware of the ecological aspects of motorcycling?
 - b. What suggestions do the organizations offer in regard to developing such areas within the community?
 - c. What are the advantages or disadvantages of having a local cycle organization.

9. Describe the effects of motorcycles on the environment.
 - a. Do motorcycles disturb wildlife? If seasonal use was advocated could this be reduced?
 - b. List ways in which motorcycles can harm the land?
 - c. What do you think is the single most environmentally disturbing aspect of motorcycles?
 - d. List (number) ways that environmental destruction due to motorcycles can be reduced.

10. Present to the proper land owners and community authorities, a plan for developing a site as a recreational area for motorcycles.
 - a. Who would purchase or maintain the site?
 - b. Where would the site be located?
 - c. Does the site conflict with other land uses i.e., residential, school parks, etc.
 - d. What is the ecological condition of the land mentioned?
 - e. Will this parcel of land, be able to sustain all the motorcyclists in your area and if so for how long?
 - f. Draw a map showing the proposed area, and its relation to surrounding land areas.

DESIGNING A SCHOOL SITE DEVELOPMENT PLAN

BEHAVIORAL OBJECTIVES:

- At the completion of a successful encounter, the student should be able to:
1. Determine (number) justifications for developing a school site.
 2. Identify (number) "key people" to serve on a site development committee.
 3. List (number) types of resources available on the school site.
 4. Identify the existing land use plan.
 5. Describe, in writing, the desired use of the school site.
 6. List (number) goals and objectives for the use and development of the school site.
 7. Make (number) recommendations for developing the school site.
 8. Identify (number) professional resource people capable of giving assistance concerning site development.
 9. Develop a land use plan.
 10. Develop a plan of action for developing the school site.
 11. Identify the power structure of the school system.
 12. Determine the appropriate individuals or committee responsible for making decisions concerning school site development.
 13. Develop a plan of action for presenting the site development plan to the appropriate individuals or committee for approval.
 14. Identify (number) individuals, committees, organizations willing to help implement the plan.

ACTIVITIES:

1. Identify several resource people knowledgeable in school site development, and invite them to class to discuss the justifications of school site development.
2. Design illustrations depicting the justifications of school site development. Example:
 - a. Microclimate improvement
 - b. Value of natural features
 - c. Value to total school curriculum
 - d. others.

3. Make plans to meet with a variety of "key people" and use your illustrations to point out the justifications of school site development. Consider:
 - a. Influential school officials
 - b. Influential community citizens
 - c. Representatives of the student body
 - d. Representatives of the faculty
 - e. Others
4. Organize a site committee comprised of a variety of "key people". (Do not overlook the individual who attended your initial meeting) Consider:
 - a. 4-6 staff members
 - b. Administrative members: principal, school board member, other
 - c. 4-5 students
 - d. 4-6 parents
 - e. Possibly others
5. Make an inventory of your school site to determine: the natural resources available on the site. Consider:
 - a. Geological features (topography, soil types, etc.)
 - b. Biological features (habitats, plants, animals, etc.)
 - c. Water resources (open bodies of water, drainage pattern, etc.)
 - d. Historical features (fence rows, other landmarks)
6. Make a map or a model of your school site showing:
 - a. All the existing resources
 - b. Present land use plan
 1. natural areas
 2. parking areas
 3. recreational area
 4. other
7. Hold a site committee meeting to determine:
 - a. Desired uses of the school site
 - b. Goals and objectives for use and development of the school site
8. Use your inventory and map or model of the site to determine: (Use professional assistance as needed)
 - a. Site features to be saved
 - b. Features to be removed
 - c. Features to be expanded
 - d. New features to be created
9. Create illustrations depicting the recommendations for site development.

10. Use these illustrations in designing a land use plan. Consider:
 - a. Natural areas
 - b. Recreation areas
 - c. Landscaping
 - d. Others

11. Call upon the appropriate resource people for professional assistance concerning your proposed plan. Consider:
 - a. Site Development Specialist
 - b. Landscape Architect
 - c. Soil Conservationist
 - d. Habitat Biologist
 - e. Other

12. Develop a plan of action for implementing your school site plan. (Consider a step-by-step plan for orderly development.)
 - a. Priority
 - b. Economic factor
 - c. Scheduling of site development projects
 - d. Others

13. Identify the power structure of the school system to determine the individuals or committee responsible for making decisions concerning site development.

