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ENVIRONMENTAL EDUCATION: IDENTIFICATION OF KEY CHARACTERISTICS AND A DESIGN FOR CURRICULUM ORGANIZATION

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY in the Faculty of Education

C

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ENVIRONMENTAL EDUCATION: IDENTIFICATION OF KEY CHARACTERISTICS AND A DESIGN FOR CURRICULUM ORGANIZATION

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ABSTRACT

Environmental education, a relatively new educational interest area, is undergoing developments in theoretical formulation and practical application. A desire to examine the substantive structure of environmental education, which could be useful in curriculum work, initiated a study of the major characteristics of environmental education theory and practice.

The study was designed to identify key characteristics of environmental education and to develop a meaningful organizational framework for examination of possible interrelationships among these key characteristics.

An extensive search of literature according to predetermined criteria revealed several major elements which may be said to characterize environmental education. It is proposed that these characteristics may be more meaningful if organized in terms of a framework which facilitates understanding of their interrelationships. Examination of theory in curriculum development and cognitive psychology suggested an organizational framework based on curriculum design.

The proposed organizational scheme for environmental education curriculum components is intended to improve understanding of the substantive structure of the curriculum of environmental education and to facilitate work in curriculum development, evaluation, and research in environmental education. Ways in which these can be accomplished are explored.

The study concluded that there are both educational program and program support systems elements which appear to characterize environmental education. Relationships among these characteristics when examined as components of educational curricula appear to enhance understanding of environmental education as a generic concept.
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CHAPTER 1: INTRODUCTION

A relatively new area of interest in education is environmental education. Prompted by an upswelling of concern about environmental deterioration over a decade ago, environmental education was initiated as an educational endeavor which sought to examine the relationship between man and environment. Although its methods and materials have, through various antecedents such as conservation education and nature study, a reasonably long historical base, environmental education is still undergoing important developments in its theoretical foundation and practical application. Questions concerning scope and definition remain as central issues because environmental education has rapidly developed from diverse roots into a large and widely scattered enterprise.

Recently, attention has been given to the substantive structure of environmental education. The generic substantive structure, consisting of philosophy, precept, and expected outcomes has been described in terms of an educational base (Harvey, 1976). An outgrowth of this generic substantive structure is a specific substantive structure of implementation. One of the components of this part of the overall conceptualization of environmental education is curriculum and instruction. Although the identification and organization of the major curriculum characteristics of environmental education would seem to be important for curriculum development, evaluation, and research, it appears to be an area which has been only tangentially studied.

Purpose of the study

The purpose of this study was to improve the conceptualization of environmental education as a possible basis for improvement of curriculum.
development, evaluation, and research. Specifically, the objectives of this study were to: 1) identify key characteristics\(^1\) of environmental education; 2) develop a meaningful organizational framework for examination of the possible interrelationships among these key characteristics; and 3) provide a generative basis for discussion, expansion, or change in the specifics of substantive structure.

Rationale for the study

The study was designed to examine the meaning of the concept environmental education in terms of specifics of substantive structure. An outgrowth of the generic substantive structure (Harvey, 1976), the specific substantive structure of implementation consist of those curricular components which are used to operationalize environmental education in the field.

The reasoning behind the statement of purpose was that many people seem to understand the concept of environmental education despite numerous definitions. Some educators who can parrot a definition of environmental education or even describe its philosophical underpinnings seem to be operating at too great a level of generality concerning specifics of curriculum implementation. In addition, many local programs which carry the environmental education label seem to reflect certain emphases and biases which complicate the meaning of environmental education.

This study attempts to examine environmental education theory and practice analytically to determine if objective description of the specifics of implementation is possible. According to Black (1969), the search for descriptive meaning involves going beyond definitions to the specification and integration of major concepts and generalizations adduced as educational

\(^1\)Characteristics, elements, and components will be used interchangeably.
aims for curriculum development by educators. Thus, objective concept analysis sought to identify key environmental education characteristics.

It was also reasoned that if certain characteristics could be identified from analysis of theory and practice, exploration of their relationship to a more general body of theory such as curriculum theory might facilitate their comprehension and use. Thus, a concern of the study was whether or not such relationships could be found and if so whether such an organizational framework could provide some direction for curriculum and research work in environmental education.

An exhaustive review of the literature, involving several hundred items, revealed that, although attempts have been made to describe the generic structure of environmental education, there was no single generally accepted specific structure in terms of elements, curriculum development, and implementation. Based on that conclusion, several questions were posed concerning the specific substantive structure of environmental education: is it possible to delineate objectively a number of specific elements which can be said to characterize environmental education? what relationships exist among potential environmental education elements? how can environmental education characteristics be most easily understood by educators? is an organizational framework for central environmental education components possible? how can such a conceptualization be of use in environmental education?

Exploration of such questions resulted in the generation of the purpose and of the specific objectives of the study.

Background to the study

As one of the hypothesized solutions to many environmental and
educational problems, environmental education has become a part of a great many school programs. The diversity of approaches evident in these programs reflect conflicting viewpoints in educational theory as well as several environmental orientations.

Much emphasis has been placed on differences of opinion among environmental educators; seldom is equal attention given principles or assumptions upon which substantial agreement exists. There appear to be areas of commonality and agreement in environmental education which can be identified and interrelated within the general curriculum field.

Relatively few studies have been done which investigate the relationships between major components of a field of study and the range of curriculum components considered for curriculum development, research, and evaluation. The few studies that have been done have analyzed the validity of culture-bound social science generalizations and the possibilities of universal generalizations in areas such as political science (Easton, 1963), or have examined the structure of several disciplines (Schwab, 1964). This kind of analysis has been concerned with isolation of generalizations or imposition of structure but has not considered the process of attempting to interrelate the concepts in terms of levels of the curricular reference frame.

The need for a framework for thinking about environmental education seems clear. With the recent and current interest in environmental problems, there is a bandwagon effect which tempts many educators and groups to declare that a particular interest or program comes closest to solving environmental problems. Whereas it is true that "everything is connected to everything else" and a more holistic approach may be needed to solve some of our current problems, it is necessary that any problem area that is to be studied seriously be delimited in terms of scope. Environmental
education cannot be analyzed or described unless it is set off from a multitude of other educational concerns. The problem then becomes one of analysis and selection according to certain principles or criteria. Justification for the selection criteria is a necessary prerequisite to this process.

A great deal of talk concerning curriculum matters, concerning justification for doing this or that, boils down to claims on the part of interested parties, claims which have no evidential backing. Empirical research can, with appropriate methodology, gather proof whether a subject such as English literature or a solo wilderness experience result in greater self-awareness. Such research, however, may not settle value questions. Thus, curriculum decisions depend on reasoning as well as intuition and morals when changes are considered. The only alternative seems to be not to think at all with the result that we end up doing what we did before and for no other reason than that we did it before.

Justification for the particular method of developing the proposed organizational framework is based on the concept of understanding or comprehension. Although details of this system of organization are described in Chapter 3, some general comments may provide background for the procedure followed.

To understand generally means to be able to relate that which is to be understood to some wider, more or less determinate framework. This involves relating specific instances and facts or concepts to more general principles as well as the reverse—that is, illustrating principles by relating them to specific concepts. According to Hamlyn (1967), there is, in the growth of understanding, an intimate connection between principles and concepts and cases.
The curriculum field seems to be an appropriate framework upon which to ground the major concepts and generalizations of environmental education given the purpose of the study—that is, to facilitate curriculum development, evaluation, and research in environmental education. Many of the concepts and generalizations in environmental education are related to conflicting conceptions of curriculum. Thus, in attempting to conceptualize environmental education, it is necessary to examine the prejudices and biases, the conflicting conceptions of curriculum, that have led to selection of certain concepts and generalizations over others.

Goodlad (1960, 1969) tried to bridge theory and practice in the curriculum field. He used a conceptual scheme for rational curriculum planning based on appraisals of curriculum research and development made with respect to six curriculum needs including the need for theoretical constructs and the need for concepts that identify the major questions in the curriculum field. Although the status of conceptual systems for identifying major curriculum questions has not shown much progress, the work of Huebner (1966) and Kliebard (1974) suggest promising directions in this area. For example, Kliebard (1974) has speculated that one direction for the curriculum field is to bring together widely separated fields into into a larger common area. The curriculum person's competence may lie, not in unearthing new knowledge, but in putting together many of the findings from other disciplines. The curriculum field also appears to offer a powerful organizing framework for a field of study such as environmental education.

Delimitation of the study

A prerequisite to conceptual understanding is specification of
the parameters of the field of study. For environmental education, this involves exploration of the meaning of the terms education, curriculum, environment, and environmental education. The broad delimitation which description of these terms provides is designed to provide general orientation. More specific delimitation of parameters for this study may be found in the section dealing with methodology.

Definition of terms

Education

Environmental education exists within the field of education. Education is a word susceptible to various definitions. According to the stance of the user, education is the passing on of a cultural heritage, the initiation of the young into worthwhile ways of thinking and doing, or the fostering of the individual's growth. Such varying conceptions of education as well as conflicting conceptions of the learner have a definite influence on educational curricula.

A common view of education involves a joint process of teachers managing and arranging curriculum resources and of children acquiring the sensibilities and skills necessary to explore and create. Many crucial educational problems cluster around the issues of maintaining and enhancing each individual's competence for coping both with life and with certain inherited creative powers. Education, then, is a process designed to produce a person who has been initiated into a number of worthwhile activities and has acquired a breadth of understanding or cognitive perspective so that his outlook on life has been transformed by his education (Peters, 1966). In this sense, education becomes an evaluative term because it involves the learning process which introduces certain criteria on the basis of which we can decide the value of the
activity.

