DOCUMENT RESUME

ED 106 075 SE 018 256

TITLE	Resource Guide, Wisconsin Environmental Education Inservice Project.
INSTITUTION	Wisconsin State Dept. of Public Instruction, Madison.; Wisconsin State Univ., Superior.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	Aug 72
NOTE	85p.
EDRS PRICE	MF-$0.76 HC-$4.43 PLUS POSTAGE
DESCRIPTORS	*Conservation Education; Elementary Secondary Education; *Environmental Education; *Inservice Teacher Education; Instructional Materials; Interdisciplinary Approach; Learning Activities; Natural Resources; Outdoor Education; *Science Education; Teacher Education; *Teaching Guides

ABSTRACT

This interdisciplinary environmental education resource guide is designed for use in the inservice preparation of teachers in environmental education. The guide is developed around nine components: (1) perceptual awareness, (2) conceptual awareness, (3) the phenomena of the natural environment, (4) the phenomena of the man-made environment, (5) aesthetic discrimination and valuing, (6) humanism, (7) fostering creative abilities and attitudes, (8) organization skills and knowledge, and (9) decision making. Nine topics are included in the guide, each topic focusing on one of the components. Each topic includes a statement of rationale, which further explains the component as related to environmental education, goals and objectives for teaching the component, the substance or content of the component that focuses on the skills or knowledge involved in understanding the importance of the component, instructional strategies (activities) for both the elementary and secondary level, and instructional resources which includes both printed and nonprinted materials. The guide also includes a definition of environmental education, and guidelines for using the guide. (TK)

THE WISCONSIN ENVIRONMENTAL EDUCATION INSERVICE PROJECT

RESOURCE GUIDE

Developed by the participants in the Leadership Training Conference for the Development of Resource Personnel in Environmental Education.

University of Wisconsin-Chippewa Lake Field Station, Clam Lake, Wisconsin, August 1972

A joint project of the Wisconsin Department of Public Instruction, the University of Wisconsin-Superior, and the National Science Foundation under provisions of NSF Grant GW7360.

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THE WISCONSIN DEFINITION OF ENVIRONMENTAL EDUCATION

The term "environmental education" means "the educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment." Be it further recognized. . . .that environmental education means the educational process of developing concepts, attitudes, values, and actions appropriate to fostering man's harmonious relationship and interdependence with his natural and man-made surroundings, including the social, political, cultural, economic, aesthetic, and biophysical dimensions of the total environment.

(Wisconsin Environmental Education Act of 1971 - Proposed)

PREFACE

Environmental Education in the Schools

Environmental education is not a discipline in itself, does not take place in a specific area, and has no well-defined limits as to content, materials, grade level, or facilities in which to work. However. in attempting to develop an outline for a college level, introductory inservice course it is possible to identify specific components of environmental education. These components are:

1. perceptual awareness
2. conceptual awareness
3. the phenomena of the natural environment
4. the phenomena of the man-made environment
5. aesthetic discrimination and valuing
6. humanism
7. fostering creative abilities and attitudes
8. organization skills and knowledge
9. decision making

Underlying and connecting these components is a man-land ethic -- a recognition that man is part of, dependent on, and responsible for maintaining a quality environment, an environment which fosters a diversity of choice and freedom for the individual.

In addition to the nine basic components of environmental education there can be identified certain factors which characterize a good environmental education program and are essential to a successful experience for students and teachers. These factors include:

1. A supportive humanistic environment which takes into account the individual's culture, values, desires, and self-concept.
2. The support of persons at all levels of the school and community involving students and teachers in attempts to understand environmental problems in the community requires a sustained commitment on the part of school administrators, school boards, and community leaders. They must be willing

to accept, encourage, and support involvement both inside and outside the traditional boundaries of the school.

3. Teachers prepared through their own investigation of concepts, values, skills, resources, strategies, and the above listed components so they will be able to devise their own approaches to environmental education.

4. The acceptance by all disciplines and grade levels of a share of the responsibility for helping students achieve a total understanding of the environment.

5. The use by teachers of approaches implementing appropriate media and experiential, open-ended approaches in pursuing investigations into the environmental concerns of students.

6. The use of the classroom, the laboratory, the community, and every possible facility so that a student is aided in realizing that the environment is where he is and what he perceives.

School systems and teachers who are willing to accept the importance of the factors listed above have come a long way toward establishing an effective environmental education program. No one can guarantee complete success but as a result of such a program participants will gain heightened awareness of and concern for the environment.

SUGGESTIONS FOR USING THIS RESOURCE GUIDE

The Wisconsin Environmental Education Inservice Project Resource Guide is designed for use in the inservice preparation of teachers in environmental education. The following suggestions and cautions are offered to those who attempt to implement programs based on this guide.

I. The nine components identified herein should be dealt with simultaneously in any teacher preparation program with the exception that discussion of separate components might be held during introductory and summary sessions.

II. Relative emphasis placed on each of the nine components should depend on the needs and desires of the participants.

III. A substantial portion of each course should be devoted to curriculum development activities which try to incorporate several if not all of the components into materials produced.

IV. A course based on this resource guide cannot be all-inclusive. Participants should be encouraged to seek additional preparation in each of the components identified. Curriculum development can only be initiated in such a course and must be continued by the participants after the completion of the course.

V. In using this resource guide to teach an inservice course, the following considerations should be kept in mind.

   A. Participant background

      1. Subject matter strengths and weaknesses
      2. Interests
      3. Academic course work
      4. Experience

   B. Intended use by participants

   C. Geographic locality

VI. Evaluation of courses based on this resource guide is desirable. Feedback from participants will aid in revisions and clarification. Reports on the following should be forwarded to David C. Engleson, Department of Public Instruction, 126 Langdon Street, Madison, WI 53702.

A. How was the course organized? (Credits, session length, time allocation for components, evening, Saturday, summer, etc.)

B. In as much detail as possible, what was the "content" of the course?

C. What was the general reaction of the participants as indicated by their change of attitude and change of behavior?

D. What curriculum materials were developed? (Please provide samples if possible.)

COMPONENT 1 - PERCEPTUAL AWARENESS

I. Rationale: Perception is a personal experience; its very nature mandates that it be point centered in the universe. That point is the individual. Collective man is guilty of assuming that the universe "happens" around him; he has not effectively perceived that he is a "happening" in the universe. He has compounded his error by ignoring the mechanics of his surroundings and indulged himself in an exploitation of the environment.

II. Goals and Objectives:

A. Perception of an environment through the senses

1. Visual perception of color, form, texture, pattern, line, movement and rhythm
2. Auditory perception of human, non-human, man-made and natural sounds
3. Olfactory perception of natural and man-made odors
4. Tactile perception of texture, shape, firmness, temperature
5. Gustatory perception of natural and man-made tastes

B. Perception of the environment through extensions of the senses

1. Enhance visual perception through use of microscope, telescope, binoculars, hand lens, etc.
2. The use of sophisticated instrumentation such as geiger counter, radar, infra-red, seimograph, thermometer, etc.

C. The ability to describe what has been perceived based on prior experiences

1. Similar and dissimilar
2. Man-made and natural
3. Moving and non-moving (rhythmic)
4. Novel and non-novel (old and new)

D. The recognition that man is a feeling animal

1. Increased awareness of the recognition of one's responses to an environment
2. Recognition of one's feelings about self, others and other things in an environment

E. Recognition of an undefined intuitive aspect which may lead to a feeling or behavior

F. The ability to recognize and express emotional response to sensory stimuli

1. Empathize

2. To express creatively with a variety of media

3. To express freely, both verbally and non-verbally

III. Substance: Since we are dealing with unprocessed data, the knowledge and valuative components will not be considered. The skill component, however, is of primary importance as it provides the actual mechanism for perceptual awareness. Those skills or processes which are particularly relevant to this aspect of environmental education are the following.

A. Observing - the use of the senses in a variety of ways, with or without the aid of instruments. Observations may be accomplished with respect to many qualities and quantities. When observations are made in order to accumulate data from which inferences will be drawn, the precision of the observations is critical.

B. Measuring - comparing identifiable characteristics directly, or indirectly, by comparison with arbitrary units which, for purposes of communication, may be standardized.

C. Comparing and Contrasting - identifying degrees of similarity and differences

D. Visualizing - forming a mental image based on accumulated observations

E. Communicating - conveying or transferring something intangible through the use of various media—the spoken or written word, graphical representation, pictures, music, actions, etc.

F. Relating - showing cause and effect relationships between perceptions or identifying similar reactions to different perceptions.

G. Empathizing - participating in another's feeling or ideas

Instructional strategies dealing with perceptual awareness should be based on and transmit this preliminary series of skills and processes.

IV. Instructional Strategies: In dealing with perceptual awareness, care should be taken to create learning environments in which perceptions may be received, recognized, and dealt with by the learner. The environments and experiences planned in them should be varied and rich in sensory data. Those experiences

which utilize all the senses will be more purposeful, direct, and personally involving. Instructional strategies should provide skill development and guidance in the recognition and expression of sensory experience. The exercises listed below are some which could be used to foster perceptual awareness. As they are intended as sample activities, teachers are encouraged to refer to the suggested literature for further activities and to design some of their own exercises. Even though some of these activities are listed under specific skills, they may be used to develop more than one skill. The activities include material for all age levels.

A. Observing

1. Elementary activities

a. Go outside with a tape recorder and find and bring back sounds you like and dislike and find and bring back morning, daytime and night sounds

b. Go outside and find things that move - then move like they do. Find sounds like your movement.

c. Go on an outdoor hike in which individual students, working in previously established groups, are to gather sights, sounds, smells, tastes and tactile impressions and record these on worksheets according to the appropriate sense.

d. Have students look for simple line patterns found in natural objects. Have them make their own on-the-spot sketches of line patterns. The students might devise descriptive words for unique patterns found.

e. Have students rub soil between their fingers to feel and hear different textures.

f. Draw what you think the cross section view would be of the following things: an orange, a dandelion, a water pipe, a cabbage, a twig, a pencil, a candy bar, an anthill. If you can think of more than one way - draw all the ways. Put the names on the drawings.

g. Preserve the patterns of leaves or bark by clay molds, crayon rubbings, or plaster casts.

h. Practice listening. One way to make the development of listening skill dramatic is to have the group of students stand with eyes and fists closed. Then a fist may be opened, one finger at a time as sounds are heard.

i. Find a place either in or out of doors. Mark off a section about 4' x 4'. Examine it very carefully on your hands and knees, feel it, taste it, smell it and listen to it. Take your hand lens and view it. Record your findings - draw some of them.

j. Go exploring with either a hand lens, a telescope or a pair of binoculars. Share what you have seen by constructing a bulletin board exhibit for the rest of the class.

2. Secondary activities

a. Keep interest centers in your classroom of objects that can be perceived through the use of sophisticated instruments, such as a geiger counter.

3. Elementary or secondary activities

a. Select a quality of yourself and record its changes.

b. Look for patterns in weather, land formations, clouds, football, sounds, you, etc.

c. Look for changes in activities in nature. What changes will there be in a day, a month, a year? In a special spot? In your school? In you? Draw a picture of how you think it will look twenty years from now.

B. Measuring

C. Comparing and Contrasting

1. Elementary Activities

a. Make a list of opposite word pairs and then go outside and find objects in your environment that represent the word pairs.

b. Try these "variety and similarity" games. First draw nine or ten creatures or plants, or nine or ten members of any group of things you may see in your environment.

Game 1 - One player silently choses one of the creatures or things. He does not tell the other players. They must figure out which creature is the chosen one by asking yes and no questions.

Game 2 - One player silently choses a creature. He tells the other players things about it until all the other objects are eliminated. "It has. . ." or "It hasn't. . ." Other players guess on the basis of the information they are given.

Game 3 - One player choses characteristics of the creatures or objects, e.g., "egg laying" or "four-legged." Other players figure out how many of the creatures would fit the description.

c. Compare barks of different trees by using the sense of touch - rough, smooth, flat, bumpy. How do barks of young trees compare with older ones of the same kind?

d. Take a classmate to your favorite spot and compare his impression of it with yours.