14. Develop a plan of action for presenting your site development plan to the appropriate individuals or committees for approval.

15. Identify individuals, committees, organizations willing to help develop the school site. Consider:
 - a. School
 - b. Community
 - c. Resource people
 - d. Site committee
 - e. Others

16. Upon approval, work with these people to implement your site development plan.

DESIGNING A COMPREHENSIVE TRAFFIC PLAN
TO AND FROM SCHOOL - AND - ON THE SCHOOL SITE

BEHAVIORAL OBJECTIVES:

- At the completion of a successful encounter, the student should be able to:
1. Identify (number) modes of transportation used to and from school.
 2. Identify (number) modes of traffic that exists on the school site.
 3. Identify (number) existing traffic patterns on the school site.
 4. Identify (number) existing traffic patterns that lead to and from school.
 5. Identify (number) traffic problems that exist on the school site.
 6. Identify (number) traffic problems that exist on the way to and from school.
 7. Identify (number) resource people capable of giving professional assistance concerning traffic patterns and problems.
 8. List the (number) major objectives of effective traffic pattern planning.
 9. List (number) ways of effectively solving traffic problems on the school site.
 10. List (number) ways of effectively solving traffic problems on the way to and from school.
 11. List (number) ways an effective landscape plan can benefit the traffic patterns on the school site.
 12. Identify the power structure within the school system.
 13. Identify the appropriate individual or committee responsible for making decisions concerning traffic patterns on the school site.
 14. Identify the local governmental structure within the community.
 15. Identify the appropriate individual or committee responsible for making decisions concerning traffic patterns in the community.
 16. Identify the laws & Restrictions that govern traffic patterns on the site and in the community.
 17. List (number) major steps involved in an effective planning process.

18. Describe, in writing, an effective way of involving the school and community in planning and working together.
19. Develop an effective and aesthetic traffic plan to and from school and on the school site.

ACTIVITIES:

1. Develop a classroom discussion on the following topics:
 - a. modes of transportation used to and from school
 - b. modes of traffic that exist on the school site
2. Organize your class into two working groups to carry out the following surveys:
 - a. GROUP A
 1. Survey the school site to determine the traffic patterns and problems that exist on the site.
 2. When determining problems consider:
 - s. Access to:
 - parking areas
 - loading zones
 - school building
 - driveway
 - others
 - b. Walkways
 - c. Bike paths
 - d. Conflict of vehicles and people
 - e. Others
 - b. GROUP B
 1. Survey the surrounding community (within your school's boundary) to determine the traffic patterns and problems that exist on the way to and from school.
 2. When determining the problems consider:
 - s. Congested travel routes during the school's opening and closing hours.
 - b. Dangerous intersections
 - c. Dangerous walkways
 - d. Narrow roadways
 - e. Poor visibility
 - f. Others

3. In the classroom, share your findings with each other and record your information in a manner that will later help you develop more effective traffic patterns. Example:

a) GROUP A

TYPES OF TRAFFIC PATTERNS ON THE SCHOOL SITE	EXISTING PROBLEMS	ALTERNATIVE SOLUTIONS

b) GROUP B

TYPES OF TRAFFIC PATTERNS -- TO AND FROM SCHOOL	EXISTING PROBLEMS	ALTERNATIVE SOLUTIONS

4. Identify several resource people who are knowledgeable concerning traffic patterns and problems. Consider the following:

- a. Traffic engineer
- b. School site developer
- c. Landscape Architect
- d. Local community planner
- e. Others

5. Invite these specialists into class to discuss:

- a. the objectives of effective traffic patterns
- b. ways of solving traffic problems
 - 1. on the school site
 - 2. to and from school

6. Divide your two original work groups into a number of smaller groups to further analyze the existing traffic patterns and problems. Example:

a)

ON THE SCHOOL SITE

EXISTING PATTERNS

EXISTING PROBLEMS

GROUP A Pedestrian	Conflict with vehicles
GROUP B Automobile	Student-Staff parking
GROUP C Bicycle	Conflict with cars and people
GROUP D Bus	Congested loading zone area

b)