More specifically, to be called education, an activity, course, or program must satisfy the criteria that it must: not only be valuable in itself but must also possess extrinsic value; include knowledge, values, and skills that are intentionally transmitted in a morally (to society) acceptable manner; be associated with other activities, courses, or programs so that in combination the activities are seen to relate to ways of understanding and experiencing; develop some feeling that it was worth doing (Peters, 1966).

The question of which concepts, generalizations, activities, courses, and programs are valuable and central will always be a matter of debate, and, if education is considered as a generic term, will be related to a descriptive meaning of more specific areas of activity such as environmental education. Thus, education implies change for the better but does not imply commitment to a particular body of content.

Curriculum

An important concept related to education is curriculum. Contemporary curriculum scholars are far from agreement as to how the term curriculum should be defined. Whether curriculum is the cumulative tradition of knowledge (Bestor, 1956; Hutchins, 1936); guided learning experience (Saylor and Alexander, 1966; Tyler, 1957); a plan for learning (Beauchamp, 1972; Taba, 1962); or educational ends or outcomes (Goodlad, 1963; Johnson, 1967; Popham and Baker, 1970) remains a matter of debate. Emergent definitions of curriculum portray changing sociophilosophic views of educators as well as changing social conditions, changing conceptions of knowledge, changing ideas about learning and the learner, and so on.
In general, there appear to be four prevailing conceptions of curriculum; namely, humanistic, social reconstructionist, technological, and academic rationalist. Such philosophical underpinnings appear to determine whether curriculum materials are designed for integration, individual supplementation, exploration, or specialization. The choice of purpose in turn gives direction to the techniques (needs assessment, futurist, rational, or training models) used to develop curriculum materials. In addition, guidelines for selecting curriculum methods come from many sources.

Because of the diversity of informed opinion about "the" definition of curriculum, it would seem more profitable to examine curriculum generically as a means of achieving conceptual clarity. This involves examination of the relationships among curriculum purposes, activities, and structures, or concepts related to curriculum organization.

Curriculum organization involves consideration of the vertical and horizontal relationships of learning opportunities (Tyler, 1950b). It also entails consideration of organizational elements. More common elements used as the basis for organization include concepts, generalizations, skills, and values. Decisions concerning these elements are made in light of objectives.

On a slightly larger scale, an organizational design examines relationships among purposes, organizing structures, organizing elements, and specific learning opportunities or activities. Depending on the function (e.g., integration), there is a range of organization structures (e.g., broad fields, projects) which may be designed to serve the function. Organizing elements that are derived from purposes indicate the kinds of learning opportunities that must be provided. Problems underlying most organizational issues relate to disputes about purpose which in turn
relate to philosophic orientation.

Gibbons (1976) has eliminated questions of purpose in a consideration of organizational design by examining the elements of curriculum from the viewpoint of educational change. Changes in program not only involve clarification of internal organizational principles but also require change in the organization within which the program operates so that the program and organization form a coherent system. Examination of the support structure of a program involves consideration of the planning and decision-making process, the arrangement of organizational patterns, the conditions of operation, the environments of the program, roles and relationships of participants, and methods and materials of teaching and learning. Consideration of all of the above curriculum elements may help to clarify the meaning of curriculum and, relevant to this study—how environmental education can be understood within the curriculum field.

Environment

In environmental education, emphasis is placed on the relational view of man and environment, on the reciprocal nature of man-environment relations, and the fact that their different properties are interdependent.

Given this man-environment interdependency, conceptual problems have, nevertheless, resulted from the use of the word environment in a wide variety of contexts. To many geographers, environment traditionally meant the physical world of landforms and climate; to architects, it is largely the structures built by man. Sociologists are concerned with an individual's environment as it consists of social groups made up of other individuals. Child psychiatrists and counsellors may use the word loosely to mean the home background of the child. Engineers use the term to refer to heating and air conditioning.
In an attempt to rationalize the use of a single term to include everything from climate to inner environment, Sonnenfeld (1972) suggested a nested hierarchy of environments consisting of the objective geographical environment (the entire universe external to the individual) within which are the operational (the portion of the world that impinges on man whether he is aware of it or not), the perceptual (that part of the operational environment of which he is aware through present sensations or past experience), and the behavioral (that part of the perceptual environment which elicits a response) environments.

To operationalize these constructs within a logical framework requires consideration of the cognitive image of the real world held by the individual. The environment exists only as it is experienced and reconstructed in the mind. How the environment is viewed depends on perception (the process of becoming aware, through the senses, of the existence of a stimulus), apperception (interpretation of something perceived in terms of previous experience), and cognition (understanding the interpretation on the basis of a cognized store of information) (Stee and Downs, 1970).

Thus, a more complete set of constructs for the varied meanings of "environment" includes consideration of personal (behavioral and experiential), contextual (beliefs, attitudes and other personality attributes derived from experience), and phenomenal (sociocultural and biophysical) environments. The personal environment includes the behavioral environment—that is, the image (perception) of the phenomenal environment held by man (Lewin, 1936) and is based on stimuli and personality (a complex of attitudes, beliefs, dispositions, preferences, and values) as well as the storehouse of cognized information (the experiential environment) built up largely from the experiences of the individual. The contextual
environment introduces the concept of the experiences of the individual as a member of a family, ethnic group, social class, cultural, national, and life-style groups and their affect on the apperception of stimuli from the phenomenal environment. The phenomenal environment includes all external conditions impinging on man. For convenience, it may be divided into the human (sociocultural) environment and the natural (biophysical) environment. When the term environment is used alone it would be taken to refer to the phenomenal environment. By changing the frame of reference to a more ecocentric and less egocentric viewpoint, without changing the meaning of the constructs, environmental educators tend to consider the personal and contextual environments as individual complexities within the human environment. This human or sociocultural environment thus consists of several component constructs including personal, social (interpersonal), cultural (informational), global, and chronological environments (McClaren and Walker, 1974). This organization parallels the tendency to consider the natural environment in terms of the concept of levels of organization ranging from individual organisms through group and community interactions and ecosystem interrelationships to consideration of the biosphere. According to Odum (1959), the actual "levels" of the spectrum, like a radiation spectrum or logarithmic scale, theoretically can be extended infinitely in both directions.

Exploration of the use of the term "environment" provides some insight into the diversity of ways in which environmental education is conceptualized. In general, the human environment appears to be considered as distinct from the natural environment. The human environment consists of all of those objects and relationships that have been devised by man. The natural environment consists of all of those objects and
relationships that exist independent of man. This distinction has important implications for the definition of environmental education to follow.

Environmental education

The United States Environmental Education Act of 1970 defines environmental education as an integrated process which deals with man's interrelationship with his natural and man-made surroundings. It is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.

Within the last two decades, environmental education has received recognition on an international scale. One of the most widely accepted and most often quoted definitions of environmental education was developed by delegates at the International Working Meeting on Environmental Education in the School Curriculum at Foresta Institute, 1970:

Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical surroundings. Environmental education entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality (Cerovsky, 1971).

The International Belgrade Workshop on Environmental Education in 1975 was the culmination of the first phase of a $4 million project co-sponsored by Unesco and the United Nations Environment Program (Unep), and was directed toward developing an overall framework and direction for a co-operative international program to further environmental education. Calling for a new global ethic, participants defined the goal of environmental education as being to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which
has the knowledge, skills, attitudes, motivation, and commitment to work
individually and collectively toward solutions to current problems and
the prevention of new ones (Stapp, 1976). Tanner (1974) has a further
discussion of definitional issues in environmental education which iden-
tifies several other conceptions of environmental education.

The essence of these definitions of environmental education has
been stated by McClaren (1978). Environmental education is the education-
al endeavor that deals with the man-environment relationship with a view
towards maintaining, conserving, and improving the quality of the environ-
ment, vis à vis, living organisms. This implies that the following
criteria may help to characterize the structure of environmental education.
Environmental education entails: knowledge of the structure and function
of natural and human systems, and understanding of the concepts and gener-
alizations that raise this above the level of a collection of disjointed
facts; those attitudes, beliefs, and values which critically examine the
man-environment relationship and which characterize a person's way of
looking at things (this implies that one is transformed by what is known
or felt); and individual and organizational behavior patterns which are,
based on existing evidence as to what living standards are consistent with
present and future environmental quality.

Some educators see environmental education as: an expanded version
of conservation education; a new version of science education; an ex-
panded version of outdoor education; an enlargement of biology into
ecology; a modification of geography into something broader and deeper;
an addition to English courses so that they, for example, might include
a composition on how we left the picnic area unlittered; or the construc-
tive use of field trips to tie together nature, history, and human heri-
tage. Others believe that environmental education should pervade the
entire curriculum, involve a change in values accompanied by a pervasive examination of man's relation to nature, address controversial implications to our political, social, philosophical, religious, and moral foundations. These conceptions of environmental education may all be correct if they make the connections between man-man, man-society relationships and man-environment relationships. This implies an extension of general ethics to include environmental ethics.

The development of a positive environmental ethic requires consideration of three ethics including: religion as a man-man ethic; democracy as a man-society ethic; and a yet undeveloped ethical relationship between man and the environment (Leopold, 1933, 1949). An ethic, biologically, is a limitation on freedom of action in the struggle for existence. An ethic, philosophically, is a differentiation of social from anti-social conduct. Both refer to evolved means of co-operation, exploitation, and general relationships between individuals or between individuals and society. There is as yet no comprehensive or widely acknowledged ethic dealing with man's relationship to environment. For example, the man-land relation is still largely economic, entailing privileges, but not obligations.