2. Secondary Activities

3. Elementary or secondary activities

a. Pay attention to someone's voice, your best friend, your mother, a T.V. star, etc. How does it sound? Monotonous? Varying? High-pitched? Strident? Melodious? Too soft? Forced? Easy? etc. Now ask yourself two questions: What is your own emotional reaction to the particular qualities of that voice? What is the emotional background in the other person that produces the particular qualities of that voice? Try a similar activity with a non-human sound. Express resultant feelings or awarenesses creatively.

b. Take a camera to your favorite outdoor spot and make a photograph of it. How is your photograph different from the actual scene?

D. Visualizing

1. Elementary Activities

a. A map is a picture of where things are. Make a map of where you eat, where you sleep, your favorite spots, your face, your friends' faces, the inside of your desk, your classroom, etc.

2. Secondary Activities

a. Think of some pairs of opposites in which neither member could exist were it not for the real or implied existence of its opposite. Ex.- past-future, beginning-end, desire-indifference.

3. Elementary or secondary activities

a. Try for a few minutes to make up sentences stating what you are aware of at this moment. Begin each sentence with the words "now" or "at the moment" or "here and now." Use various sensor modalities e.g., "I am now aware of a mosquito bussing."

b. Consider some everyday life situations, objects, or activities as if they were precisely opposite of what you customarily take them to be.

c. Imagine the motions around you as if they occured the other way around, as in a reverse-motion moving picture film where a diver sails gracefully from the springboard into the water and then with equal ease flies back up from the water to the springboard.

d. Reverse functions, e.g., under what circumstances might a chair be used to eat from and a table as something on which to sit? Take the white ceiling and blue walls of your room and imagine them the other way around. Turn the pictures upside down. Allow submarines and fishes to fly through the air. Draw it - share it.

e. Pretend that you and six people you know have been ship-wrecked on an island. Can you predict how everyone would act? Who would be the leaders? Who would be afraid? How would you feel? Write a story or a ballad about what you think might happen.

f. In your daily log, record any feeling or hunch you might have about people, things, or events. Give youself ten points for every correct hunch. Find out who has the best "insight" in your class.

E. Communicating

1. Elementary Activities

a. Touch box - Place an item or several items of various shapes and textures in the box. Have students reach in, touch the item, and describe orally what they felt within the containers.

b. Odor box - Saturate small pieces of sponge with various scents. Have students describe the scent to their classmates.

c. Ask students to describe their "pet" object in their own poetry or prose, paying particular attention to the use of sensory words.

d. Crush a leaf from various plants and try to describe each smell.

e. Make a collage or montage (a collection of pictures which have a theme) which describes what you see on your way home from school.

f. Form small groups, put on blindfolds and pass around a variety of objects to touch. Communicate your feelings from the experience.

g. Draw tastes you like and one you don't like. Do the same things with smells, sounds or textures. Can you taste a texture? Or a smell? Try it.

h. Think of a place that is special to you. Make drawings of what you see there or write about what you see there or make up a poem about the place, where it is and its importance, or list all the interesting events that occur on your spot when you look closely.

i. Keep a daily log of things you see, hear, smell, touch or taste or in any other way experience. Include your feelings about these experiences.

j. Think of your favorite room in your house. Write as many answers as you can for each of the following questions:

(1) What can you see and hear?
(2) What can you see and touch, but not hear?
(3) What can you see and hear, but not touch?
(4) What can you smell, but not see?

Think of a different place, a car, a park, your classroom, etc.

2. Secondary activities

3. Elementary or secondary activities

   a. Do an inventory of your eating habits. What do you concentrate on while eating your food? Do you taste your first bite only or do you keep in contact with your taste through the whole meal? Do you chew thoroughly? Do you like to adventure with new foods? What are your likes and dislikes?

   b. Make a collage or montage which describes the environment you would like to live in someday.

   c. Find five things in a "natural environment" and five things in a "man-made environment." Look at all of them under a microscope. Record your reactions.

   d. Make a collage which relays the way you feel about someone special.

   e. Make a montage which expresses an emotion - fear, anger, love, sadness, happiness, etc.

F. Relating

1. Elementary activities

   a. Go outside and see if you can find two leaves that have the same shape, the same color or the same size. Can you find two that are exactly alike?

2. Secondary activities

3. Elementary or secondary activities

   a. Use a series of pictures and short musical selections. Match the pictures with the musical selections according to your own feelings.

   b. Find and bring back to school sounds that make you feel angry, sad, beautiful, afriad, happy, tough.

   c. Relate your favorite tastes with a smell, a sound, a sight, a feeling.

   d. Can you find something natural that has the same pattern as something man-made? The same rhythm? The same lines? The same shape?

   e. Find something natural that you like, then make something with the same rhythm, patcern, shape, color, textures and/or lines.

G. Empathizing

1. Elementary activities

   a. Pretend you are a ladybug. How would a snowflake look to you, a raindrop feel, etc.

   b. Draw a bird dreaming, but find one first.

2. Secondary activities

3. Elementary or secondary activities

   a. Role playing. What if you were a man instead of a woman or vice versa, your pet, your mother, a fish (in a polluted stream), a Christmas tree, a growing apple, a flower in bloom. Express this feeling, tell your friend, write a poem or story, draw a picture, or dance it out, etc.

   b. Sensory deprivation exercises may be done with any sense. E.g., take a blind walk through your school, the woods, around the block (any environment). Wear a blindfold and let a friend be your guide.

V. Instructional Resources

A. Print Materials

1. Elementary activities

   a. Adventures in Environment, Outdoor Book, National Environmental Education Development, Silver Burdett Company, Morristown, NJ,1971.

   b. Environmental Awareness Study Unit One, Look Around You, Earth Corps, Scholastic Book Service, Englewood Cliffs, NJ.

   c. Kleinsinger, Irene J., Environmental Education Picture Packet, Silver Burdett Company, 1971.

   d. Mason, Fred J., Tuning up the Five Senses, Conservation and Environmental Science Center for Southern New Jersey.

   e. Rowland, Kurt, Learning to See, (a series of visual perception manuals, workbooks and teacher guides), Van Nostrand Reinhold Co., 1971.

2. Secondary activities

   a. Powell, Rev. John, Why Am I Afraid to Tell You Who I Am, Angus Communications, Chicago, IL.

   b. Rowland, Kurt, Looking and Seeing, (a series of visual perception manuals, etc.). Individual titles include: "Pattern and Shape" - level 9, "The Development of Shape" - level 10, "The Shape We Need" - level 11, "The Shape of Towns" - level 12. Van Nostrand Reinhold Company, NY, 1966.

3. Elementary or secondary activities

a. Brown, Robert and G. W. Mouser, Techniques for Teaching Conservation Education, Burgess Publishing Company, Minneapolis, MN.

b. Burgess, L., Fragments, Workshop for Learning Things, Educational Development Center, Newton, MA, 1949.

c. Combs, Arthur (ed.), Perceiving, Behaving, and Becoming, Association for Supervision and Curriculum Development, Washington, D.C., 1962.

d. Conceptual Approach to Art Curriculum Planning K-12, Wisconsin Department of Public Instruction #184, 1970.

e. Environmental Studies Packets 1-4, Environmental Studies, Box 1559, Boulder, CO.

f. Gunther, Bernard, Sense Relaxation Below Your Mind, MacMillan Co., NY, 1968.

g. Hills, Christopher and Robert B. Stone, Conduct Your Own Awareness Sessions, New American Library, Grand Central Station, NY.

h. Laun, Charles H., The Natural History Guide, Alsace Books and Films, Alton, IL.

i. Lessons and Teacher Resources in Environmental Education, Environmental Science Center, Golden Valley, MN.

j. McInnis, Noel, You Are An Environment, Center for Curriculum Design, Evanston, IL, 1972.

k. Our Man-Made Environment, Group for Environmental Education (GEE), Philadelphia, PA, 1970.

l. Perls, Frederick, Ralph Hefferline and Paul Goodman, Gestalt Therapy, Delta, 1951.

m. Sensor Sheet, ES/ESTPP Newsletter, Box 1559, Boulder, CO, free.

n. Schultz, William, Joy: Expanding Human Awareness, Grove Press, NY, 1967.

o. Terry, Mark, Teaching for Survival, Ballantine, NY, 1971.

p. Van Der Smisser and Oswald H. Goering, Nature Oriented Activities.

q. Van Matre, Steve, Acclimatization, Towering Pines Camp, Eagle River, WI.

B. Non-Print Materials

1. Elementary

a. Environmental Awareness, a series of filmstrips. Individual titles: Life in a Pond, Patterns in Nature, Textures in Nature, Awareness in Forest and Field, and Colors in Nature. Centron Educational Films, 1621 West Ninth Avenue, Lawrence, KS 66044.

b. Suhn, David, Come to Your Senses, Scholastic Book Services, Englewood Cliffs, NJ.

2. Secondary

a. Art and Environment, a slide tape program plus text, Art in Society, UW Extension, UW, Madison, WI 1967.

b. Sensitivity, Sensitivity Games, Inc., Boston, MA.

3. Elementary or secondary activities

a. Art Awareness Environment, a compilation of Super 8mm film loops, Hester & Assoc., Dallas, TX, 1970.

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COMPONENT 2: Conceptual Awareness

I. Rationale

Man has created an environmental crisis. Contributing greatly to this problem is man's lack of awareness of basic environmental concepts. Organizing learning experiences around these concepts will lead the student to an understanding of those principles underlying the structure and organization of the natural and man-made environment and the relationship between them.

II. Goals and Objectives

A. Provide learning experiences that introduce and develop an awareness of the following environmental concepts:

Alternative (1)	Alternative (2)
1. The concept of energy flow	1. The concept of diversity
2. The concept of recycling within a closed system (ecosystem)	2. The concept of change
3. The concept of ecosystem	3. The concept of continuity
4. The concept of succession	4. The concept of interaction
5. The concept of diversity	5. The concept of organization
6. The concept of carrying capacity	6. The concept of limitation
7. The concept of adaptation	

III. Content

A. Knowledge (Alternative 1)

1. The concept of energy flow

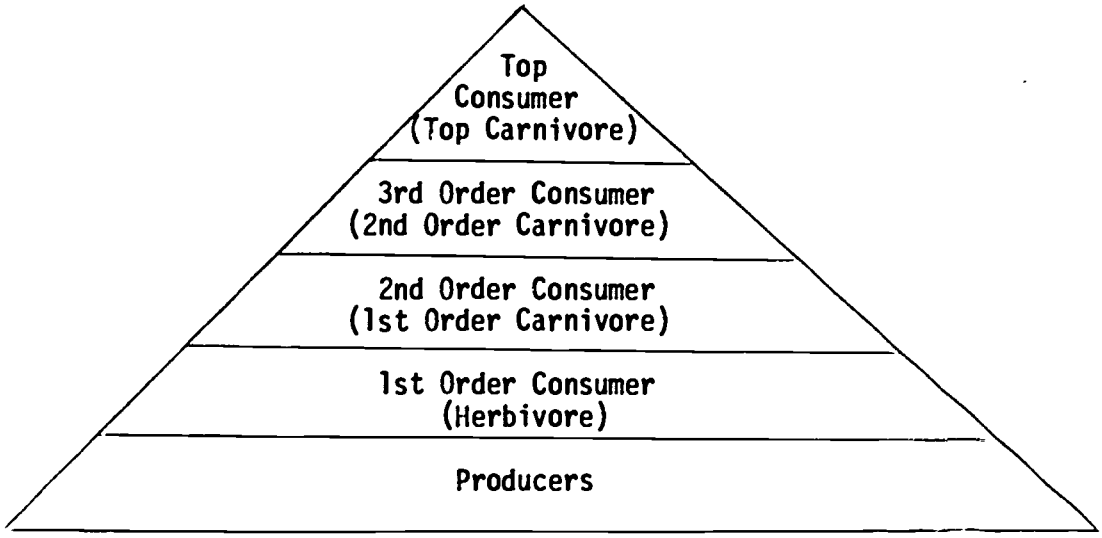
a. Energy flow is similar in pattern for all ecosystems

b. The primary energy source is the sun

c. Through photosynthesis, producers convert radiant energy into chemical energy. The flow continues with first order consumers (herbivores) depending upon producers, second level consumers (carnivore) upon first order consumers, third level consumers on

second level, etc. until a top consumer level is reached.

u. The earth's energy budget is balanced at any point in time and changes only over long periods of time



2. The concept of recycling within a closed system (ecosystem)
   a. The earth's resources are finite
   b. The life support system of the earth is maintained by the recycling of materials by abiotic and biotic processes (i.e., water cycle, carbon dioxide-oxygen cycle, etc.)
   c. A portion of the earth's energy is distributed as it drives these biogeochemical cycles
3. The concept of ecosystem
   a. An ecosystem is defined as the interaction between a community and its physical environment
   b. A community consists of different populations of organisms, each carrying on a particular job (producer, consumer, decomposer, etc.)
   c. A population is a group of organisms of the same kind within a particular area at a particular time
   d. An organism is an individual member of a population
   e. A cell is a structural unit of an organism
   f. Protoplasm is the living matter within cells

4. The concept of succession

   a. Succession is "the orderly and progressive replacement of one community by another until a relatively stable community occupies the area" (Smith, Ecology and Field Biology, pp. 127 ff)

5. The concept of diversity

   a. Matter and energy exist in many forms and combinations which exhibit a variety of properties. All forms of matter have some properties in common

   b. The physical earth exhibits a variety of form, composition and organization of matter and energy

   c. Matter and energy is organized into various structural, functional and behavioral patterns in living things which allow them to live in a diversity of environments.