TO AND FROM SCHOOL

SAME TYPE OF ORGANIZATION

7. Interview the student body, school administration (principal, teachers, and surrounding community citizens to determine their feelings and suggestions concerning:
 - a. Present traffic patterns
 - b. Existing traffic problems
 - c. Possible solutions
8. As a class, decide upon the goals and objectives you want to use as a basis for:
 - a. Solving the traffic problems that exist:
 1. on the way to and from school
 2. on the school site
 - b. Developing more effective traffic patterns:
 1. to and from school
 2. on the school site
9. In your small work groups determine the best possible alternative solutions based on:
 - a. What the people at school and in the community want
 - b. What seems right for the area under consideration
 - c. Suggestions from professional resource people
Example - landscape architect - using landscaping
as a means of effective traffic control
 - d. Your own research
 - e. Economic factor
 - f. Laws and restrictions governing school and community traffic patterns
 - g. Others

10. On the original chart, that was made, list the alternative solutions your group decides upon.
11. Make sketches to illustrate the effectiveness of your alternative solutions.
12. Using the sketches, design a model (with movable parts) of the school site and the surrounding community traffic patterns within the school's boundary) to show your traffic pattern plan.
13. Determine the power structure of your school system and identify the appropriate school officials to inform concerning your model and plan.
14. Determine the local governmental structure in the community and identify the appropriate community officials to inform concerning your model and plan.
15. Develop a plan of action for presenting your model and implementing your traffic pattern plans to the appropriate individuals, committees and organizations. Consider:
 - a. Student body representatives
 - b. Surrounding community citizen representatives
 - c. Appropriate school officials
 - d. Appropriate community officials
16. As a group, review all the possible alternatives concerning more effective traffic patterns on the school site and in the surrounding community.
17. As a group, make all necessary revisions and agree upon a final plan.
18. Present the plan agreed upon to the appropriate governmental and school officials for approval.
19. Upon approval, work with the necessary groups in order to put your plan into action.

DESIGNING & CONSTRUCTING A GARDEN POOL ON A SCHOOL SITE

BEHAVIORAL OBJECTIVES:

- At the completion of a successful encounter, the student should be able to.
1. Describe (number) ways of constructing a garden pool on a school site.
 2. Determine the physical conditions necessary for developing a natural garden pool.
 3. Describe (number) ways of supplying a garden pool with water.
 4. Identify the local building and/or sanitary code requirements concerning garden pools.
 5. Describe (number) new environments a pool brings to a garden area.
 6. Identify (number) types of plants that will grow in and around the pool.
 7. Determine the conditions necessary for keeping fish in the pool.
 8. Identify (number) ways of obtaining fish from the pool.
 9. Identify (number) types of fish that could live in the pool.
 10. Identify (number) ways of managing a garden pool to control algae.
 11. Identify particular individuals who might assist with the pool construction.
 12. Design a garden pool that will support both fish and plant life.

ACTIVITIES:

1. Secure as much information as possible on how to construct garden pools.
2. Interview the local Soil Conservationist to determine the necessary conditions for constructing a natural garden pool.
3. Determine the purpose or purposes the pool is to serve, and, with the help of various resource people decide upon:
 - a. The type of pool that will best meet your needs.
 - b. The best location for the pool (soil test).
 - c. The source of water to supply the pond.

4. Interview the proper officials concerning local building, sanitary and safety laws.
5. Draw a mural depicting the major new environments created by a garden pool.
6. Label the various plants found in each of the newly created environments.
7. With the help of a fish biologist determine:
 - a. the necessary conditions for keeping fish in a pool.
 - b. the types of fish that would live in that particular size pool.
 - c. the best way to obtain fish for the pool.
 - d. how to maintain a balanced aquatic community in the pool.
 - e. how to control algae.
8. Design a garden pool that will provide the proper habitat for both the fish and the plants.
9. Determine the cost of the project and develop a plan of action for financing the project.
10. Develop a plan of action for implementing the garden pool project.
11. Identify the people who will make the final decision concerning the garden pool.
12. Design a plan of action for presenting the project to these particular people.
13. Decide what people are to be involved in implementing the project.
14. Upon approval, carry out your project plan.