According to Odum (1974) there are strong scientific reasons for the proposition that such a major extension of the general theory of ethics is now necessary for human survival. Science, including environmental science, can define reasonable levels and limits of growth, energy usage, and so forth that are optimum for the quality of human existence, but ethics coupled with the legal and political-economic tendencies that derive from ethical behavior are now necessary. Jones (1974) refers to survival as the criterion of viability which is based upon the principle of long-range responsibility:
That there ought to be through all future time such a world fit for human habitation is more than a persuasive desirability of speculative imagination. It is now a moral proposition, namely, a practical obligation toward the prosperity of a distant future, and a principle of decision in present action, it is quite different from the previous ethics of contemporaneity... The new order of human action requires a commensurate ethics of foresight and responsibility, which is as new as the issues with which it has to deal (Jonas, 1974, p. 12).

Environmental education does not ultimately have validity unless it involves educating to change the man-environment relationship for the better by acquiring an environmental ethic. This implies a knowledge of the ecological basis of all life, upon which judgments about the quality of the environment can be based, and an understanding of the socio-political institutions which regulate activities of people in relation to the physical world around them.

Definitions such as those stated are intended as delimiters for the field of environmental education. Whereas there is an element of descriptive meaning in them, they seldom provide the detailed hints and clues that will enable us to draw specific conclusions as to how we are to proceed as educators. That is the task of the remainder of this study.

Significance of the study

A conceptual framework which functions to organize the major concepts and generalizations of environmental education may function to provide the ideational scaffolding (Ausubel, 1963) to which new knowledge can be related. It may permit continuing extension, refinement, and integration through each succeeding exploratory experience. It may serve as a frame of reference in subsequent inquiries and relate new information to a larger heuristic pattern of relationships. In this way, the proposed environmental education organizational framework may contribute to a
...
Different programs in environmental education use different sets of assumptions about the nature and scope of environmental education. Consequently, there is a diversity of program activities, resources, and learning environments. By helping to operationalize a general definition of environmental education, a framework may aid in the translation of generalizations into more concrete concepts. In this way, various options and possibilities for environmental programs can be considered in light of interests and strengths of the instructional staff. The framework concepts and generalizations could facilitate systematic examination of program components so that advantages and disadvantages of adopting particular types of programs and approaches could be assessed. Until a conceptual bridge is formed between very general purposes and specific operating components, curriculum workers and practitioners have no clear guidelines for selection of learning experiences.

An environmental education framework, through specification and integration of environmental education concepts and generalizations, may provide a perspective for informed evaluation decisions. Identification of major concepts and generalizations may provide a series of program goals, objectives, or intents. These goals could be examined within specific programs for congruence between intents and observation and for either logical or empirical contingencies among antecedents, transactions, and outcomes as a means of processing descriptive evaluation data.

By exposing major concepts and generalizations of environmental education within a program development context, school administrators and the public can base judgments concerning the content and methods of environmental education on a better understanding of environmental education. The relationship between curriculum components and environmental education concepts and generalizations should facilitate communication about
environmental education programs by making possible more effective and defensible arguments for particular educational strategies. At the very least, a conceptual framework in environmental education, based on environmental education concepts and generalizations which have been described by identification of conflicting educational and curriculum conceptions, should serve to expose basic philosophical differences regarding the school, the educational program, and the learner.

The framework, by identifying major concepts and generalizations in environmental education which are appropriate across the spectrum of program development, may facilitate comparative evaluation or research studies. For example, if a program developer elects to emphasize only selected environmental education elements, the consequences in terms of subject matter and learning experiences can be assessed and compared with alternatives.

Use of and criticism of the descriptions of environmental education characteristics may facilitate communication in environmental education by providing a basis for discussion of the meaning of these terms among curriculum workers and practitioners.

The specificity which the framework can introduce to environmental education may prove useful to educational researchers by generating hypotheses about relationships among environmental education component categories and their effects on students. For example, relationships among the learning domains may become more apparent through comparison of program emphases (components) which differ widely in scope and focus. How does a program which primarily emphasizes outdoor experiences compare with an in-school program that emphasizes problem-solving behavior? Can a values-oriented program be successfully taught with a minimal conceptual basis? Research can contribute to theoretical foundations of environmental
education if environmental education field theory is sufficiently well conceptualized to provide the basis for research questions.

The framework may contribute to organizing the field theory in environmental education which in turn might aid the review and reorganization of existing research studies so similar results in related areas can be more profitably examined. The framework may also reveal possibilities for research which have been ignored, avoided or unrecognized. The framework may help to uncover some problem areas in environmental education.

If the framework is used as a means of organizing the literature on both research and curriculum development in environmental education, it may stimulate more unified approaches and larger generalizations about such things as relative program effectiveness.

If environmental education in the public school has been characterized by rather loose organization (Cummings, 1974) and if reasons for this loose organization are related not to basic theory and practice but to a parochialism in form and content and the overall lack of a coherent framework in environmental education (Perelman, 1976), an organizing framework may help to identify and integrate environmental education commonalities and thus help to alleviate problems of obscurity and parochialism. Systematic exploration of major environmental education concepts and generalizations within the broader curriculum context seems a necessary prerequisite to responsible curriculum development, evaluation, and research.

Limitations of the study

The extent to which substantive elements of environmental education theory and practice were identified and meaningfully interrelated as curriculum components were limited by several factors.

The methodology used in this investigation was designed to answer
the question: what do environmental educators consider the major curriculum characteristics of environmental education to be? The answer was obtained by systematically examining the pertinent literature rather than conducting survey research. Although definite "rules" guided the sampling of literature sources, certain weaknesses are inherent in this approach.

First, the sampling procedure was stratified in the attempt to adequately represent the heterogeneity of the field. Recommendations of major conferences concerning environmental education characteristics were considered before individual opinions. Thus, certain trends among fairly localized individual preferences or biases may have gone undetected. This was a recognized "trade off" because the sampling method was deemed most appropriate for this sample.

A second limitation concerning methodology was observer bias and contamination. The procedure was designed to avoid the presupposition of a particular concept of environmental education. For example, only about ten percent of literature sources sampled could be quoted as advocating a particular environmental education characteristic. This occurred because, especially among environmental education program descriptions, many characteristics were only implied. To avoid observer bias as much as possible, to be accepted as environmental education components, authors had to actually state their advocacy. This procedure was intended to avoid the use of inferences in recording; that is, to eliminate the necessity to make subjective evaluations, to draw implications or conclusions, or to make judgments. Even so, the possibility remains that undeliberate or unconscious errors occurred in the method of recording which permitted undue emphasis upon characteristics in accord with observer bias or expectations.

Thirdly, the limiting of the sample to "educational" sources is a
recognized shortcoming. Although public awareness/media programs were initially considered, it became evident that inclusion of these programs would stretch the scope of the study beyond reasonable limits. As the title of the study implies, the intent was to examine programs and sources which recognized the role of environmental education in the school (i.e., curriculum).

It is also possible that there are variations among individual authors' perceptions of the meaning of particular characteristics. This introduces a secondary problem in observer interpretation. However, given the criteria for acceptance of particular environmental education elements, the possibility of this type of error appears greater in the attempt to describe the characteristic. Although environmental educators appeared to be reasonably consistent in their use of terms, the possibility exists that educators may not agree with descriptions of environmental education characteristics presented in Chapter 4 or that their views may have changed with time. Broad generalizations (principles and constructs) always contain a degree of uncertainty.

In addition to limitations concerning objectivity in procedural design for identification, there are limitations to organization of characteristics within a particular reference system. Although a thorough examination of the curriculum literature resulted in the hierarchy of curriculum components used to interrelate environmental education characteristics, the actual organizing scheme or framework is somewhat arbitrary. The proposition of an organizing framework does not pretend to describe relationships among environmental education elements in a manner which implies further work or revision is not needed. It is intended as a metasystem which appears to have potential for clarification and organization in environmental education. Such an organizing framework may
point out general philosophical or theoretical foci for debate in environmental education. Thus, category descriptions in Chapter 4 are intended more as grist for discussion than definitions of characteristics. Such is the state of the art in environmental education theory.

The key to the usefulness of the framework is that, at some point in the process of identification and integration of environmental education concepts and generalizations, the essentials of organization are internalized and can then be communicated. The environmental education framework is limited to an organizational scheme that is based on current understanding of curriculum structure. That this particular system for organizing information seems to "make sense" is a decision which favors one method of organization over other possible methods. Only by including interrelationships among categories can such a system begin to make sense. The exact phrasing of category descriptions will perhaps be the subject of considerable debate. Although every effort was made to describe major aspects of each of the concepts and generalizations using frequent references to widely recognized diverse definitions and viewpoints and research results, the decisions may only be defended on pragmatic grounds.

The framework may raise questions which have the effect of more clearly defining concepts and generalizations in environmental education. Conversely, there is a danger that the framework may contribute to a rigidity of thinking in environmental education by fragmenting what many environmental educators believe to be a holistic concept. This limitation is recognized but is believed to be outweighed by the need for more adequate conceptualization of the field than that which is provided by repeated attempts at broad general definitions.
CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this review of the literature is to provide background information that will attempt to clarify the evolution of ideas which has led to the current conception of environmental education. It will attempt to provide an overall picture of the field of study which will facilitate identification of key characteristics.

Theory and practice in environmental education are, as in any educational endeavor, conditioned by the realities and ideas of society and by choices made by individuals with varied conceptions of what education is or should be. The literature review will examine the process of conceptual development that has occurred in environmental education from three vantage points: development of environmental emphases; development of educational emphases; and development of curriculum conceptions in the theory and practice of environmental education. The review will also examine ways of organizing environmental education characteristics that would best facilitate understanding of the specific substantive structure of environmental education.

Development of ideas of concern for the environment which appear to have influenced environmental education

The complexity of the man-environment relationship has resulted in several human orientations toward the environment. The rise of industrialism and its philosophical underpinnings intensified two apparently contradictory approaches to nature, each one with deep roots in Western history—nature versus civilization, and civilization versus nature (Santmire, 1970). Thoreau's philosophy is the prototype of the first theme which means that the individual seeks Deity, virtue, and vitality in nature. This message
has been echoed through the writings of many influential conservationists from John Muir to Aldo Leopold. It is on this foundation that a large number of environmental education programs have been developed.