6. The concept of carrying capacity

   a. There is a limit to the size of population of a species which the resources of an area can support

7. The concept of adaptation

   a. When physical environments change, those species which can no longer fulfill their needs become extinct in that environment

   b. If new inheritable characteristics appear which allow a species to fulfill its needs, the chances of survival of the species improves

   c. The degree and direction to which a species changes is influenced by the genetic characteristics of the species, by the selective pressures of climate, habitat, and competition, and by the availability of ecological niches

B. Knowledge (Alternative 2)

1. The concept of diversity

   a. The vast number of natural phenomena which can be observed display a wide variety of similarities and differences

b.
c.
d. } Same as abc under concept 5 in alternative 1

2. The concept of change
   a. The environment, living and non-living, microscopic and macroscopic, is constantly undergoing change
   b. Genetic and environmental factors cause organisms to change through time, new species to arise, and other species to become extinct.
   c. As a result of change, organisms may be adapted to their environment
3. The concept of continuity
   a. There is a constancy in cause-effect relationships which precludes any abrupt reversal in natural phenomena
   b. Physical quantities used to describe matter and energy and their relationships exhibit constancy and may be used to understand and predict natural processes
   c. Evidence of changes in the universe and observation of its present characteristics may be used in interpreting its past and predicting its future
   d. The characteristics of living things are transmitted from generation to generation through a genetic code by either the fusion of specific cells or the division of cells, and results in individual organisms with characteristics similar to those of the parent
4. The concept of interaction
   a. The interactions of matter in an environment and the resulting exchange of energy determine the nature of the environment
   b. Energy may be transmitted through the application of forces - electromagnetic, gravitational, and nuclear - which are the results of interaction of matter

c. Forces acting upon the earth may change it physically

d. Living things interact with their environments and both are affected by these interactions

5. The concept of organization

a. Systematic relationships exist in natural phenomena. Systems within systems comprise the universe

b. The earth is organized into a complex of matter-energy systems

c. Complementarity between the structure and function of an organism or its parts (molecules, cells, tissues, organs) results in similar living things to be adapted to similar environments

6. The concept of limitation

a. Natural phenomena are limited by the fundamental nature of matter and energy. The tendency toward random distribution in energy leads to a corresponding tendency towards equilibrium in an environment

b. Heredity and refined environmental conditions limit the behavior organisms. The energy available limits interactions within the biosphere

c. In matter-energy changes there is a tendency toward equilibrium with random distribution of energy

C. Skills - Certain process skills are closely related to conceptual awareness. The act of conceptualizing involves taking percepts and organizing them into groups with commonality

1. Classifying. Classifying is the grouping or ordering of phenomena according to an established scheme. Objects and events may be classified on the basis of observations. Classification schemes are based on observable similarities and differences in properties which are arbitrarily selected. Classification keys are used to place items within a scheme as well as to retrieve information from a scheme. Classification is useful in that it helps limit or control the data being investigated.

2. Inferring. Inferring is drawing tentative conclusions about what is not directly or immediately observable. While it may be based on observations, inference requires evaluation and judgement. Inferences based on one set of observations may suggest further observation which in turn requires modification of original inferences. Inferring is necessary in any field of study because of the incompleteness of data. Inference leads to prediction (see Organizational Skills and Knowledge and Decision Making).

IV. Instructional Strategies: Keep in mind that this component, conceptual awareness, continues the processes initiated in the first component, perceptual awareness

A. The concept of energy flow

1. (An introductory activity) Investigation 1.5, pp. 26-28 of BSCS Green Version, "Interrelationships of Producers and Consumers." Have students set this up during class, observe it during the week and report their results at the next class period.

Note to Reader: These activities need to be identified as to grade level for which they are best suited.

2. Build a food chain by any means available (i.e., pictures, words, etc.)
3. Divide class into groups. Give each group a different picture from which they are to list as many energy flow patterns as can be perceived. Each group defends its energy flow patterns to the class.
4. Divide the class into groups. Each group is given a box containing some objects found in the environment (car, tree, sun, rabbit, river, wolf, man, etc.). Groups may have the same terms or different ones but all boxes should contain the word "sun." The groups should then develop an energy flow pattern from their words.
5. Divide the class into groups and have each consider ten items found within a city and construct an energy flow system.
6. Develop energy flow patterns using slides and/or transparencies.
7. Take the contents of a meal eaten by the student and develop an energy flow pattern for each food consumed.

B. The concept of recycling

1. Investigation 1.5, BSCS Green Version, pp. 27ff. Work for an awareness of "closed system" by asking what is unique about tube two as discussion proceeds the "WHY?" is developed by the student.
2. Develop laboratory activities which demonstrate respiration, photosynthesis, and decomposition. Relate the three and follow elements (i.e., carbon, oxygen) through these processes.
3. Go to a recycling center, salvage yard, and/or sanitary landfill. Discuss what is being done and why.

C. The concept of ecosystem

1. Build an ecosystem with "pictures" of various components.
2. Show a series of single objects representing various levels of organization, abiotic and biotic. Ask students to determine if each is an ecosystem and explain why or why not.
3. Conduct an ecosystem inventory
   a. Pick an ecosystem (e.g., park, lake, forest, field, courtyard, parking lot, business district, residence and lot)
   b. Divide class into groups representing various communities in the ecosystem
   c. Identify biotic components of each community
   d. Identify abiotic components of the ecosystem
   e. Relate the biotic and abiotic components for each community identified
   f. Discuss the interdependence of the various communities
   g. Note the degree of diversity among organisms
4. Investigation 3.2, BSCS Green Version, pp. 98ff, Abiotic Environment, A Comparative Study. Modify to fit needs.
5. Brainstorm to determine the interacting components of a specific ecosystem.
6. Take a hike and record observations about the environment. Use these observations to develop a list of components which comprise an ecosystem.

D. The concept of succession

1. Introduce by field activities in which succession may be observed (e.g., lake edge, forest, forest edge, school yard, inner city vs. suburbs)
2. Use film on succession (many available) or the Inquiry Film Loop, "Succession" from Rand McNally
3. Study succession using slides. Show stages and different types
4. Divide class into groups representing different types of communities (e.g., bog, pond, forest, grassland, city, lake, stream, blacktop, etc.). Starting at the primary level develop the succeeding stages that can be expected to occur. Combine field and class work in this procedure.
5. Observe and discuss the relationship of plant to animal succession.

E. The concept of diversity

1. Conduct a "diversity hunt"
   a. In a designated amount of time have students collect six or more "items" from the out-of-doors
   b. Have each student categorize his or her items according to an individually devised system
   c. Combine materials with five other students and as a group categorize your combined items. (Students should now be noting diversity)
   d. Concluding activity: (Modify to fit needs) Exercise five of BSCS Field Ecology Lab Block.
2. Habitat-diversity comparison
   a. Divide class into groups
   b. Supply each group with similar sized rings (i.e., hula hoop)
   c. Randomly toss ring in various habitats (i.e., lawn, edge of parking lot, woods, etc.)
   d. Count the number of different organisms in a ring
   e. Analyze data and discuss why the different organisms were found where they were

F. The concept of carrying capacity

1. Begin a "fruit fly" culture with ample food and air supply. Observe the population flux of the culture and interpret results.
2. Investigation 2.2, pp. 53, BSCS Green Version, "Study of a Yeast Population" (modify to your needs).
3. Investigation 2.1, pp. 43, BSCS Green Version, "Population Growth—A Model"
4. Investigation 2.3, pp. 62, BSCS Green Version, "Population Changes in Open Systems" (modify to fit needs).

G. The concept of adaptation

1. Brainstorm ideas of how organisms have adapted to various ecological niches (i.e., bears at Yellowstone Park, crows, Norway rats, deer in Wisconsin).
2. Life series filmstrips on adaptation and evolution.
3. E.B.F. movie, "Natural Selection"
4. Movie - "Voyage to Enchanted Isles" (about Galapagos Islands)

V. Instructional

A. Print materials

1. Elementary
   a. Everyday is Earth Day, Illa Podendorf, Children's Press, Chicago, 1971
   b. Web of Life Series, McCue, George, Benziger, Inc., New York, 1972
   c. Reading the Landscape, May Watts
2. Secondary
   a. High School Biology: BSCS Green Version, Second edition, BSCS Staff, Rand, McNally & Company, 1968
   b. Fundamentals of Ecology, Second Edition, Howard Odum, W.B. Saunders Company,
   c. Ecology and Field Biology, Robert Smith, Harper & Row, 1966
   d. Environmental Biology, Roger Anderson, Stipes Publishing Company, Champaign, Illinois

e. Concepts of Ecology, Kormondy, Prentice-Hall, 1969

f. Basic Concepts of Ecology, Knight, MacMillan, 1965

3. Elementary and Secondary

a. What's Ecology?, Humphrey and Evans, Hubbard Press, 1971, $1.50 (paper)

b. Ecology, Science of Survival, Laurence Pringle, MacMillan

c. Wildlife, People, and the Land, Ruth Hine, Ed., Wisconsin Department of Natural Resources, Madison, 1968

d. Field Ecology Lab Block, BSCS Staff, D. C. Heath & Company, 1963

B. Non-Print

1. Investigations in Ecology,(35mm slides), Denoyer-Geppert Company
2. Slide series from Biology 500 Series
3. People Problem (filmstrip), Guidance Associates, New York
4. Population (film), Centron Educational Films, Lawrence, Kansas
5. Population and Pollution (film), International Film Bureau
6. Life filmstrips on Adaptation and Evolution
7. Natural Selection (film), E.B.F.
8. Voyage to Enchanted Isles (film about Galapagos Islands)
9. Succession (film loop), Rand McNally
10. Ecology and Ecosystems (film loop), Hubbard
11. Ecosystem Processes (film loop), Hubbard

COMPONENT 3: The Phenomena of the Natural Environment

I. Rationale

An understanding of basic ecological phenomena is necessary to enable man to operate in harmony with the natural environment. Whatever man does, good or bad, is beside the point. He will be governed by natural phenomena.

II. Goals

A. To develop understanding of basic ecological concepts

B. To develop an ecological concern

C. To develop a sense of personal and social responsibility for maintaining a quality environment

III. Objective

A. To understand the importance of sun's energy in sustaining all life on earth

B. To understand the role of natural recycling in the conservation of matter

C. To provide basic information on the operation of ecosystems

D. To understand the phenomenon of succession and how it effects management of natural environments

E. To appreciate how diversity leads to survival

F. To understand that every natural environment is limited to the number of organisms it can support

G. To understand the adaptability of populations to changing environments

IV. Content

A. Energy Flow

1. The sun is the original source of most of the earth's energy. It is transferred to the earth by radiation.

2. The radiant energy is converted to chemical energy in green plants by the process of photosynthesis.

3. Energy is transferred from green plants to herbivores to carnivores as a

result of feeding. Not all energy available at one level is transferred to the next.