INVESTIGATING ECOLOGICAL RELATIONSHIPS OF PROTOZOANS
FOUND IN A SMALL LAKE OR POND

BEHAVIORAL OBJECTIVES:

At the end of the successful encounter, the student should be able to:

1. Identify (number) different species of protozoa.
2. Construct a graph to illustrate population changes among protozoa both in the laboratory and in the field.
3. Compare and contrast the numbers and kinds of protozoans found in different parts of the aquatic area.
4. Determine whether the study area is relatively sterile or fertile (oligotrophic vs Eutrophic).
5. Describe in writing ecological succession among protozoa.
6. Draw a food chain showing where protozoa fit in among the other animals in the pond or lake community.
7. Prepare a topographic map showing the relationship to depth and contour of the study area to protozoan numbers and variety.
8. Identify (number) environmental problems associated with the study areas and describe how each problem affects protozoans.
9. Develop a plan of action to solve one of the environmental problems associated with the study area.

ACTIVITIES:

1. Using small jars, collect small samples of mud and other debris from the study area. Also, collect water from different strata, i.e., surface, middle and near bottom.
 - a. Label samples as to their origin.
 - b. Examine the samples with the microscopes in the lab.
 - c. With the aid of texts and manuals identify as many species as you can.
1. How can you begin to group protozoa?
2. Do numbers and varieties of protozoa seem to be related to different water strata.

2. Prepare graphs showing protozoan-population growth curves
 - a. What is the relationship of population growth to oxygen levels?
 - b. Do protozoan populations increase or decrease during certain hours of the day and night?
 - c. What are some other factors which seem to limit or speed up the growth of protozoan cultures.
3. Identify kinds and numbers of protozoa within certain ecological niches of the study area.
 - a. What if any, are the relationships of protozoa to water turbidity?
 - b. Why are some protozoa attracted to certain ecological niches?
 - c. Why do you suppose some areas of the study area have little or no protozoa?
4. Draw a chart comparing and contrasting an oligotrophic body of water with an eutrophic body of water.
 - a. Take water samples and using the Hack chemical kit analyze to determine dissolve oxygen content.
 - b. Using the Hack kit, analyze water samples from the local area as to nutrient content.
 - c. Using the same equipment, sample the Ph of the water in the study area.
 - d. What is the color of the water in the study area?
 - e. Make a depth chart of the study area.
 - f. What is the bottom of the study area like? Is it uniform?
 - g. Using the above information, and the knowledge you have gained, decide if the study area is eutrophic or oligotrophic.
5. Observe and identify ecological succession in the laboratory.
 - a. Plot a graph to show the hourly or daily rate of succession of certain protozoan cultures.
 - b. What seems to be the determining factors of succession in the laboratory? Can this be applied to field conditions?
6. Illustrate how protozoa fit into an aquatic food chain.
 - a. Are protozoa consumers, producers, or reducers?
 - b. What are some factors which might disrupt protozoan population thereby effecting the food chain.

7. Using appropriate measuring devices chart the depth of the study area.
 - a. Is the depth uniform or erratic?
 - b. Is the study area natural or man made?
 - c. What is the water source for this body of water?

3. List some problems associated with the body of water studied and show how such problems relate to the protozoa therein.
 - a. What is the land used for surrounding the study area?
 - b. What type of soil surrounds the area, and what type of ground cover does it have?
 - c. Are there residential homes or industry in the immediate vicinity of the study area?

 - d. Can you discern any artificial drainage into the study area.

9. Prepare a list of who uses the study area (pond or lake community) and what the uses are.
 - a. Is the study area visited frequently? If so, what is it used for mostly?
 - b. If the study area is not widely used what are the reasons?

10. Determine who owns the property surrounding the study area.
 - a. Is the land private or public?
 - b. What are the uses designated by the owners?
 - c. What are the future plans of the owners in regard to maintenance or development of the study area?
 - d. Submit to the proper authorities your evidence regarding the condition of the study area.
 - e. Present your recommendations to them regarding preservation and improvement of the study area.
 - f. List (number) ways you and your fellow students can act directly toward preserving and maintaining the aquatic areas studied.

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