The way for the second theme, civilization versus nature, was paved by a number of cultural and economic forces. The combination of invention, immigration, and vast stores of natural resources set loose economic forces which, combined with a mechanical view of nature championed by Descartes and Newton, regarded nature as a machine governed by physical forces which were objectively detached from man. This view of nature, along with what Max Weber labelled the protestant ethic, and utilitarian views, implied that man should strive to build a society with an economic level of productivity which would provide the underpinnings for political institutions.

The disastrous behavior of industrial man toward nature has been attributed to our Judeo-Christian heritage (White, 1967), Greek philosophical thought (Pirsig, 1974) and the dichotomy between scientific knowledge and values (Skolimowski, 1975). Whatever the cause, environmentalists and environmental educators believe the greatest obstacle to achieving environmental quality is a world view held by people who see themselves in control of, and thus apart from natural systems (Hansen, 1975; Swan, 1975; Yambert, 1975). What is needed is a comprehensive perspective afforded by an organized, yet all-encompassing area such as environmental education (Wright and McInnis, 1975).

Consolidation of viewpoints among antecedents of environmental education

It was during the period around the turn of the twentieth century that the largely unarticulated drama between man and nature began to play upon a growing conservation movement in North America. This conservation movement may be seen to have expanded and refocused itself, through stages
geared to the preservation and management of natural resources, to the environmental quality movement which began in the early 1960's.

Influenced by transcendentalist writings, one school of naturalists, led by John Muir, promoted the esthetic and ethical value of wilderness and, thus, its protection (Nash, 1968). The other conservation school advocated wise use and development of natural resources for the public's economic interest. Clashes between these conservation viewpoints are still manifested in emphases and biases in current environmental education programs.

The modern forerunner of elementary school science is to be found in the nature education movement (Swan, 1965). Influential university educators such as Wilbur Jackman, Liberty Hyde Bailey, and Anna Botsford Comstock published nature study materials and conducted teacher education programs which had wide-spread effects. The American Nature Study Movement was formed in 1908 with the following purposes: to help develop appreciation and understanding of nature through first-hand experiences; to support conservation of natural areas and encourage their use in nature study; and to improve the quality of nature interpretation in schools. It was implied that if someone can become interested in the environment then concern about environmental problems will follow (Stapp, 1974a). The influence of the philosophy and materials of the nature study movement is evident in many environmental education programs today.

It was not until the early 1930's that attention was paid in the schools to the concept of conservation education (Funderburk, 1948). The educational philosophy of the period had ruled against the consideration of current problems in the schools until the environmental consequences of poor agricultural practices caused a re-examination of this philosophy. During this time conservation and resource agencies began to employ public information and education specialists to prepare and distribute materials
about natural resource conservation. There was a demand for materials and teacher education programs which in part resulted in creation of university programs. However, the diversity of opinion concerning the definition and scope of conservation remained as many educational institutions shifted their orientation to meet environmental education needs.

Outdoor education is generally defined as the use of resources outside the classroom for educational purposes (M. Swain, 1974). Although an important aspect of nature, conservation, and now environmental education, the basis or rationale for outdoor education is substantially different. It is more concerned with the approach or environment of a learning situation—with the educational method—than with substance or content. The nature study movement, the human resources component of conservation education, the camping movement and park interpretation were all antecedents from which the philosophy and practices of outdoor education developed (Donaldson and Goering, 1972).

Developments in the field of education such as the activity curricula of Dewey and Kirkpatrick added substance to arguments for the use of direct experiences inside and outside of classrooms. L. B. Sharpe developed residential outdoor education programs on the premise that the outdoors is a laboratory which helps to achieve the goals of education by providing direct experiences in the natural environment. Julian Smith stressed the acquisition of skills for intelligent use of the outdoors and for proper use of leisure time. Smith (1970) describes the late 1960's as the period in which concerns about environmental quality were being studied outside classrooms. The general aims of such programs using the outdoors include: the development of a fuller understanding of self and surroundings; and the development of experiences designed to enrich and complement content areas of the curriculum by firsthand observations and direct learning.
activities outdoors (Hammerman and Hammerman, 1964).

The study of ecology has probably had the greatest influence on the development of the conceptual basis for environmental education. Increased knowledge of the structure and functioning of natural systems and of man's effect on the delicate balance of the biosphere has led to a questioning of some fundamental human value assumptions including re-examination of educational priorities.

A number of antecedents and contemporaries of environmental education which have themselves also been concerned with the environment in various ways have influenced present day educational programs. This influence is most visible in conservation, outdoor, and nature education programs, and in ecological research. It is also present in basic philosophical positions which underlie the attitudes and teaching methods of a great many educators. Program emphases including field experiences; firsthand observations, and direct learning activities outdoors have resulted from environmental concerns as well as from educational concerns.

Development of educational ideas which appear to have influenced environmental education

Conflicting conceptions of the aims, content, and methods of education have influenced theory and practice in environmental education. Historically there is always a lag between the proposition and implementation of innovation. The reason for this appears to be found in philosophical differences among educators. For example, in colonial North America, where traditional educational practice embraced theories of mental discipline, thoroughness and knowledge of subject matter, there were few educational reforms despite the emergence of new educational theories. Yet many of the ideas of nineteenth century thinkers were retained and form part of
education's legacy.

Ideas such as learning by first-hand experience, discussed by Pestalozzi (1894), learning as discovery-inquiry (Spencer, 1894), humanistic learning (Russell, 1831) and sense realism (Rousseau, 1911) continue to be rediscovered in modern education's thought.

Many of the rather isolated individual attempts at educational reform were consolidated in the progressive education movement. This movement was initiated by Francis Parker (1894), whose ideas for curriculum synthesis and knowledge integration and for field trips and first-hand experiences are echoed in current educational practice. The most influential spokesman for the movement was John Dewey (1916), who forged the link between education and society with the concept, familiar to environmental educators, that education had a distinctively social as well as individual purpose. Environmental educators have merely extended this social function concept of education to include an environmental function. The basic ideas appear to be quite similar.

After the First World War there was a change of focus in education from social purpose to individualism (Harris, 1969). Progressive education was divided when Hall's (1891) work supplied a scientific basis for child-centered approaches. The activity movement which grew out of the child-centered school had an important effect on elementary education and appears to be the basis for social problem solving in environmental education. The idea that the solution to a problem required using material from several subject fields, inherent in the activity movement, became an organizing principle for social studies. However, the association of the problem solving idea with serious curriculum errors in the child-centered school appears to have colored its potential as a useful educational idea. Kilpatrick's (1934) project method is illustrative of the type of child-
centered activity approach which developed difficulties due to lack of scope and sequence. Although almost forgotten in the educational literature, the project method continues to influence science and environmental education as well as industrial and vocational education programs.

The evidence is that, although progressive education collapsed as an organized movement, ideas from the progressive movement have formed the bedrock of present educational theory (Tanner and Tanner, 1975). Many of the characteristics of environmental education appear to have evolved through extension and elaboration of these ideas. The remainder of this section of the literature review explores some of the influential ideas.

The idea of learning as inquiry or discovery, often associated with empirical-inductive methods, has long existed in the educational literature. Object teaching was one nineteenth century educational reform based on this idea. The inquiry concept is deeply rooted in the Deweyan ideal of active inquiry through units, activities and projects. Field trips, excursions, observation, and discussion were absorbed into the school. The goal was one of learning to solve social problems. In recent years proponents of learning as inquiry emphasized that the inquiry process differs from subject to subject (Bruner, 1960; Glasser, 1966). Environmental educators, in teaching interdisciplinary problem solving, are concerned with the application of knowledge, not the conceptual scheme that determines the process of investigation in a given discipline. Many teachers have followed the Deweyan ideal of encouraging children to identify problems of interest to them and of importance to the community (LeBrant, 1972)—even in the absence of disciplinary substance.

A corollary of the idea of learning as inquiry is the idea that learning must be self-directed. In recent years, educators have found
new theoretical bases to support these ideas. The work of Piaget and Inhelder (1969) indicates that the child plays an active role in his own intellectual development and that direct experience is essential for the development of intelligence. Bloom, Hastings, and Madaus (1971) have defined higher level cognitive objectives as those involving the mastery of thinking processes rather than simple recall. These theoretical ideas have focused attention on the development of teaching strategies for fostering skills of autonomous thinking (Taba, 1962).

Basic to the idea that learning should be self-directed is the theory of interest in education. The Deweyan concept that the learner must be interested in the learning task if he is to learn has found adherents in many schools. Whether this implies that child or teacher selects the learning experiences remains a matter of debate.

Contemporary studies on intellectual development support the progressivist view that motivation is in no small way a product of the learner's past experience. For example, Bloom (1964) stresses the importance of cognitive and affective functioning of environmental encounters in the early years. Piagetian (1952) theory concurs with cognitive field theorists who define learning as a process by which the learner reorganizes his "field", his perceptual and psychological world. This buttresses the progressivist principle that one cannot deal with the child's mind in abstraction, as an entity apart from his body and his environment. The gestaltist view of the "whole child" is one of the most significant conceptions of the curriculum legacy (Tanner and Tanner, 1975).

Another fundamental principle in the educational legacy is that the curriculum must be geared to the needs of individuals. How this should be done is not always entirely clear. Whether through mastery
learning (Bloom, 1971), through provision of a variety of modes of learning (Taba, 1962) or in terms of readiness (Piaget and Inhelder, 1969), individualization remains as a central issue in education and in environmental education.