4. Food webs

5. Number, mass and energy pyramids

B. Cycles in nature

1. The quantity of matter on this planet is finite and is used over and over in various biogeochemical cycles.

2. The role of decomposers

C. Ecosystem

1. Levels of biological organization

a. Molecules
b. Cells
c. Tissues
d. Organ-systems
e. Individual organisms
f. Populations
g. Communities
h. Ecosystems
i. Biosphere
j. Biomes

2. Ecosystems

a. The interaction between a community and its physical environment

b. Energy flow keeps ecosystems operating

c. Each organism plays a role in the ecosystem

3. Biomes: influencing factors

a. Climate

b. Topography

c. Geographic location

4. The biosphere is the sum of all ecosystems and biomes.

D. Succession

1. Succession is a natural ongoing process whereby one community over time modifies the environment to the extent that it can no longer survive and this makes way for a succeeding community.

a. Rock ⟶ Moss and Lichens ⟶ Higher Plants

b. Pond ⟶ Wet Meadow ⟶ Woods

c. Bog succession: Open Water ⟶ Floating Mat ⟶ Shrubs ⟶ Trees

2. Application of succession to management of natural environments

a. Retarding eutrophication in lakes

b. Retarding succession of mature forest by cutting or burning to support a deer population

E. Diversity as a value for survival

1. A variable species has more change of survival in the face of natural selective pressures

a. The American Elm species is more susceptible to Dutch Elm disease than is the Chinese Elm

b. The domestic sheep is more vulnerable to disease than wild populations of mountain sheep

2. A diverse ecosystem is less vulnerable to insect attack or disease than is a homogeneous ecosystem

a. Stability of a native prairie versus instability of a corn field

3. Selective pressure is greater in a more rigorous environment

a. As one progresses from sea level to a mountain top the number of species encountered is reduced. The same holds true for proceeding from sea level to lower ground.

b. As one proceeds from the equatorial regions poleward, species diversity lessens (fewer species are found in the tundra as compared to a tropical rain forest).

F. Carrying capacity

1. Every environment has an optimum population and a limit to the population it can support. This optimum is determined by the rate of recycling, climate and population needs.

2. When the optimum population is exceeded, environmental deterioration occurs. (excess deer - deterioration of range - starvation of deer)

3. The earth has a finite carrying capacity for all species, including man.

G. Adaptation related to limiting factors

1. All organisms have an optimal range in which they can function (tolerance level)

2. When an environmental factor (e.g., temperature) exceeds the minimal or maximal range it becomes a limiting factor for the population.

a. Cattails are drowned in deep water and die out in dry areas

b. Excessive heat and cold are intolerable to man; hence, he develops a new environment

V. Instructional Strategies

A. Energy flow activities

1. Construct food chains, webs and pyramids. Recognize their existence in the natural habitat.

2. Demonstrate the importance of radiant energy in the photosynthetic process.

3. Construct a diagram showing energy flow through an ecosystem.

B. Recycling activities

1. Follow a drop of water from a cloud back to a cloud.

2. Show relationship between man and a tree.

3. Show how the nitrogen in a carcass is returned to the soil for plant uptake.

C. Ecosystems activities

1. Identify the ecological niche of various components of a real ecosystem e.g., producers, consumers and decomposers in a pond.

2. Identify the niche of soil organisms. (Make soil samples with tuna fish can)

3. Compare terrestrial ecosystems and aquatic ecosystems in regard to energy flow and ecological niches.

4. Identify the level of biological organization of selected living systems.

D. Succession activities

1. Construct a possible successional progression which was not previously identified.

2. Suggest methods for retarding eutrophication of a lake.

E. Diversity activities

1. Show how homogeneity limits survival in an ecosystem.
2. Explain why mountain tops have less diversity than a tropical rain forest.

F. Carrying capacity activities

1. Account for the range wars between sheep men and cattlemen in the early 1900's of the West.
2. Relate deer management practice to carrying capacity of the deer range.
   a. Open season on doe when herd is very large
   b. Shortened deer season to allow for increase of the herd

G. Adaptation activities

1. Identify the factors that exclude the presence of roses in a bog.
2. Relate the insect eating ability of a pitcher plant to a low nitrogen availability in a bog.
3. Explain why you would not find trout in a water body where bullheads are prevalent.

H. General activities

1. Slide set presentation, i.e., pond succession, ecosystem components
2. Field activity where possible - examining school grounds for ecosystem components
3. Demonstration presentation of concepts
4. Student experimentation to discover a concept
5. Use of overhead projection of ideas such as food chain, web, pyramid, succession
6. Completion of diagrams and/or flow charts demonstrating processes or concepts, i.e., nitrogen cycle, bog succession
7. Discussion of newspaper or journal articles on current environmental topics e.g., importing ladybug beetles for aphid control
8. Providing models for study such as a balanced aquarium
9. Simulation games

VI. Instructional Resources

A. Print materials

1. Elementary

a. Preston and Clymer, Communities at Work, 1964, D.C. Heath

b. Harrison, C.W., First Book of Wildlife Sanctuaries, 1963, Watts, N.Y.

c. Watson, Geoffrey G., Fun With Ecology, 1971, Winchester Press, N.Y.

2. Secondary

a. BSCS Green Version, High School Biology, Second Edition, Rand McNally

b. Brandwein et al, Life Its Forms and Changes, 1969, Harcourt, Brace and World, N.Y. (T.P. - Teacher Preparation)

c. Farb, Peter and the Editors of Life, Ecology, 1963, Time, Inc., N.Y.

d. Smith, Robert, Ecology and Field Biology, Harper and Row, N.Y.

e. Boughey, Arthur S., Ecology of Populations, 1968, The Macmillan Co.

f. Morgan, Morgan and Wiersma, Environmental Analysis, Little and Brown

g. Anderson, Roger C., Environmental Biology, 1971 Stipes Publishing Co., Champaign, Illinois

h. Lewis and Taylor, Introduction to Experimental Ecology, 1967, Academic Press, N.Y.

i. Ehrlich, Paul and Ann, Population Resources Environment, 1970, W.H. Freeman and Company

3. Elementary and Secondary

a. Grange, Wallace Byron, Those of the Forest, Faber and Faber, 24 Russell Square, London

b. Humphrey and Evans, What Is Ecology, Hubbard Press, Northbrook, Illinois

c. Pringle, Lawrence, Ecology, Science of Survival, Macmillan Co., N.Y., 1971

d. Storer, John, The Web of Life, Signet paperback pub. by the New American Lib. of World Literature, Inc., 1953

e. Terry, Mark, Teaching for Survival, Ballantine Press

B. Non-print materials

1. Films

a. Energy and Living Things, Centron Educational Films

b. Populations, Centron Educational Films

c. The Eternal Forest, U.S. Department of Agriculture

d. Patterns of the Wild, U.S. Department of Agriculture

e. Our Land - Its Many Faces, U.S. Department of Agriculture

f. Realm of the Wild, U.S. Department of Agriculture

g. The Pond, International Film Bureau, Inc.

h. The Prairie, International Film Bureau, Inc.

2. Filmstrips

a. Ecological Systems, Imperial Film Company, Inc.

b. The Underwater Environment, Imperial Film Company, Inc.

c. The Role of Trees in the Environment, Imperial Film Company, Inc.

d. Man in the Biosphere, Ward's Natural Science Establishment, Inc.

e. Ecosystems and Ecology, Hubbard Scientific Company

f. Ecosystem Processes, Hubbard Scientific Company

g. The Physical Environment, Hubbard Scientific Company

h. Biomes, Hubbard Scientific Company

i. Man's Natural Environment, Guidance Associates

j. Wisdom of Wildness, Guidance Associates

COMPONENT 4: The Phenomena of the Man-Made Environment

I. Rationale

Man's social, economic and cultural values and actions affect the natural environment through misuse of land and natural resources. Human resources are misused also. Overpopulation, overproductivity, overconsumption, urban sprawl and pollution are only some of the problems that plague man and his natural environment.

Thus, man has developed a complex environment in which he and nature are not always in harmony. Man must re-examine his values and alter his life style to follow ecologically sound practices. This spaceship Earth is a limited closed environment subject to the ultimate laws of nature. Man must be made aware of his folly and learn to live with nature.

II. Goals

A. To nurture an awareness of man's environment

B. To recognize that technological change may or may not be compatible with the environment

C. To develop the understanding that population control is essential in solving environmental problems

D. To develop the realization that man has a moral responsibility to modify his behavioral patterns to reconstruct a harmonious and aesthetically pleasing environment

III. Objectives

A. To apply perceptual and conceptual awareness in reference to the man-made environment

B. To apply the basic principles of "Environmental Design" in reference to the man-made environment

C. To apply aesthetic principles to the man-made environment

D. To be aware that urban planning must be compatible with the natural and social environment

E. To develop an awareness that change for the sake of change is not always environmentally healthy

F. To develop an awareness of the potential of recycling.

G. To develop an awareness of the historical factors behind the technological development of man (Industrial Revolution)

H. To develop a realization that technology is not a "cure-all"

I. To develop an awareness that population pressure causes stress factors that may result in mental and/or physical disorders

J. To develop an awareness that there are alternatives to uncontrolled population growth

K. To develop an awareness that environmental quality is lost due to overpopulation

L. To develop a realization that urban renewal, without consideration of human needs and values, may be futile

M. To develop an awareness that polarization of society affects the general quality of the society and does not allow for meaningful interaction within that society

IV. Content

A. Visual pollution

1. Signs and billboards
2. Litter, rubbish and garbage
3. Junk yards
4. "Unkept" structures
5. Dyes, foam and debris on waterways

B. Auditory pollution

1. Physical effects considering intensity, frequency and duration
2. Psychological effects considering intensity, frequency and duration

3. Sources

C. Olfactory pollution

1. Industrial sources
2. Domestic sources
3. Exhaust emissions
4. Waste treatment facilities
5. Refuse piles
6. Others

D. Environmental design

1. Determination of aesthetic values
2. Application of aesthetic values to the urban environment
3. Consideration of architectural styles and man-made beauty of line, form, color and texture in urban planning
4. Intrinsic (i.e., organic - Frank Lloyd Wright) and extrinsic (i.e., inorganic - Marcel Breur, Walter Groprus, Le Corbusier)
5. Environmental patterns as form determinants
   a. Above surface (weather, toxic patterns)
   b. Surface (i.e., flood, scientific, ethnic, land personality)
   c. Sub-surface (aquifer recharge, ground water, vulcanism, sub-strata)
6. Environmental corridors

E. Land use

1. Regional planning
2. Urban renewal
3. New towns
4. Eminent domain
5. Carrying capacity
6. Conflict of interests
7. Wilderness areas
8. Recreation
   a. Lake & river sites
   b. Camping facilities
   c. Parks
9. Agriculture
   a. Contour plowing
   b. Strip cropping
   c. Agricultural wastes
   d. Crop rotation
   e. Fertilizers
   f. Pesticides

F. Practices affecting the present state of technology

1. Neolithic Revolution (change from food gathering and hunting to crop planting & domestication of animals) enabled man to settle in more urban concentration

2. Industrial Revolution caused a change in life style of the people

   a. Domestic system to factory system
   b. Growth of industrial towns
   c. Need for transportation (roads and railroads)

      1) To move [illegible]ds and products
      2) To move [illegible]ple

3. Development of internal combustion engine

   a. Utilization of natural resources

      1) Metals
      2) Rubber
      3) Petroleum
      4) Other

   b. Building of roads and the effect on the environment

      1) Urban sprawl
      2) Loss of wildlife habitat
      3) Loss of agricultural land
      4) Destruction of natural areas

   c. Mobility

4. Centralization of industry

5. Industrial expansion

   a. Over-production
   b. Over-consumption
   c. Materialism
   d. Built-in obsolesence
   e. Conspicuous consumption
   f. Depletion of natural resources
   g. Advertising industry creates a desire for goods and services

6. Demands for new products and services

G. Alternatives

1. Conservation of natural resources

   a. Sacrifice "throw away" convenience
   b. Lessen the demand for electricity
   c. Refute convenience packaging
   d. Refute over-packaging

2. Recycling

   a. Industrial products (metals, glass, paper, etc.)
   b. Remodeling of structures vs. razing
   c. Use of presently developed highway corridors
   d. Organic gardening

3. Mass rapid transit systems

   a. Alleviates or modifies:

      1) Parking problems
      2) Highway congestion
      3) Inner-city congestion
      4) Psychological problems
      5) Exhaust emissions
      6) Other

4. Decentralization of industry

5. Implementation of new town concept

6. Other alternatives (brainstorming)

H. Carrying capacity

1. Every environment has an optimum population it can support

   a. Extreme urban population densities results in environmental deterioration. (both human & natural)
   b. Minority groups are suspect of population control attempts
   c. Pathological problems

      1) Physical disease
      2) Mental disease
      3) Social disease

   d. Economic factors

      1) Income
      2) Poverty
      3) Unemployment
      4) Housing quality
      5) Illiteracy
      6) Economic mobility

I. Causes of population growth (control of limiting factors)

1. Increased food supply

2. Improved practices in sanitation and health

3. Lower infant mortality rate

4. Longer life span

5. Increased employment

6. Spiralling effect

7. Cultural factors

8. Religious factors

9. Immigration and emigration.

J. Quality of life as affected by:

1. Crowding
2. Poverty
3. Polarization
4. Unemployment
5. Crime rate
6. Mental and physical health
7. Housing
8. Illiteracy

K. Alternatives

1. Physical

   a. Birth control devices
   b. Sterilization
   c. Abstinence

2. Educational

   a. Birth control techniques
   b. Family planning
   c. Adoption as an alternative
   d. Sex education in the schools
   e. Value clarification

3. Economic

   a. "Tax break" for limiting size of family
   b. Lessen tax load on unmarrieds

4. Moral responsibility to support children already born

5. Malthusian theory of population growth

L. Urban renewal with consideration of human needs and values

1. Citizen committees to formulate plans for urban renewal

2. Alleviation of polarization

   a. Invite all socio-economic groups to participate

3. Value clarification for all segments of the society

4. Preservation of ethnic enclaves

   a. Retention of identity

5. Promote the concept that sameness within a society is not necessarily good for all members of that society

V. Instructional Strategies

A variety of kinds of activities should be used to develop an understanding of the phenomena of the man-made environment. Direct (first-hand) experiences are desirable but not always possible. All instructional activities should relate the man-made environment to the natural environment. Some kinds of possible instructional activities are:

A. Panel discussions
B. Chart noise pollution in various sections of the environment
C. Model construction
D. Home survey (ways to lessen pollution in the home)
E. Independent student research
F. Time lapse photography
G. Group research
H. Collections (water samples, etc.)
I. Formulation of questionnaires
J. Develop and lead ecology games
K. Development of opinion polls
L. Imagine yourself on the city planning commission (role playing)
M. Rating of land use
N. Comparisons
O. Brainstorming
P. Book reviews
Q. Problem solving techniques
R. "In the Ghetto," by Elvis Presley - what do you get from it?
S. Outside resource personnel
T. Write a short story
U. Interviews with specific field experts
V. Write a poem
W. Interdisciplinary approach
X. On-site inspections
Y. Simulation games
Z. Cartoons
AA. Collage development
BB. Case study
CC. Role playing
DD. Bulletin boards
EE. Collection of resource material
FF. Video-tape report
GG. Field trips
HH. Student developed multi-media presentations
II. Development of graphs and/or charts
JJ. Play writing
KK. Debate
LL. Song writing
MM. Plan a city of the future
NN. Pretend you are a newspaper reporter in the year 2000 A.D. (write a story concerning an event of that day)
OO. Visit city council meetings
PP. Design a vehicle of the future
QQ. Club work (ecology clubs, etc.)

VI. Instructional Resources

A. Print materials

1. Bacon, Edmund N., Design of Cities, Viking Press Inc.
2. Caldwell, Lynton Keith, Environment, A Challenge to Modern Society, Natural History Press
3. Circle of the World, A Web of Life Series, Benziger, Inc.
4. Cities and Planning Series, Earl Collins Bibliography, George Braziller Inc.
5. Cook, Peter, Architecture, Plan and Action, Reinhold Pub. Corp., NY
6. Crosby, Theo, Architecture, City Sense, Reinhold Pub. Corp., NY
7. Eckbo, Garrett, Urban Landscape Design, McGraw Hill
8. Ehrlich, Paul R. and Anne H., Population, Resources, Environment
9. Exploding Metropolis, The, Editors of Fortune, Doubleday & Co., Inc.
10. Gibberd, Frederick, Town Design, Frederick A. Praeger, Inc.
11. Greer, Victor, The Heart of Our Cities, Simon Schuster
12. Hall, Edward T. The Hidden Dimension, Doubleday & Co., Inc.
13. Halprin, Lawrence, Cities, Reinhold Publishing Company
14. Halprin, Lawrence, Freeways, Reinhold Publishing Company
15. Howard, Ebenezer, Garden Cities of Tomorrow, MIT Press, Cambridge, MA
16. Hughes, Corin, Transport Design, Stanton Studio Vista: London, Reinhold Pub. Corp., NY
17. Johnson-Marshall, Percy, Rebuilding Cities, Aldine Publishing Company
18. Lewis, Philip H., et. al., Regional Design for Human Impact, U.S. Department of Interior, National Park Service
19. Liston, Robert A., Downtown, Delacarte Press
20. Lynch, Kevin, The Image of the City, MIT Press
21. McHarg, Iam, Design With Nature, Natural History Press
22. Myerson, Martin, Face of the Metropolis, Random House Publishing Company
23. Nairn, Iam, The American Landscape, Random House Publishing Company

24. Nairn, Iam, American Townscape, Random House Publishing Company

25. Our Man-Made Environment, Book Seven, Group for Environmental Education, Philadelphia, PA

26. Richards, Brian, New Movement in Cities, Reinhold Pub. Corp., NY

27. Rienow, Robert & Laona, Moment in the Sun, Sierra Club, Ballantine Book

28. Rowland, Kurt, Looking and Seeing, Set of Four - Pattern and Shape, Development of Shape, Shapes We Need, and Shapes of Towns, Reinhold Pub. Co.

29. Rudofsky, Bernard, Streets for People, Doubleday & Company, Inc.

30. Smithson, Alison & Peter, Urban Structures, Reinhold Pub. Corp., NY

31. Stein, Clarence S., Toward New Towns for America, MIT Press

32. Tretten, Rudie W., Cities in Crisis, Prentice Hall Inc.

33. Weaver, Robert C., The Urban Complex, Doubleday & Company, Inc.

34. Wrong, Dennis H., Population and Society, Random House

B. Non-print materials

1. Films

a. A Child Went Forth, American Institute of Architects

b. All the Difference, Modern Talking Picture Service Inc.

c. Boomsville, Learning Corporation of America

d. La Cuidad (The City), A.V.P. Inc.

e. Like Rings on Water, Pyramid Films

f. Little Man, Big City, CMC Columbia University Press

g. No Time for Ugliness, American Institute of Architects

h. Open Space: Going. . .Going, Modern Talking Pictures

i. The Park, Ace Films, Inc.

2. Filmstrips

a. A City is Many Things, Imperial Film Company

b. America's Urban Crisis, Singer SVE

c. Art and Man (The City), Scholastic Magazines

d. Environment: Changing Man's Values, Guidance Associates

e. Environmental Pollution, Wards Natural Science Establishment

f. Man and Living Things, Guidance Associates

g. Man in the Biosphere, Wards Natural Science Establishment

h. Man in the Biosphere, Guidance Associates

i. Man-made World, International Film Bureau

j. Man's Natural Environment, Guidance Associates

k. Man, Technology and Pollution, Hubbard Scientific Company

l. People Problem, Guidance Associates

m. Prosperity Equals Pollution, Multi-Media Productions Inc.

n. The Automobile: Beyond Air Pollution, Multi-Media Productions Inc.

o. What is Air Pollution, Multi-Media Productions Inc.

3. Film loops

a. Design in the Environment, Awareness Series, Hester and Associates

b. Man and His Environment, Awareness Series, Hester and Associates

4. Other

a. Man and His Environment (book and record), Association of Classroom Teachers, National Education Association

FIRST DRAFT

Component 5: Aesthetic Discrimination

I. Rationale

Aesthetic discrimination is the perception and selection of what is pleasing and self-satisfying within the environment. It provides an awareness which is a foundation for making sound decisions regarding life styles and environments. It is built upon perceptual awareness and is fostered by a human and creative learning atmosphere. This component is fundamental to and interwoven with the other components. (Example - spider webs are aesthetically attractive, but also are a functional necessity to the spider's life style.)

II. Goals

Every student, through the processes of perceiving and valuing, should be able to aesthetically discriminate in a way which relates to a quality environment.

III. Objectives

A. To develop an appreciation of the harmony, beauty and order within the natural environment

B. To relate this refined appreciation to the man-made environment

C. To promote the idea of stewardship of the land and a kinship with the creatures of the earth

D. To develop the ability to recognize the potentialities and limitations of the biophysical aspects of the earth prior to man's intrusion upon it

E. To show the importance of diversity in design of the natural and urban environments

IV. Content

A. Knowledge

1. Design and function

2. Colors, texture and form found in natural materials

3. Man-made forms

4. Harmony in the natural environment

5. Special interests of children

6. Art heritage

7. Human and animal characteristics and forms

B. Skills: observing, interpreting, communicating, classifying, valuing

V. Instructional Strategies

A. Use of simulations which involve value clarification (e.g., baroness and the baron)

B. Assigned readings - The Singing Wilderness (Sierra Club Books), etc.

C. Reflect the atmosphere in the classroom to foster aesthetic discrimination and valuing

D. Art projects which use materials from nature (e.g., making mobiles from natural materials, crafts, etc.)

E. Use individualized cards from Environmental Studies (Boulder)

F. Show non-narrative films (e.g., film of Grand Canyon)

G. Have students produce films and collect natural sounds for sound tracks

H. Have a student centered activity in evaluating the aesthetic aspects of their own school campus giving reasons and rationale

I. Use optical equipment to enhance aesthetics (e.g., hand lenses, binoculars, stereo microscopes)

J. Organize field excursions at times other than the school day (e.g., early morning - late evening). May also include extended field trips.

K. Rejuvinate old time crafts (e.g., bucket-homemade ice cream, butter, cheese-sauerkraut, meat curing, edible wild plants, utilization of hand tools, make maple syrup, fox fire

L. Photograph nature as well as impositions on nature

M. Design a building to fit into a natural setting

N. Design a model city as in Integrating Man and Land (Environmental Science Center, Golden Valley)

O. Relate planning experiences to the student's own city

P. Have mathematics teachers relate symmetry and geometric forms to the natural environment

Q. Recycled art (old cans, etc.)

R. Relate structure to function in an aesthetic manner

S. Compare the aesthetic values of signs in the community and design more desirable ones

VI. Instructional Resources

A. Print materials

1. Elementary

a. Burton, Maurice, Animal Partnerships, Frederick Warne & Co. Ltd: New York, 1969

b. Carr, Donald, Death of Sweet Waters, W.W. Norton Co., Inc., New York, 1966, (DPI Art Bibliography)

c. Darling, Lois and Louis, A Place in the Sun, William Morrow & Co., 1968

d. Elementary Science Study, A Working Guide, McGraw-Hill Company

e. Rowland, Kurt, Learning to See, Vol. 1-5, VanNostrand, 1968

2. Secondary

a. Carr, Donald, Breath of Life, W.W. Norton Co., Inc., New York, 1965, (DPI Art Bibliography)

b. Crisler, Lois, Artic Wild, Harper and Brothers, New York, 1958

c. McLuhan, T.C., Touch the Earth, Outerbridge and Dienstfrey, 1971

d. Mead, Margaret, Culture and Commitment, Natural History Press/Doubleday & Company, Inc., Garden City, New York, 1970

e. Stevens, Mary Otis and Thomas McNulty, World of Variation (DPI Art Bibliography)

f. Watts, May Theilgaard, Reading the Landscape, The MacMillan Company, 1970

3. Elementary and Secondary

a. Aslin, Elizabeth, The Aesthetic Movement (DPI Art Bibliography)

b. Baumgart, Fritz, A History of Architectural Styles, (DPI Art Bibliography)