The concept of interdisciplinarity survived the disciplines emphasis of the 1960's and became the basis for a number of approaches to curriculum synthesis including correlation, fusion, broad fields, and the core curriculum. The idea behind these approaches was to introduce students to methods of inquiry and generalizations applying to knowledge fields rather than single disciplines.

In the face of exploding societal problems of the late 1960's among scientists, educators, and the general public, there was a growing realization that the quality of life on earth was not so much dependent on coping with a knowledge explosion as on man's capacity to deal with a problems explosion. A new awareness of our finite resources led to consideration of problems of environmental deterioration, over-population, energy utilization, and so on, with the likelihood of economic and social stagnation unless man turned his intelligence to the wise husbandry of resources (Tanner and Tanner, 1975). A committee of the American Association for the Advancement of Science proposed that society develop multi-disciplinary, problem-oriented institutions to deal with the growing complexity of today's problems (AAAS, 1974). Expressing the conviction that emphasis on specific disciplines obscures the unifying questions of man's existence, the Social Studies Curriculum Program of the Education Development Center (the center that had developed PSSC Physics) turned to interdisciplinary approaches (EDC, 1968). In a similar vein, the Social Science Education Consortium moved toward multi- and cross-disciplinary studies with
more emphasis on processes of inquiry, values, and value conflict. Recently the consortium has embarked on developing interdisciplinary curricular material such as those pertaining to environmental education (Radz and Risinger, 1971). Although a legitimate case can be made for the disciplinary construct and subject specialist of an advanced technological society, the disciplines, when taken by themselves, are inadequate to the task of dealing with such problems as environmental pollution, population growth, food resources. Interdisciplinary problem-focused approaches appear necessary (Tanner and Tanner, 1975).

With the advocacy of alternative organizational schemes for educational programs have come many different program support ideas relating to teaching arrangements, learning environments, roles and relationships, and so on. For example, team teaching, laboratory and field experience, values education, core curricula, curricula for relevance, and "real world" study, community studies, cooperative pupil-teacher planning and many other educational "ideas" have been developed or revitalized for focus on problem areas of great personal-social significance (Wagner, 1974).

Also in recent years, the activity curriculum appears to have re-emerged in the form of the open classroom or informal classroom. Originally conceived by Dewey as a way to curriculum integration, the open classroom has been implemented in many ways—ranging from almost free activity (Holt, 1972; Kohl, 1969; Silberman, 1970) to very highly structured managerial arrangements. In promoting such conceptions of open education, educators have neglected to reveal how disparate activities are integrated (Tanner and Tanner, 1975).

The ecological crisis of the 1970's has illustrated dramatically that social and intellectual interests cannot be separated from man's
work, science, industry, health, government, and so on. The great divisions and conflicts in modern society have impelled educators once again to seek ways of making education relevant to life problems. Environmental education appears to have been one educational response to current environmental and educational problems.

As in all areas of education, there are basic disagreements among environmental educators concerning the sources and dominant influences in curriculum development and implementation. However, certain characteristics repeatedly seem to surface in the environmental education literature including: first-hand experience, learning by active involvement of the learner and teacher, self-directed activity, knowledge integration, field trips, inquiry, problem-solving, individualization of instruction, and interdisciplinarity. Environmental educators have opted for and against many of these and other educational emphases, as may be seen in an examination of the development of environmental education through its decade of existence.

Development of conceptions of environmental education: Theory and practice

Emergence of environmental education

The rise of modern concerns both in environmental and educational matters has led to an area of study called environmental education. The precise origin of the term and incidents leading to its adoption are difficult to isolate (J. Swan, 1974a). Although many individuals such as Leopold (1949) warned of the consequences of poor land practices during the 1930's and 1940's, it was not until 1962 that conservation issues were interwoven with issues of public health and welfare in Silent Spring (Carson, 1962). For the first time on any major scale, the mid-1960's
saw public pressure against a variety of environmental insults.

In 1968, the term environmental education was first used in an article in the *Educational Record* by University of Wisconsin professor Clay Schoenfeld. The following year, the concepts and purposes of environmental education were set forth by educators at the University of Michigan. Environmental education was defined as that part of the environmental quality movement which stresses the importance of co-ordinated, extensive, and pervasive educational programs aimed at producing a citizenry that is: knowledgeable concerning the total environment and its associated problems; aware and skilled in how to become involved in helping to solve these problems; and motivated to work toward their solution (Stapp et al., 1969). The principal feature in the philosophy of environmental education is that man is an integral part of a system consisting of man, culture, and the biophysical environment and that man has the ability to alter the interrelationships of this system. Thus, we require a broad understanding of the role of both natural and man-made environments and attitudes of concern for environmental quality that will motivate participation in environmental problem-solving.

In general, the first issue of *The Journal of Environmental Education* (Fall, 1969) made two main points—environmental education must be both pervasive or multilevel and integrated or interdisciplinary. Southern (1969) argued that if the child acquires particular broad environmental understandings (knowledge) he will develop a social conscience (attitudes) that will affect his behavior (actions) toward the total environment. Covert (1969) proposed that an integrated, interdisciplinary, instructional program be developed in environmental education to promote environmental awareness and sociological attitude. This understanding
requires knowledge of the social, political, economic, and technological processes as well as institutional arrangements and aesthetic considerations (Stapp et al., 1969). Analysis of the frequency of occurrence of key words in the most important environmental concepts identified by Roth (1969) suggested that these early attempts to characterize environmental education were accurate and consistent with usage by scholars and educators interested in or active in environmental education (Archbald and Gundlach, 1970).

After the initial flurry of environmental education definitions, a number of articles and documents provided more concise summaries of environmental education characteristics. Schoenfeld (1970a) describes environmental education as education which deals with the environment of man; that is the total environment as affected by the interaction of man with the world in which he lives; it does not deal just with cities or just with nature, but with our attempts at coexistence of the two. Environmental education is interdisciplinary, it seeks long-term, ecologically-sound solutions to human problems, and it should lead to an integrated environmental ethic.

Through the Environmental Education Act of 1970 (PL 91-516), the U.S. Congress defines environmental education as the combination of two working definitions that, taken together, reflect the consensus established among many educators, ecologists, environmentalists, and other citizens. This Act states that environmental education is the process that fosters greater understanding of society's environmental problems and also the processes of environmental problem solving and decision-making. This process is accomplished by teaching the ecological relationships and principles that underlie problems and by showing the nature of possible alternative approaches and solutions. That is, the process of environmental
education helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks. It involves the development of skills and insights needed to understand the structure, requirements, and impact of interactions with and among various environmental entities, subsystems, and systems.

One of the most important concepts in environmental education is the definition of "environment" which was discussed in Chapter 1. Clearly environment cannot be assumed to imply only endangered species and walks in the wilderness; it includes these but something far more encompassing as well. Because the environment is so vast and complex, environmental education is much more comprehensive than specialized approaches to environmental subjects, such as traditionally defined approaches to conservation and resource use education, environmental science, nature study, and outdoor education. These approaches normally do not give consideration to mutually reinforcing social, physical, cultural, political, economic, technological, and ethical implications of their areas of focus.

It is generally agreed, however, that environmental education projects would undoubtedly draw upon some of the ideas and materials of these traditional subjects and emphases, but would do so in synthesis with ideas and materials from many other areas, such as the social sciences, the applied and theoretical natural sciences, the arts, and other areas of the humanities, all as appropriate and needed for the particular topic of inquiry.

The U.S. Senate Report for the Environmental Education Act provides a more precise statement of environmental education concepts and generalizations contained in the Act. Environmental education is: an integrated process which deals with man's interrelationship with his natural and
man-made surroundings; a study of the factors influencing ecosystems' mental and physical growth, living and working conditions, and population pressures; and is a life-long process of recognizing responsibilities for our activities in our environment. Environmental education should enable us to make sound ecological decisions and foresee their consequences, to make value judgments, and act accordingly. It is much more than a schoolhouse approach to environmental problem solving; it is a way of thinking—a synthesis which colors and affects the humanities, languages, social sciences, history, economics, and religion as dramatically as it does the natural sciences. It will give an ecological perspective to every aspect of living (Vivian, 1973).

A balanced view of content versus methods is found in a document issues by the U.S. Office of Education (Environmental Education Handbook, 1973). There are many ways to impart and acquire the kinds of information, perspectives, and techniques that are essential in developing the environmental awareness and skills that our society needs. Many of these ways involve emphasis on learner-directed and discovery-guided inquiry; some involve innovative and integrative learning outside the classroom. But in certain cases, environmental education must operate through more traditional approaches, such as lectures, classroom activities, and other nonexperience-oriented educational methods if the learner is to attain some of the essential skills, concepts, and facts he needs.

Several major environmental education conferences have helped to identify environmental education concepts and generalizations which are widely agreed upon. Based on an existing statement by B. Ray Horn and previous writings of Brennan, Brandwine, and others, the first International Working Meeting on Environmental Education in the School Curriculum (1970)
agreed that environmental education was the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality (Cerovsky, 1971).

The National Conference on Environmental Education at the University of Wisconsin, Green Bay in December, 1970, sponsored in part by the U.S. Office of Education, was designed to bring together authorities with successful experience in environmental education to discuss the dimensions of environmental literacy and the materials and strategies for environmental education. Discussion groups agreed on the following generally acceptable components of the environmental education area: environmental education is interdisciplinary, problem-centered, value-oriented, community-oriented, concerned with man's survival as a species (man is an integral part of the environment rather than an entity separate from it), has present and future orientation, and is a process involving man in developing the tools that enable him to make crucial environmental management decisions. Environmental education is a process of developing individuals who are capable of developing and living according to the life styles that are humanly successful and ecologically sound (Cook and O'Hearn, 1971). This definition lends itself to the development of a continuing learning experience from childhood through adult life and places proper stress on value and attitude development. Environmental education is an attempt at clarifying or changing value judgments via knowledge, motivation, and awareness of socio-ecological interdependencies. Such a holistic conception of environment functions to broaden the conceptual framework of ecology.
into an operative curriculum framework in which all teachers in all
disciplines can work. Examination of education from this ecological per-
spective may provide a truly unique opportunity to completely unify the
curriculum.