c. Bevlin, Marjorie Elliol, Design Through Discovery (DPI Art Bibliography)

d. Blake, Peter, Gods Own Junkyard, 1964, (DPI Art Bibliography)

e. Burnham, Jack, Structure of Art, George Braziller, Inc. (DPI Art Bibliography)

f. Guyler, Vivian, Design in Nature, Davis Publishing Company, 50 Portland Street, Worcester, Massachusetts (DPI Art Bibliography)

g. Keps, Georgy, Editor, Vision + Value, (DPI Art Bibliography)

h. Leopold, Aldo, A Sand County Almanac, Ballantine Books

i. Linderman, Earl & Don Heberholg, Developing Artistic & Perceptual Awareness (DPI Art Bibliography)

j. Littell, Joy and Sarah Solotaroff (ed.), The Environment, McDorgal, Littell & Company, Evanston, IL

k. Maxwell, Gavin, Ring of Bright Water, Fawcett Publications, Inc., Greenwich, CT

l. McHarg, Ian, Design With Nature (DPI Art Bibliography)

m. Middleton, Michael, Group Practice for Design (DPI Art Bibliography)

n. Nairn, Ian, The American Landscape (DPI Art Bibliography)

o. Nearing, Helen and Scott, Living the Good Life, Shocken Books, Inc., 1971

p. Pringle, Laurence, Ecology-Science of Survival, MacMillan, 1971

q. Raths, Louis E., Merrill Harmin, Sidney B. Simon, Values and Teaching, Charles E. Merrill Publishing Company, 1966

r. Reiner, Thomas A., The Place of the Ideal Community in Urban Planning, 1963

s. Samples, Robert, et. al., Environmental Studies, Volumes 1-4, American Geological Institute, Boulder, CO, 1971

t. Schutz, William, Joy: Expanding Human Awareness, Grove, 1967

u. Schwartz, William, Voices for the Wilderness, Ballantine Books, New York, 1969

v. Shepard, Paul, Man in the Landscape, Ballantine Books, New York, 1967

w. Shinno, Tat, Flower Arrangements to Copy, Doubleday and Company, Inc.

x. Storer, John H., The Web of Life, Devin-Adair Company, New York, 1962

y. Udall, Stewart L., The Quiet Crisis, 1963 (DPI Art Bibliography)

z. Wright, Frank Lloyd, Architecture, Man in Possession of His Earth, 1962, (DPI Art Bibliography)

The following print materials are from Environmental and Outdoor Education Materials Company, Dowling, MI

aa. Aldrich and Aldrich, Creating With Cattails, Cones, Pods

bb. Angier, Free for the Eating

cc. Audubon Guide Books, Manual of Outdoor Interpretation

dd. Carrigher, Icebound Summer

ee. Cutler, From Petals to Pine Cones

ff. Gibbons, Stalking the Blue-eyed Scallop

gg. Gibbons, Stalking the Healthful Herbs

hh. Gibbons, Stalking the Wild Asparagus

ii. Graves, Goodbye to a River

jj. Hay, The Great Beach

kk. Hess, How to Point with Natural Earths and Sands

ll. Linton, Photographing Nature

mm. Norbeck, Book of Indian Life Crafts

nn. Reich, The Greening of America

oo. Rood, Wild Brother

pp. Shomon, Open Land for Urban America

qq. Stribling, Art From Materials Discarded and Natural

rr. Teal and Teal, Life and Death of a Salt Marsh

B. Non-Print Materials

1. Films

a. Natures Half Acre, Walt Disney

b. All the Difference, Modern Taling Pictures

c. Like Rings on Water, Pyramid Films

2. Film loops

a. Awareness Series, Hester and Associates

b. Design in Our Environment, Hester and Associates

3. Multi-media

a. Arts in Society, Komarck-Edward

b. Art and the Environment, UW-Extension

c. Our Environment 3 - Aesthetics, EMC Corp.

COMPONENT 6: Humanism

I. Rationale

There is a need to humanize education by examining the values of man that give meaning and purpose to his life. This need centers around judging others as individuals rather than by race, power, status or religion. Man is an evolutionary product and a part of his environment. As such, he can only achieve and sustain a high quality of life through harmonious interaction with the factors that contribute to the total welfare of the community. This must result from the implementation of reason and scientific thought in an environment of trust and human dignity. The fostering of a questioning attitude toward basic assumptions and conditions should permeate the whole of society.

II. Goals

A. To develop the self concept, confidence and self respect of the individual

B. To foster an understanding of the influence of culture on an individual's environment

C. To develop understanding of the psychological factors contributing to a sense of self worth

D. To emphasize that there is a possibility of beneficial change in all environments

E. To aid the individual in developing a strong sense of ethics and social values

F. To develop individuals who are self-reliant but also open to suggestions from others

III. Objectives

A. To help the individual to develop his concept of life quality

B. To clarify the role of humanistic behavior in a materialistic society

C. To demonstrate the constant need for critical analysis of the assumptions we hold about the environment

D. To clarify the individual needs which must be fulfilled by the environment

E. To develop understanding of the importance of respect for the individual

F. To develop understanding of the responsibility of each individual to society

G. To develop the use of reason and scientific thought in the examination of environmental questions

H. To clarify the relationship between natural laws and humanistic principles

IV. Content

A. Knowledge

1. A study of ethics (behavior)

a. Puritan ethic

b. Work ethic

c. Developmental ethic (exploitive)

d. Preservation or conservation ethic

e. Equilibrium ethic

f. Land ethic

g. Other cultural systems of ethics

2. Philosophy of man in nature

a. Historical background in the U.S. - Thoreau, Emerson, Frank Lloyd Wright, Jefferson, Hobbes, etc.

b. In other cultures

3. Individual has specific needs, which need to be fulfilled from the environment

a. Aesthetic

b. Biological

c. Self-esteem

4. Effect of the immediate environment on the individual

5. Examination and assessment of the social-cultural myths and premises underlying our economic and social-cultural problems

6. Relation of natural laws to humanistic principles

B. Values

1. Value clarification

a. Teacher

b. Student

c. Society (mores)

d. Social conflicts (e.g., honesty, cheating)

2. Investigation o uman value conflicts in environmental issues

3. Psychological factors contributing to a sense of self worth

4. Fostering self-concepts

a. Cultivating student interests

b. Dignity

c. Self-expression

e. Discovery

f. Experience

g. Questioning

h. Confidence

i. Motivation

5. Fostering respect for human relationships

a. Rights

b. Property

c. Beliefs of others

d. Inclusion and exclusion (clique)

C. Skills

1. Communication and interaction

2. Utilization of resource materials

3. Valuing

4. Listening

5. Observing

6. Awareness

7. Interpreting

"Are you trying to tell me that human relations are more important than public relations?"

SR/JUNE 3, 1972

V. Instructional Strategies

A. Pupil centered

1. Independent studies

2. Student need oriented

B. Develop communication and trust between the teacher and the student (teacher rejects authority role)

C. Teachers are both teachers and learners, students are both learners and teachers

D. Flexibility of physical surroundings to meet student need (e.g., change seating arrangement)

E. Freedom of expression and investigation

F. Value clarification

G. Emphasis of the role of the individual in school and society (e.g., role playing)

H. Fostering self-concepts

I. Implementation of reason and scientific thought

V. Instructional Resources

A. Print materials

1. Becker, Ernest, The Birth and Death of Meaning, Free Press Books, New York

2. Bessell, Harold, Human Development Program, Human Development Training Institute, San Diego, CA

3. Bessell, Harold, Methods on Human Development, Human Development Training Institute, San Diego, CA

4. Borton, Terry, Reach, Touch and Teach, McGraw Hill

5. Boy, Angelo, Expanding the Self: Personal Growth For Teachers, Brown Books, Dubuque, IA

6. Brown, George, Human Teaching for Human Learning: An Introduction to Confluent Education, Viking Press, New York, NY

7. Combs, Arthur, Editor, Perceiving, Behaving and Becoming, Association of Supervision of Curriculum Development, 1201 Sixteenth Street, N.W., Washington, D.C.

8. Dasman, Raymond, A Different Kind of Country, MacMillan Company

9. Disch, Robert, The Ecological Conscience: Values for Survival, Prentice Hall

10. Dubos, Rene, So Human An Animal, Doubleday, 1969

11. Fantini, Mario, Making Urban Schools Work, Holt Reinhart

12. Ficker, Victor, Social Science and Urban Crisis, MacMillan, 1971

13. Glasser, William, Schools Without Failure, Harper

14. Higbee, Edward, A Question of Priorities, Morrow Books, 1970

15. Holt, John, How Children Fail and How Children Learn, Delta Books

16. Hunter, Elizabeth, Encounter in the Classroom: New Ways of Teaching, Holt Reinhart

17. Izaak Walton League of America, E.P., The New Conservation, 1971

18. Keller, Suzanne, The Urban Neighborhood: A Sociological Perspective, Random House, 1968

19. Khare, R., Editor, Environmental Quality and Social Responsibility, U.W.-Green Bay

20. Kohl, The Open Classroom, Vintage Books

21. Leopold, Aldo, A Sand County Almanac, Ballantine Books

22. Lyon, Harold, Learning to Feel - Feeling to Learn, Charles Merrill

23. Marine, Gene, America the Raped, Avon Books

24. Maslow, Abe, Toward a Psychology of Being, Van Nostrand

25. McHarg, Ian, Design with Nature, Natural History Press, 1969

26. McGinnis, Noel, You Are An Environment, Center for Curriculum Design, Box 350, Evanston, IL

27. Michelson, William, Man and His Environment: A Sociological Approach, Addison-Wesley, 1970

28. Pahl, Ray, Readings in Urban Sociology, Pergamon Press, Oxford, NY

29. Piele, Editor, Social and Technological Change, University of Oregon

30. Postman & Weingartner, Teaching As A Subversive Activity, Delta Books

31. Potter, Bioethics: Bridge to the Future, Prentice Hall

32. Reich, Charles, The Greening of America

33. Rogers, Carl, Freedom to Learn, Charles Merrill

34. Roth, Louis, Values and Teaching: Working with Values in the Classroom, Charles Merrill

35. Samples, Robert, The Cutting Edge, Environmental Studies, Box 1559, Boulder, CO 80302

36. Schmuck, Richard, Group Process in the Classroom, Brown Books, Dubuque, IA

37. Shostron, Everett, Man the Manipulator

38. Stone, Glenn, Editor, A New Ethic for a New Earth, Faith-Man-Nature, Cider Mill Road, Andover, CT

39. Swatek, Paul, The Users Guide to the Protection of the Environment, Ballantine Books

40. Terry, Mark, Teaching for Survival, Ballantine Books, 1971

41. Theobald, Robert, An Alternative Future for America, Swallow Press

42. Toffler, Alvin, Future Shock, Random House

43. Torrance, Paul, Encouraging Creativity in the Classroom, Brown Books

44. Udall, Stewart, The Quiet Crisis, Avon Books

45. White, Morton, Intellectual vs. the City, Mentor Books

B. Non-print materials

1. Films

a. All the Difference (Kodak), Modern Talking Pictures

b. Ark, Arthur Barr

c. Boomsville, Learning Corporation of America

d. Like Rings on Water, Pyramid Film Company

e. Little Man, Big City, CMC Columbia Univ. Press

f. Maslow and Self Actualization (2)

(1) Honesty and Awareness

(2) Freedom and Trust

2. Filmstrips

a. Can Man and Nature Co-exist?, Current Affairs Films

b. Crisis of the Environment, New York Times Educational Program

c. Environment: Changing Man's Values, Guidance Associates, Pleasantville, NY

d. Man-Made World, International Film Bureau, Chicago, IL

e. The Wisdom of Wildness, Guidance Associates, Pleasantville, NY

3. Cassettes

a. Man, An Endangered Species, (8 tapes), Amidon Associates

b. The Environment of Man, (6 tapes), Amidon Associates

c. Urban Problems, (6 tapes), Amidon Associates

COMPONENT 7: Fostering Creative Abilities and Attitudes

I. Rationale

Environmental education must involve students in experiencing many facets of their environment. This involvement should emphasize that environmental situations and the problems that arise from them are very complex and that there are no simple solutions to any of them. Therefore attempts to solve these complex problems require that students participate in creative activities to explore the many complexities of these problems and develop creative attitudes toward seeking alternative, open-ended solutions to them. Such creative activities and attitudes are more likely to be found in an educational environment which fosters excitement, wonder, and a joy of learning.

II. Goals

A. To assist the student in developing self-confidence in organizing various approaches to problems and to increase his or her independence from the teacher.

B. To support enthusiasm and love for inquiry and learning.

C. To recognize that complex and interrelated problems do not lend themselves to simple solutions.

D. To acquaint students with a wide variety of techniques and skills to encourage creative approaches to problem solving.

E. To foster divergent thinking in order to encourage multiple approaches to seeking solutions to problems.

III. Objectives

A. To incorporate all senses and art forms in communicating and interpreting observations of nature.

B. To encourage students to value the results of their own thinking.

C. To allow students freedom to employ alternative methods to arrive at solutions.

D. To expose students to a broad spectrum of experiences so that they will be open to alternative approaches and solutions to problems.

E. To encourage students to periodically re-examine their prior conclusions so as to assess their suitability.

IV. Components and Instructional Strategies

A. Knowledge

1. Guidelines

a. Develop a creative environment to free students to function as individuals.

b. Interpret observations in the environment through the use of all art forms and the students' senses.

c. Invite more controversy into the classroom.

d. Develop aesthetic values through involvement with the natural environment.

e. Implement various creative approaches to problem solving.

f. Investigate the cultural restraints to the environment.

g. Encourage individuals to relate to both sides of an issue.

h. Utilize independent study and/or research in investigation of problems.

i. Orient students to give consideration to the future consequences of present solutions to environmental problems.

2. Techniques

a. Use of available research data to foster discussion and investigation.

b. Use of inquiry techniques in discussion.

c. Use of feasibility studies.

d. Assistance to students in assessing theories and assumptions.

e. Development of UNIPACS and Learning Activity Packages (LAP).

f. Encouragement of individual processes rather than recipes.

g. Development of the process of divergent rather than convergent questioning.

h. Utilization of the concept of open-endedness in questions, projects, and experiments.

B. Values

1. Guidelines

a. Valuing by the teacher of an open and trusting interpersonal relationship with students.

b. Willingness of teacher to accept student ideas as to modifications of procedures, content, and classroom structure.

c. Inclusion of aesthetic values in observation and study of the environment.

d. Individualizing of instruction.

e. Providing decision-making experiences

(1) which allow the use of alternative methods to arrive at a solution.

(2) which encourage individual opinions in arriving at a group concensus.

f. Encourage students to value the results of their own thinking.

C. Skills

1. Techniques

a. Student devised projects, experiments, and materials.

(1) Models

(2) Art forms

(3) Photographic essays

(4) Audio and videa tape recordings

(5) Slides

(6) Slide-tape presentations

(7) 8 mm. (super-8) movies

(8) Class newspaper

(9) Creative writing

(10) Diary or log

(11) Project fair

(12) Crossword puzzles and scramblers

(13) Opinion surveys

(14) Research and independent study

(15) Extracurricular club projects (4-H, etc.)

(16) Puppet shows

(17) Graphing - charting - mapping

(18) Leisure time activities

(19) Bulletin boards

(20) Role playing and dramatics

(21) Bibliography

(22) Field trips

(23) Spelling bee

(24) Beautification project (landscaping)

(25) Debate - formal

(26) Recycling drives

b. Teacher-assisted projects

(1) Traffic pattern designs to facilitate freedom of movement.

(2) Encouragement of creativity in staff and through workshops.

(3) Role playing

(4) Use of community resources

(5) Public relations

(6) Simulation games and problem solving.

(7) Brainstorming

(8) Large and small group dynamics

(9) Cultivation of aesthetic values

V. Resources

A. Free source guides

1. ERIC - Columbus, Ohio and Tuscon, Arizona
2. Educators Guide to Free Materials - Educators Progress Service, Randolph, Wisconsin
3. NYCEM index - Stanford

B. Industry (materials, literature, data).

1. Aluminum Association of America
2. Westinghouse
3. Olin-Matheson Corp.
4. Weyerhauser
5. American Petroleum Association
6. Wisconsin Valley Improvement, Wausau, Wisconsin

C. Governmental agencies (local, state, federal)

1. T.V.A.
2. National Park Service
3. Department of Natural Resources (each state)
4. U. S. Department of Interior
5. U. S. Department of Agriculture
6. Local planning and zoning boards

D. Classroom, school, community libraries.

E. Books of activities (see H below for additional sources)

1. Tips and Tricks in Outdoor Education, Interstate Publishers, Danville, Ill.
2. Environmental Education - Curriculum and Teaching Activities, CESA 12, Portage, Wisconsin
3. E. P. The New Conservation - Izaak Walton League

F. State Departments of Education

G. Film libraries, regional, university

H. Educational publishers

1. Houghton, Mifflin
2. Holt, Rinehart, Winston
3. Interstate Publishers, Danville, Ill.
4. Rand McNally

I. Environmental Societies (national, regional, local)

1. National Audubon Society, 1130 Fifth Avenue, New York, New York 10028
2. Friends of the Earth, 30 East 42nd Street, New York, New York 10028
3. The Nature Conservancy, 1522 K Street, N.W., Washington, D. C. 20036
4. Sierra Club, 1050 Mills Tower, San Francisco, California 94104
5. Wilderness Society, 729 15th Street, N.W., Washington, D. C. 20005
6. National Parks Assoc., 1701 18th Street, N.W., Washington, D. C. 20009
7. The Izaak Walton League of Am., 1326 Waukegan Road, Glenview, Ill. 60025
8. Zero Population Growth (ZPG), 367 State Street, Los Altos, California 94022

J. Scientific Supply Companies (hardware)

1. Wards Scientific
2. NASCO - Fort Atkinson, Wisconsin

(other standard suppliers)

K. Audio-visual Supply Companies (hardware)

1. Solar-Cine
2. Bell and Howell
3. Kodak
4. Singer Graflex
5. Polaroid - land

L. Audio-visual Supply Companies (software)

1. Eye-Gate
2. Kodak
3. 3-M Company
4. Avid Corporation, Providence, Rhode Island

M. Periodicals

1. Ranger Rick, National Wildlife Association
2. Curious Naturalist, Massachusetts Audubon Society
3. Instructor
4. Science and Children
5. Science Teacher

N. Book jobbers

1. Environmental and Outdoor Education Materials Company, Dowling, Mich. 49050
2. Demco (Regional offices)
3. Gordon Flesch Company, Madison, Wisconsin
4. DeWolf and Fisk

C. Community Resources (zoos, museums, arboretae, hobbyists, historical soc.)

P. National Curriculum Study Groups

1. SCIS - Rand, McNally
2. ESS - McGraw Hill
3. AAAS - Xerox Corporation
4. EDC - Newton, Massachusetts
5. BSCS - Green version, Rand McNally
6. ESCP - Houghton Mifflin
7. ISCS - Silver Burdette
8. Environmental Studies Project, Box 1559, Boulder, Colorado 80302

Q. Film rental sources

1. Indiana University, Audio-Visual Center, Bloomington, Illinois 47401
2. Modern Talking Picture Service, Inc., c/o Roa's Films, 1696 N. Astor St.
3. Shell Film Library, 450 North Meridian Street, Indianapolis, Indiana
4. Association-Sterling Films, 6420 West Lake Street, St. Louis Park, Minnesota 55426
5. UW - Bureau of Audio Visual Instruction, P. O. Box 2093, Madison, Wisconsin 53701

COMPONENT 8: Organizational Skills and Knowledge

I. Rationale

Environmental quality deteriorates as man increases his impact on the natural resources. If man is effecting changes in the environment which threaten his own well being and ultimately his survival, then it is important for man to be able to organize studies of his impacts on the environment so he can make rational decisions regarding them.

II. Goals

A. To familiarize the learner with the methods of investigation and problem solution.

B. To direct attention to processes and procedures for assessing environmental quality.

C. To examine various methods of environmental quality control.

D. To examine the role of environmental planning and design as a device for maintaining a healthy environment fit for man.

E. To establish the teacher and the school as facilitators in developing (1) skills in environmental analysis and design, (2) knowledge of environmental regulative options and (3) the ability to evaluate the usefulness of these skills and knowledge in environmental problem solving.

F. To establish the role of the various disciplines at all grade levels as necessary contributors to the total development of the learner.

G. To examine the role of the school as an active agent contributing to investigating community environmental problems and suggesting solutions.

III. Objectives

A. To develop skills in using problems as the vehicle for environmental studies within the multidisciplinary mode.

B. To develop skills in identifying environmental problems and their components.

C. To develop skills for identifying and applying useful environmental analytical procedures including those useable at various student achievement levels.

D. Using a creative approach to develop skills for identifying environmentally harmonious alternatives.

E. To communicate alternative problem solutions as options available to the decision making process.

F. To involve learners in environmental analysis and design through a direct problem encounter.

IV. Content

A. Techniques for identifying environmental problem areas.

B. Techniques for investigating environmental problems and their impact on society.

1. Methods for collecting and analyzing biological, chemical and physical data
2. Methods for collecting and identifying effects of environmental changes on the human community
3. Procedures for communicating data and its assessment to action agencies and the general public
4. Identifying resources which deepen understanding procedures for interacting factors which produce environmental quality changes
5. Mapping, etc.

C. Techniques for developing regulative devices effective in environmental quality control.

1. Technological factors (hardware and processes)
2. Political processes
3. Legal tools
4. Communicative tools
5. Applying mathematics
6. Economics, incentives and methods

7. Role of regulatory agencies

8. Role of non-governmental agency

D. Processes for environmental planning and management

1. Analysis of data

2. Application of analysis information

3. Modeling

4. The role of zoning

5. Planning agencies

6. Role of informational services in extending knowledge of zoning-planning

7. Considerations of human needs-wants in planning processes

8. Consideration of environmental impacts and the role of the environmental impact statements

V. Instructional Strategies

A. Problem identification

1. Provide suggestions for identifying environmental problems and their components

2. Develop the concept of problem orientation as a teaching vehicle for applying learning skills and knowledge

3. Discuss a variety of environmental problems facing society

a. water quality
b. food production
c. energy crisis
d. air quality
e. population growth
f. population distribution
g. cultural demands
h. pesticides
i. solid wastes
j. land use
k. limited resources
l. noise
m. others

4. Identify sample problems for demonstrating problem investigation methods. (Water quality is used in this outline as the demonstration vehicle.)

5. Investigate environmental principles involved in maintaining a well working system in the problem area. (For water, use Understanding Lakes and Lake Problems - see bibliography.) Assign pp. 4-16 as optional prior reading before class session. Consult other manuals for details on aquatic ecosystems and their operation.

6. Examine scope of problem and identify problem components. (Use visual aid - Singer filmstrip-cassette "Water Pollution - A Complex Problem" A202-3-SD-CM. Use "Water Pollution" by Lavaroni, O'Donnell & Lindberg - Addison-Wesley pub. (junior high level). Incorporate local issues from the press and television. Optional prior readings may also include (senior high level) "Ecology, Pollution, Environment" by Turk, Turk & Wittes. "Water Use, Principles & Guidelines for Planning & Management in Wisconsin" by Wisconsin Chapter of Soil Conservation Society of America, Madison, Wisconsin. Teacher level.

B. Methodology for attaching environmental problems

(The case study method serves as an example of an instructional vehicle. Direct field and community investigations are recommended for local situations when possible.)

1. Environmental analysis: finding out what's wrong.

   a. Provide experimental encounter with simple water quality study methods which provide significant and easily understood data. Provide a variety of optional techniques useable according to the interest and ability of the teacher. Use simple water quality tests for dissolved oxygen, temperature, turbidity, pH, phosphates, etc. as demonstrators of materials and techniques useable by students for direct physical data collection. Involve teachers directly in testing procedures using water samples brought in if field experience is not possible.

   b. Provide a variety of real data from an actual study, preferably local. This data should include scientific survey data, photographs,

statistics, interviews, maps, media, articles, agency reports, environmental impact statements, economic impact data, tax rates, climate factors, etc. Include as wide a range of data components as possible. Provide information on investigative tools and methods including a variety of techniques and tools that can be used by students at their achievement level. This data bank should represent information gathered from many disciplines.