More recent definitions and descriptions of environmental educa-
tion appear to have refined the language somewhat but seem to rely on the
same basic environmental education characteristics. For example, Tanner
(1974), in describing environmental education as interdisciplinary, refers
to 19 articles, books, and other materials which support this claim. Tanner
also attempts to differentiate between environmental education and non-
environmental education. Topics or activities are only part of environ-
mental education when they include an environmental-ecological ethic
component. For example, the U.S. Office of Education identifies transport-
ation as an area which can properly be studied in an environmental educa-
tion project. But quickly goes on to point out that if some aspect of
transportation is chosen as an area for an environmental education activity,
the following kinds of questions would have to be examined, as appropriate
to the activity: what are the impacts of present transportation modes
on environmental pollution, land use planning, resource allocation, contrib-
utions to perception of crowding and actual crowding? In short, transpor-
tation is not a concern of the environmental education curriculum if we /are asking only the relatively simple-minded questions: how many people
can we move? how far? how fast? in these latter questions the focus is
on transportation. In the earlier questions, the focus is on environment
though the questions all are related to transportation.

The Federal Register of January 30, 1974 states that environmental
education is the process that fosters greater understanding of society's
environmental problems and also the process of environmental problem-solving and decision-making (McGowan and Kriebel, 1975).

Horn and Rogers (1975) state that through environmental education we learn to understand the behavior-determining aspects of human value systems, of personal and cultural attitudes, and of psychological needs. We also learn the basic functional requirements of healthy ecosystems. With these understandings we can distinguish the range of human behavior that is compatible with the continued health of the ecosystems that sustain us and on the basis of such distinctions prescribe policies that will assure healthy interactions between human and natural environments.

Recently, Unesco's "Belgrade Charter" described environmental education as a life-long, interdisciplinary approach to the development of a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions to current problems and the prevention of new ones (Connect, 1976). This definition is similar to Stapp et al.'s (1969) original definition of environmental education.

Characterization of environmental education by concept analysis

Several researchers and writers have attempted to characterize environmental education through the identification and analysis of concepts considered to be appropriate for environmental education. Roth (1969) used survey techniques to identify fundamental concepts for environmental education, K-12. He later recombined the more highly rated concepts into a model or conceptual schema for purposes of research and teaching in environmental education (Figure 2-D).
The "P" at the center of the model can stand for people or problems. Perception of the people-related problems would center on understanding and dealing with concepts within the model. For example, within the conceptual scheme "socio-cultural environments" appropriate concepts from Roth's (1969) list of environmental management concepts would include those related to politics, family, economics, values, and esthetics. The importance of concepts of interdependence and interaction is evident in this model.

Archbald and Gundlach (1970) statistically identified key words in environmental education from Roth's (1969) list of 112 environmental
education concepts. These key words formed the basis of their model of environmental education which is presented in Figure 2-2.

![Diagram of environmental education concepts](image_url)

(Archbald and Gundlach, 1970, p. 76)

Figure 2-2

Key Words in Environmental Education Statistically Identified from the 112 Environmental Education Concepts

Other widely known conceptual models for environmental education are the National Park Service's five "strands" (variety and similarity, patterns, interaction and interdependence, continuity and change, and adaptation and evolution), and the "spaceship earth" model (Stapp, 1974b).

Both the strand model and the "spaceship earth" model use major conceptual schema as the basis for organizing K-12 interdisciplinary activities which stress processes and values as well as concepts. The Stapp (1974b) model, which includes a representation of the philosophy involved in development of environmental education curricula, will be examined in greater detail later in this literature review.

Archbald (1975) proposed a conceptual model for environmental
education which is based on a research study in which ecologists and biology teachers were surveyed to determine the number of concepts necessary to a basic understanding of the dynamics of healthy ecosystems. The survey led him to develop a logical progression of seven basic single word concepts.

![Diagram of Ecosystem and Human Systems](From Archbald, 1975)

**Figure 2-3**

Balance of Ecosystems and Human Systems—Single Word Concepts

These basic concepts were also fully elaborated for instructional purposes through 39 additional one-word concepts. This model is not intended as a curriculum in itself, but rather as a conceptual tool for organizing the information in existing curriculum formats and materials.

Although this trend by environmental educators toward conceptualization of content represents a break from the traditional academic tendency to compartmentalize subject matter, McInnis (1975) believes education can be "environmentalized" procedurally as well as conceptually. He presents the following list of environmental education components as representative of the environmental education movement's concern with
procedure: perceptual awareness; conceptual understanding of natural and man-made environments; esthetic discrimination; values and value clarification; fostering creative abilities and attitudes; humanism; organizational skills and knowledge; and decision-making.

Examination of definitions and descriptions of environmental education not only provides a consistent set of major environmental education concepts and generalizations but also provides clues as to the organization of concepts. Two regularities appear from the review of the literature that suggest ways of organizing environmental education concepts that are related to content. First, there is a tendency among environmental educators to group concepts relating to natural and to human environments. This regularity was also noted by McInnis (1975). Second, there is a tendency in the environmental education literature to regard principles of ecology as the basis for all environmental education. This regularity was also noted by Kupchella and Byland (1977) after a review of articles in The Journal of Environmental Education and other environmental education-related periodicals.

To facilitate conceptualization of the human environment, McClaren and Walker (1974) proposed the following model (see Figure 2-4).

In this model the component environments (personal, social, cultural, global, and chronological) follow various levels or organization, all continuously interacting, in the human or man-made environment. The model appears to stress educational processes.

This discussion alludes to one of the main issues in environmental education today—differences in philosophy among educators who see environmental education either in terms of content or subject matter, or in terms of methods of teaching and learning. Those who define environmental education in terms of its methodologies stress procedural aspects, emphasize
open-ended investigation, and talk of a supportive classroom atmosphere. Some are especially concerned about the feelings and self-perceptions of the learners (McInnis, 1975); all are concerned that the children become active learning participants. Process-oriented environmental educators usually contrast their kind of learning atmosphere with one in which the teacher confines himself to the text book, expects students to gain irrelevant and outdated information, and generally creates a passive, dull classroom atmosphere (Tanner, 1974).

The process-content issue is directly related to another controversial issue in environmental education—cognitive versus affective emphasis. According to Roth (1972), Hendee (1972), and Southern (1969), before attitudes can be built it seems probable that ideas will have to be
formulated at the cognitive, or verbal level. Emotionalism, or affectivity per se, will not "do the job" in the present state of the art. All of our past experience with failures in conservation education clearly support this argument. The only effective programs have been those that began in the knowledge area and then proceeded to blend with the emotional (Roth, 1972).

Tanner (1974) suggests that until we know more, it seems prudent to attempt a judicious mix of cognitive and affective domains at all grade levels. A number of total approaches to environmental education curricula have attempted just such a mix.

Total curricular approaches to environmental education

Although the content-process issue is central to environmental education, the concern of the present work is with those characteristics which are important in terms of total curricular approaches to environmental education. Although descriptions of major environmental education elements in Chapter 4 contain detailed references to complete environmental education programs, a number of examples deserve comment here.

Balzer (1971), with an admitted bias toward science, attempted to develop a schema which could be used to develop environmental education objectives that represented cognitive, affective, and process-skills areas. The schema is useful for conceptualization of environmental education because it considers interrelationships between individual and environment and suggests educational techniques which could be useful in reaching stated objectives.

Stapp (1974b) describes a fairly comprehensive approach to curriculum development in environmental education (see Figure 2-5).
This model appears to be one of the most complete theoretical formulations concerning what environmental education is about. Various key environmental education components are illustrated and expanded upon in the text. This model served as the basis for the development of an interdisciplinary set of curriculum materials for use in schools, K-12 (Stapp and Cox, 1974).

Jinks (1974) examined the problem of implementation of a proposed total curricular approach to environmental education based on five
environmental concepts. He proposed sets of learning objectives, teaching strategies, and basic subject matter content for each of the environmental education concepts within each of the major subject matter disciplines of the curriculum. He concluded that this appeared to be a useful way to implement an interdisciplinary curricular approach.

Total curricular approaches developed by the National Park Service (1975) and the University of Wisconsin, Green Bay (1972) are also illustrative of attempts to operationalize environmental education theory. However, many other programs seem to be concentrating on content or process to such an extent that macrocurricular and program support systems are neglected. These approaches may be too narrow because curriculum workers are now suggesting that for effective educational change to occur, a total curricular approach must go beyond microcurricular elements to consider the wider curricular context (Gibbons, 1976).

It appears that even some environmental education programs which are described as total curricular approaches may be neglecting important aspects of curriculum development. This neglect may be due to the fact that there was no substantive structure for environmental education at the time they were proposed. Harvey (1976) recently specified a substantive structure for environmental education (see Figure 2-6).

In this figure, environmental education may be conceptualized generically in terms of philosophy, precept, and expected outcomes. These components establish a man-environment relationship foundation (MERF) for environmental education that has environmental literacy, competency, and dedication as its goal. For a topic to be considered part of environmental education it must satisfy the criteria that: all three components of the precept (man, environment, and relationship) must be present; and a human
Superordinate Goal of the Man-Environment Relationship (MER)
Achieving/maintaining a homeostasis between quality of life and quality of environment

Specific Substantive Structure
Action strategies for resolving value conflicts in the MER Man-environment relationship education--curriculum and instruction

Generic Substantive Structure
Use of all levels of cognitive, affective, and psycho-motor learning domains to develop environmentally literate, competent and dedicated citizenry Precept (man-environment relationship) in a formally values-laden context Philosophy--"Spaceship Earth/lifeboat"

Education Base
Man, environment, and relationship focused

Physical-Psycho-Social Base
The biophysical environment/human organisms

(From Harvey, 1976, p. 71)

Figure 2-6

The Substantive Structure of Environmental Education with its more General Bases

values component must also be present.

Given this generic substantive structure as a frame of reference for environmental education, it is now possible (and necessary) to deal with the specific substantive structure in the area of curriculum. The action strategies component of this structure has been examined (Hungerford and Peyton, 1977). There remains the examination of the curriculum and instruction component of the overall conceptualization of environmental
education—which is where the present work begins.

This section of the literature review was intended to achieve three aims: to establish the historical basis for elements associated with the term environmental education; to indicate some of the conceptual models which have been developed for environmental education; and to examine existing total curricular approaches to environmental education. The overriding purpose was to gain a concept of the total environmental education ecosystem as a basis for analysis of major characteristics. Clearly, environmental education is an amalgam of environmental and educational ideas. What remains is to establish whether the ideas have meaning as a total curriculum system.

The basis for the development of an organizational framework

This section of the literature review summarizes an extensive exploration of literature in educational psychology which is related to comprehension and understanding. The purpose of this search was to determine which learning principles were relevant to development of an organizational framework for key environmental education characteristics. It was reasoned that an organizational scheme which displayed relationships among environmental education characteristics would have more meaning for educators than a listing of unrelated elements. Perhaps a meaningful basis for organization could be found from an understanding of what kinds of organizational patterns are most easily learned and remembered. Given an underlying purpose of the study, the facilitation of curriculum work in environmental education, principles related to understanding and organization of material were examined as potential criteria for the evaluation of curriculum organizational models.
Instructional theorists who focus on curriculum, on learning environment, and on teaching acts and teachers, offer concepts and principles for instructional theory based on what psychologists have been able to establish about learning. Several of these generalizations about learning appear to provide a rationale for an environmental education curriculum-organizational framework. They are summarized as follows:

1. Evidence is quite clear that humans can develop organizing schemes to aid memory (Bousfield, 1953; Jenkins and Russell, 1952; Katona, 1940; Mandler, 1966; Miller, 1956).

2. Personal structuring and organizing is involved in learning (Tolman, 1959).

3. A theory should specify how a body of information is organized so that it may be understood by the learner (Bruner, 1966).

4. When one has a structure to which one can anchor or subsume new material, learning and retention are facilitated (Ausubel, 1960, 1968; Ausubel and Fitzgerald, 1961; Merrill and Stolow, 1966; Reynolds, 1966).

5. A person's repertoire of structures is of primary importance in cognition. Some of these structures are called groupings which are, in fact, systems of simple or multiple class inclusion (Piaget and Inhelder, 1969).

6. It is widely accepted that one's knowledge of structures within a subject matter field influences ability to learn new material in the field (West and Foster, 1976).

7. The cognitive structure of the learner can be influenced substantially by the inclusiveness, explanatory power, and integrative properties of the particular unifying concepts and principles presented to the learner (Ausubel, Novak and Hanesian, 1978).
Given that the curriculum field is to be explored as an organizational basis for environmental education characteristics, the research evidence cited above provides several criteria on which to judge the appropriateness of curriculum organizational schemes. First, the relevant curriculum ideas, concepts, or components must be understood as a comprehensive system (substantiveness). Second, the curriculum concepts must be logically related to one another (logical meaningfulness). Third, educators must already know the relevant curriculum ideas (nonarbitrariness). According to Ausubel (1968) meaningful learning can occur when these three criteria are met through recombination of new and known material into new structures or relationships.

Schemes for curricular organization which pass this initial screen must also be examined in terms of criteria derived from principles related to a finer filter, concept learning. The reason for this is that environmental education, as a generic term, may contain characteristics which may be concepts in their own right, possessing some degree of meaning independent of environmental education. An organizational scheme for environmental education, based on curriculum components, must consider conceptualization of such instances if meaningful learning is to occur.

Recent research efforts into concept learning provide several principles which may ultimately serve as evaluation criteria for curriculum organizational frameworks. They are summarized as follows:

1. The attainment of a concept can be viewed as a process of generalization in which we start with an image of a specific object in a specific orientation and arrive at an abstracted version of that image which allows us to recognize an object regardless of changes in a multitude of irrelevant details (Piaget, 1968).
2. Individuals can generalize that the instances of a concept belong to the same set without being able to define boundaries of the set in terms of its defining (criterial) attributes (Deese, 1967; LeFurgy, Woloshin and Sandler, 1969).

3. Whether an individual must infer the concept definition from viewing instances or is given the concept definition at the outset, he must discriminate and label the attributes of the concept (Trabasso, Rollins and Shaughnessy, 1971).

4. Acquisition of verbal labels for attributes of concepts may facilitate learning by making discriminations among instances easier and by directing attention to attributes common to a group of objects (Johnson and O'Reilly, 1964).

5. Although emphasizing relevant attributes will probably facilitate concept learning, the individual must learn not only the relevant attributes but also how they are combined to define the concept (Klausmeier, Ghatala and Frayer, 1974).

In terms of environmental education, it would seem that conceptualization could be facilitated by: examining key characters in terms of their contribution to the criterial attributes of a general definition; establishing verbal labels for character attributes; and describing curriculum components which can combine environmental education characters based on their relationships to educational practice. This conclusion implies that additional criteria must govern the selection of a curriculum organizing framework for environmental education. The curriculum framework for key environmental education characteristics must be able to relate attributes or elements of environmental education to a complete range of labelled curriculum components. Each attribute may then be
referred to as a value on a dimension. Every category must be specified by at least one distinctive feature. These distinctive features or category rules may seem quite arbitrary so that the problem in conceptualization becomes one of making decisions according to what is relevant.

When the curriculum literature is scrutinized for organizational schemes which satisfy the desirable criteria for meaningful learning and concept understanding, no suitable organizing frameworks could be found. A major reason for this appears to lie in the conflicting conceptions of curriculum that are rooted in widely different philosophical positions. However, many of these conceptions have contained similar elements (Posner, 1972). The traditional and persisting view of curriculum as subject matter (Beauchamp, 1968; Phenix, 1958) which influenced many national curriculum projects of the 1960's has been reflected in many theories relating to principles for selection, sequence and grade placement of subject matter. Saylor and Alexander (1974), citing more comprehensive and functional curriculum ideas of Dewey (1916), Rugg (1927), and Tyler (1971), view curriculum more broadly as learning opportunities utilizing both knowledge classified in subjects and knowledge and experience that cut across or are independent of subjects. Curriculum is considered to be a dynamic conceptual scheme or system—a set of components so related and organized as to attain the ends for which the system is established. The concept of curriculum domains and subsystems are introduced to define broad areas of the curriculum such as instruction and learning which can be implemented regardless of whether the goals fit conventional subjects and activities.

The systems approach to curriculum advocated by Joyce (1971) and Feyereisen, Fiorino and Nowak (1970) and subsequently by Saylor and
Alexander (1974) provides the means to consider comprehensively the entire scope of broad interest areas in education including environmental education. For example, this curricular approach considers the integral relation of goals and learning opportunities. Objectives are central in decision-making activities, including those major ones relating to choice of learning opportunities. Curriculum development, curriculum planning, evaluation and research are subsystems of the curriculum system which includes all of the relevant factors that are involved in the achievement of desired objectives.

Curriculum workers such as Saylor and Alexander (1974), who broadly analyze the products of curriculum planning, discuss several curricular components such as practices of teachers and teaching environments that would seem to be useful in organizing environmental education elements. However, these general curriculum schemes do not attempt an organizational design or an outline of the relationships among purposes, organizing structures (broad fields, subjects), organizing elements (concepts, skills, values), specific learning opportunities or activities and the principles to be followed in ordering and relating specific learning activities (McNeil, 1977). Such conceptual schemes provide the basis for organization without providing details of specific components.

The most productive path in the search for organizational designs in the curriculum field was traced through areas of curriculum implementation and educational change. The literature on curriculum implementation provided a number of curriculum components as curriculum-instruction variables such as teacher strategies, evaluation processes and learning environments. The material on educational change considered the principles and concepts which must taken into account if changes in schools
and school programs are to occur. Whereas both areas provided help in detailing curriculum components, neither area provided a model which considered the interrelationships of these components with the broader concept of curriculum.

Within the literature on educational change, Gibbons (1976) discussed problems of support and implementation for educational programs which are vital to change. He analyzed each element which represents a major influence on the program and in so doing devised a model for examination of the dimensions involved in curriculum development (see Figure 2-7).

![Diagram](image-url)

**Figure 2-7**

Dimensions of a Setting for the Development of Educational Programs

(Gibbons, 1976, p. 140)
When considered together with program structure, Gibbons' (1976) model for program support structure appears to provide a comprehensive curricular framework for organization of key characteristics of environmental education, or any other area of education. The organizational scheme is comprehensive, contains curriculum concepts which are logically related to one another in terms of program and program support systems, and is nonarbitrary in that educators already know the relevant curriculum ideas contained in the elements or attributes of the system. Each environmental education characteristic may then be related to this more general organizing system as values on the various program and program support dimensions. Each curriculum category contains distinguishing features which may facilitate understanding of environmental education characteristics. Thus, this model of curriculum organization, by satisfying criteria related to learning and concept understanding appears to provide a meaningful and systematic method of examining relationships among attributes from a complex educational concept such as environmental education.