Set small teams to work compiling and interpreting data according to category, i.e., scientific data, mapping data, economic factors, communications, etc. Study groups should report this analysis to the whole group. Good interpretation provides the raw materials needed for selecting regulative methods adequate to accomplish problem abatement and improve the problem situation.

2. Environmental control: the ways to end the mess

   a. Present short film or filmstrip on methods for controlling water pollution, e.g., Its Your Decision: Clean Waters, League of Women Voters 1966, 14½ minutes, free to civic organizations

   b. River Must Live, Shell Film Library

   c. Open Your Eyes Series, (Sound Filmstrip), AVID Corporation, 10 Tripps Lane, East Providence, Rhode Island

   d. Small group resource search. Investigate appropriate control methods useful for pollution abatement and improvment of water quality. Use newspaper reprints, popular and technical magazines, reports, books, industrial flyers, diagrams and charts. Provide samples of control methods from the various disciplines. Provide samples of the same appropriate to student use.

      -- technical method

      -- engineering design and construction of facilities

      -- mathematical applications, e.g., flow rates, absorption

capacities, costs time factors and implementation schedules

-- laws and regulations

-- enforcement methods and agencies

-- political procedures and how to make them count

-- the role of the media

-- individual action

-- economics and economic incentives

-- tax factors

-- zoning

-- non-governmental agencies

-- the role of the school

-- behavioral change and changing consumer demand

e. The resource search investigates the control options available to the community for solving an environmental problem. Sub-groups summarize and report these options to the group.

3. Environmental designs

When the level of the problem is known (environmental analysis) and the options for control under the present technology are clarified, the next step, environmental design, prepares alternative designs or plans using various control methods to outline the steps necessary for solving the environmental problem.

(Sample class procedure options)

Option A:

Plan a panel discussion with planners and environmental specialists who are working on the real situation, e.g., lawyer, government representative, water quality investigator, regional planner, director of water treatment facility. Panel and class exchange ideas based on class interpretation of case study and professional analysis of situation. Various design features are explored. A set of alternate approaches

incorporating various control procedures and potentials is roughed out. Place stress on setting up planning options which can be submitted to decision making procedures. No decisions are attempted at this time.

Option B:

Review films, filmstrips, video-tapes, etc. on planning and design possibilities related to the problem area with discussion as to how analysis and control procedures studies fit into the situation. E.g., film - It's the Greatest Little City, Ohio State University Department of Photography.

Option C:

Continue case study method with sub-groups planning various aspects of a real or imaginary water resource control system based on previous investigation.

VI. Instructional Resources

A. Print Materials

1. Elementary

a. Johnson & Mann-Ecolab-(Kit), grades 3-6, Benific Press

b. Pringle, Laurence, The Only Earth We Have, MacMillan Company, New York, 1969

c. Mine Publications, Pollution, 25 Groveland Terrace, Minneapolis, MN 55403, pp. 65-76

d. American Water Works Association, 2 Park Avenue, New York 16, NY, The Story of Water Supply

e. Environmental Protection Agency, Region 7, 911 Walnut, Kansas City, MO 64106, Walter Waterdrop Coloring Book

2. Secondary

a. Andrews, William A., Freshwater Ecology, Prentice Hall, Inc., 1972

b. American Chemical Society, Cleaning Our Environment, American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036, 1969, $2.75

c. Detwyler, Thomas R., Man's Impact on Environment, McGraw Hill, 1971

d. Davis and Day, Water, the Mirror of Science, Doubleday and Company, New York, 1961

e. Reid, George, Ecology of Inland Waters and Estuaries, Guinn Company, Inc., New York, 1967

f. Bardach, John, Downstream, Grosset and Dunlap, New York, 1964

g. Turk and Wittes, Ecology, Pollution, Environment, W.B. Saunders Co., Philadelphia, 1972

h. Institute for Environmental Education, Curriculum Activities Guide to Water Pollution and Environmental Studies, Cleveland, Ohio, 1971

i. McCue, George, The Freshwaters and Man, Benoziger, Inc., New York, Beverly Hills, 1971

j. Addison, Wesley Publishing Company, Menlo Park, CA, Water Pollution, 1971

k. Superintendent of Documents, Government Printing Office, Washington, D.C. 20402

(1) Methods for Collection and Analysis of Water Samples for Dissolved Minerals and Gases

(2) Practical Guide to Water Quality Studies of Streams

(3) The Practice of Water Pollution Biology

l. Wisconsin Department of Public Instruction, Pollution: Problems, Projects and Mathematical Exercises, Publications Sales, 126 Langdon Street, Madison, WI 53702, $ .50

3. Elementary and Secondary

a. Eastman Kodak Company, 454 State Street, Rochester, NY 14605, Fight Pollution With Pictures

b. Silver Burdett Company, Park Ridge, IL, Environmental Education Picture Packet

c. Supt. of Documents, Government Printing Office, Washington, D.C. 20402, A Primer on Waste Water Treatment

B. Catalogs

1. Hach Chemical Company, Box 907, Ames, Iowa 50010, Water Test Kits
2. Nasco, Fort Atkinson, WI 53538, General Scientific Supplies

COMPONENT 9: Decision Making

I. Rationale

The development of decision making skills is necessary in preparing students to participate in the problem-solving process in their communities, states and nation. These skills include applying the knowledge, processes and values embodied in the arts, sciences and social sciences toward the resolution of environmental problems.

II. Goals

To develop an awareness of environmental problems and a personal commitment to their solution.

III. Objectives

A. To involve students in clarifying what they value in the environment. This evaluation should involve the democratic process.

B. To identify conflict groups in decision making. (Special interest groups might be the various disciplines in the school.)

C. To define the role of the school in solving the community's problems.

D. To define the role of science and technology in relation to causes and solution of environmental problems.

E. To stimulate an awareness of environmental influences and limiting factors.

IV-V. Content

A. Experiences relating to the basic environmental problems

1. Brainstorm with the class for subject material

2. Search out in your school and/or community solvable environmental problems that can be presented to the group

a. school problems (waste, crowding, etc.)

b. sewerage treatment

c. freeway proposal

d. industrial pollution

e. auto pollution

3. Show how the problem is affected by interrelationships among living and non-living things

B. The student should gain basic knowledge as a basis for understanding broader concepts and ideas pertaining to environmental problems.

1. Determine the validity of the data

2. The following techniques should be considered and used where appropriate

a. interview men on the street, city official, industrialists, etc.

b. surveys - attitudes, awareness, data

c. testing water samples, etc.

d. analyze previous data (sources, sewerage treatment, plant data, etc.)

e. solicit expert help - EPA, DNR, etc.

f. construct maps, land use, ariel soil, etc.

g. develop a cruising survey - personal observation, etc.

h. utilize resource material (textbooks)

C. As a student gains knowledge of man's relationships to the environment, imbalances which are creating problems should be recognized.

1. Population growth magnifies pollution problems

2. Pollution problems persist

3. Resource depletion is inevitable

4. Our environment is becoming continually less asthetic and healthy

5. Economic feasibility complicates solutions o environmental problems

D. The student should consider a variety of possible solutions.

1. Investigate all the possible solutions

2. The following factors should be considered in evaluating the solutions

a. ecological

b. social

c. political

d. psychological

e. philosophical

f. geographical

g. biological

h. economical

i. ethical

E. The student should clarify his own values and values of society before considering possible solutions to the problems. The teacher should provide guidance in the process of value clarification.

1. Help the student become aware of the values that other people use in arriving at solutions to environmental problems.

a. interest group simulation games

b. role playing

2. Help the individual student to decide what he values in the environment.

3. Help students realize that final action taken will be based on an assessment of the feasibility, consequences and values underlying the action.

4. Help the individual student realize that commitment may involve changes in life style

a. recyclable packaging

b. use of mass transportation

c. fewer electronic gadgets

d. organic gardening

F. The student should decide whether the solution necessitates individual or social action and act upon it.

1. Students should develop skills in terms of the following action possibilities

a. legal

b. legislation

c. lobbying

d. election

e. recycling

f. clean up

g. tax incentives

h. protest

i. using interest groups

j. etc.

2. Students should develop skills through teacher-student interaction plans

a. simulation games

b. role playing

c. land use problems

d. construct charts of characteristics of various forms of transportation

e. see bibliography for additional activities

G. The student should continually evaluate his decisions

1. Have we developed an awareness of environmental problems and possible solutions

2. What factors limit the effectiveness of our decision making

3. What further data would enable us to be more assured that we made the best decision

4. Have we done a responsible job in decision making about our environment

5. Is the environment a better place to live because of what we've done

VI. Instructional Resources

A. Print Materials

1. Elementary

2. Secondary

   a. Addison-Wesley, Air Pollution, Water Pollution, Noise Pollution

   b. Brevard County Florida, Social Studies Resource Units, Human Implications of a Threatened Environment

   c. A Catalog of Federal Domestic Assistance, Information Center, OEO, Executive Office of the President, Washington, D.C. 20506

3. Elementary and secondary

   a. Berman, Louise, New Priorities in the Curriculum

   b. "The Crisis of Survival," The Progressive Magazine, Madison, WI, April 1970

   c. DeBell, Garrett, The Environmental Handbook

   d. Fabun, Don, The Dynamics of Change, Prentice-Hall

   e. Guidelines to Environmental Education, University of Washington

   f. Leopold, Aldo, Sand County Almanac

   g. Love, Sam, Earth Tool Kit

   h. Olson, Sigurd, Open Horizons

   i. Mitchell, John G. and Constance Stallings, Eco-Tactics

   j. Raths, Harmin & Simon, Values and Teaching

   k. Rienow, Robert and Leona, Moment in the Sun

   l. Science for Society: A Bibliography by John A. Moore, Commission on Science Education, AAAS

   m. Schoenfeld, Clay, Everybody's Ecology

   n. Thoreau, Henry David, The Portable Thoreau (Viking)

   o. Udall, Stewart, The Quiet Crisis

   p. Wisconsin Department of Public Instruction, Knowledge, Processes and Values

   q. Wright, Frank Lloyd, The Living City

   r. Zuckerman, P.W. & R.E. Horn, The Guide to Simulation Games for Education & Training, Information Resources, Inc., 1675 Massachusetts Ave., Cambridge, MA

B. Non-Print Materials

1. Films

a. How Do Things Get Done, Indiana University A-V Center

b. Little Man, Pan-American Health Organization

c. Progress-Pork Barrel-and Pheasant Feathers, McGraw Hill

d. Bayfield-Face of A Community, University of Wisconsin, Bureau of A-V Instruction

e. Crisis in the Environment

f. Come to Florida Before It's Gone, Indiana A-V Center

2. Filmstrips

a. Crisis of the Environment (SFS), silent filmstrip

3. Simulation games and kits

a. The Coca Cola Simulation Game

b. Predator Prey Ecology Kits, Urban Systems, Inc., 1033 Massachusetts Avenue, Cambridge, MA 02138

c. Extinction, The Game of Ecology, Sinauer Assoc., Inc., Stamford, CT

d. Cities, Dynamic Design Industry, 1433 North Central Park, Anaheim, CA 92802

e. The Planet Management Game, Houghton Mifflin Company, Boston

f. The Redwood Controversy, Houghton Mifflin

g. The Cornell Land Use Game, Misc. Paper No. 3, Center for Housing and Environmental Studies, Division of Urban Studies, Ithaca, NY: Cornell University, n.d.

h. Dube, Richard, "Gaming Urban Systems," Reprint Series of the Institute for Community Development, East Lansing: Michigan State University, No. 30, 1965-66

i. The Water Pollution Game, Urban Systems, Inc., 1033 Massachusetts Ave., Cambridge, MA 02138

j. Population, A Game of Man and Society, Urban Systems, Inc., 1033 Massachusetts Avenue, Cambridge, MA 02138

k. Insight, Games Research, Inc., 48 Wareham Street, Boston, MA

l. Micro-Society, Real World Learning Company, San Carlos, CA

m. The Value Game, Herder & Herder, NY

n. Pollution, Houghton Mifflin, Cleveland

o. Dirty Water, Urban Systems, Cambridge, MA

p. Smog, Urban Systems, Cambridge, MA