Summary

The literature review was intended to provide the basis for subsequent development of an organizational framework for environmental education through: examination of the current environmental education ecosystem for major concepts and generalizations that characterize environmental education; consolidation of several orientations in environmental theory and conflicting conceptions in educational theory in order to expand the context and background of these environmental education concepts and generalizations; and examination of ways of organizing information that would best facilitate conceptualization and understanding of the environmental education ecosystem.
CHAPTER 3: PROCEDURES AND DESIGN

The procedure for this study consisted of the following steps: delimitation of the field of study, identification of the sample, delination of the procedure used to examine the literature, and delination of the procedure used to select a design for an organizational framework.

Delimitation of the field of study

The field of study, environmental education, was delimited to literature documented under the descriptor "environmental education" by the Educational Resources Information Center (ERIC) in the following publications: Current Index to Journals in Education (CIJE), Resources in Education (RIE), and environmental education documents distributed by the ERIC clearinghouse for environmental education. Both CIJE, which abstracts articles from more than 700 education and education-related journals, and RIE, which abstracts descriptions of educational programs, educational research reports, and other documents of educational significance, are part of a world-wide ERIC identifier index. It was assumed that the field of environmental education could be adequately represented in terms of theory, practice, and research results through use of the ERIC system. This assumption was made with the proviso that environmental education materials could be traced to documents not necessarily abstracted in ERIC by following leads from references and bibliographies listed within the ERIC system.

The environmental education field was further delimited in that the literature search examined documents published between 1966 and 1978. This delimitation was based on the assumption that the characteristics of environmental education as a field, which according to the literature was
first defined and discussed as an interest area about 1968, could be identified, indeed they existed, from documentation beginning in 1966. The literature review in Chapter 2 which provided the background to this study traced the historical development of environmental education and its antecedents. It provided the basis for this assumption.

Identification of the sample

The sample for this study consisted of an initial literature scan of the entire field of study. This literature scan took the form of examination of document abstracts in CIJE and RIE for information about what environmental education entailed. Techniques of historical research provided guidelines for inclusion/exclusion of material. First, each abstract must have contained the descriptor "environmental education" to be considered as part of the sample. This criterion was important because bibliographies of ERIC abstracts for environmental education from RIE compiled by Roth et al. (1973, 1976) contained entries which did not mention the specific descriptor, environmental education. Second, each abstract must have actually stated the certain characteristics which were considered to be elements of environmental education or at least contained information which provided an indication that the full text of the abstract would contain such information and therefore merited examination of the microfiche. This criterion was quite restrictive because a great many abstracts and texts provided indirect evidence of advocacy to certain characteristics without actually stating it in words. About ten percent (in excess of 2000) of the sources could be considered reliable according to this criterion. Use of this criterion was considered a necessary trade off to help reduce observer bias and distortion. Although it reduced
the number of sources that were considered reliable, it reduced the burden of interpretation and hopefully a major source of internal criticism of studies of this nature.

Because many of the sources, particularly those listed in RIE, contained statements which could not be considered to reliably (given the above criteria) advocate particular environmental education characteristics but which contained further documentation, many of these references were traced to sources outside the ERIC system. It was found that the actual statements of what environmental education did or did not entail could be found in these more basic or primary sources.

Examination of the literature

A purpose of the study was to determine whether key characteristics of environmental education theory and practice could be identified by systematic examination of the environmental education literature. But how can the literature be examined in order to get a representative, unbiased, and objective picture of the environmental education field?

If one were conducting a research study one might attempt to avoid bias and local eccentricities by reaching consensus through appropriate sampling procedures. If it is expected, upon inspection of the area, that there is a certain degree of heterogeneity in the population, a form of stratified sampling may be deemed most appropriate. To determine if there are regularities within a somewhat heterogeneous body of theory and practice, the survey may be conducted to determine if agreement exists. The survey could determine consensus among the considered opinions of those sampled. Alternatively, considered opinion may be gleaned from a systematic examination of the literature according to fairly strict
criteria which are designed to achieve consensus.

It was reasoned that the written opinions of individuals and groups of individuals may provide at least as reliable and valid a representation of environmental education as survey research, if procedures were carefully controlled. Thus, given the bounded universe of environmental education and the specification of sampling criteria, it was assumed that elements or components in the form of characteristic concepts and generalizations of environmental education could be analyzed from the literature. In order to systematically examine the literature, criteria were developed to guide analysis and, prerequisite to this, delimitation of the terms of reference was used to describe elements and guide analysis.

The analytic strategy used in this study approached a generic-type analysis in that it involved clarification of a concept, environmental education, by identification of its key characteristics. Definitions of environmental education are often programmatic and value-laden whereas descriptions attempt to examine the criteria or standards that are assumed and applied. For example, when we ask, "What is environmental education?", we may really wish to know the criteria that distinguish environmental education from other endeavors. While we may never establish the necessary and sufficient criteria to distinguish environmental education, the analysis process may at least probe the concepts of environmental education in an attempt to make them clear and understandable.

The question asked in the environmental education literature search concerned the identification of the basic generic features of environmental education which provide the criteria for distinguishing environmental education from non-environmental education. This involved identification of concepts and generalizations which environmental educators stated were a necessary part of environmental education. As was
mentioned earlier in this chapter, all sources could not be considered equal in the identification of these key environmental education characteristics.

There appear to be certain fundamental "rules" for relevant choice of characters in a body of literature. The first criterion is that of repetition. Key characteristics should exhibit a certain frequency of occurrence in the literature. The source of occurrence must also be considered and priorities established. Second, key elements should appear uniformly throughout the specified literature, both spatially and functionally (e.g., books, periodicals, research). Third, key environmental education characters should display consistency or resistance to rapid change. In other words they must not be whimsical or unsubstantiated by tradition or research. Fourth, each element should exhibit limited variation in approach; that is be recognizable as a singular element. Finally, characters should be reasonably simple to define and describe.

Criteria which governed the identification of major environmental education characteristics were developed as a subset of the more general criteria stated above. The following criteria were used to identify key characteristics of environmental education from the literature of the field:

1. The characteristic must have been stated, to be a core component of environmental education, by at least one major conference or workshop initiated by a major, recognized international sponsoring agency such as the United Nations.

2. The characteristic must have been stated, to be a core component of environmental education by at least one major conference or workshop initiated by an major, recognized sponsoring agency on the
national level (e.g., University of Wisconsin).

3. The characteristic must have been stated, to be a key element of environmental education, by at least ten individuals writing in refereed journals (listed through CIJE) or in published books which refer to journal articles in environmental education.

4. The characteristic must have been stated, to be a key element of environmental education, by at least ten individuals writing in articles abstracted in RIE or in published books which describe environmental education programs.

5. The characteristic must have satisfied all of the above criteria to be eligible to be included in a list of key environmental education characteristics.

These criteria appear to be directly related to the fundamentals for relevant choice of characters in a body of literature. In terms of priority within the frequency of occurrence criteria, it was reasoned that international and to some extent national conferences and workshops represented attempts to reach consensus on ideas and elements with global or at least regional significance. Although lower in priority, frequency of occurrence among individuals attempted to satisfy internal criteria of uniform occurrence, consistency or resistance to rapid change by examining sources of many kinds (books, periodicals, research) from 1978 back to 1966. At the same time, another internal criterion involved being able to recognize a characteristic as a singular element with consistency (1966-1978) and relative ease.

Given these criteria for inclusion/exclusion of environmental education characteristics, the environmental education literature was examined to determine if there were in fact characteristic elements of
environmental education in terms of a specific substantive structure as defined by Harvey (1976). It should be noted that the author is aware of Schwab's (1964) contention that structure is comprised of two interdependent modes—substantive and syntactic. The substantive structure consists of a body of concepts—commitments about the nature of subject matter functioning as a guide to inquiry. The syntactical structure concerns the pattern of its procedures, its method, how it goes about using its conceptions to attain its goals. Although many curriculum theorists and developers have attempted to treat these two modes as separate systems, they are not capable of distinction in practice (Shulman and Tamir, 1973). Thus, Harvey's (1976) conception of specific substantive structure, consisting of curriculum and instruction, appears to have some meaning.

The author is also aware of the difficulties scholars have encountered in their attempts to find "the" substantive structure of various disciplines. Efforts to construct a given curriculum package on the premise of finding the fixed inherent structure of a discipline have tended to result in widely differing organizations and treatments of subject matter. However, there is a vast difference between seeking to find the substantive structure and structuring according to a given set of organizational principles. This study seeks key elements of one educational system, environmental education, and attempts structuring according to organizational principles of what is believed to be a metasystem of environmental education. One may assume the possibility that there are other metasystems of environmental education, but investigation of such systems is beyond the scope of this study.

Although results of the study will be discussed more fully in the next chapter, it would seem useful at this point to indicate that, upon application of the criteria for inclusion/exclusion of environmental
education characteristics to the environmental education literature, several key environmental education characteristics were identified. In all, 25 elements that may be said to characterize current theory and practice were identified. These components of environmental education are listed, together with single sentence descriptors in Table 3-1.

The identification of key characteristics involved use of a note-card system which allowed notes to be arranged in any order desired. This procedure facilitated the recording of a number of environmental education characteristics from a single source. The author's name and article publication date were recorded as they indicated advocacy of particular characteristics. The complete list of environmental education characteristics together with support references may be found in Appendix A.

The recording or note-taking proceeded as follows. When a potential environmental education characteristic was identified from a source (e.g., in the recommendation of an international conference) that characteristic became the column heading for scrutiny according to inclusion/exclusion criteria established earlier. As the literature search continued, new potential characteristics were added and support or nonsupport determined as examination proceeded. Some potential characteristics such as interdisciplinary satisfied minimum criteria early in the literature review. Although it could not be used as a formal research procedure, the author informally employed the concept of the eigenvalue cut-off point from factor analysis and the concept of the break in the graph of a species-area curve from ecological vegetation analysis to determine cut-off points in the literature search. These concepts appear to be quite similar. A brief, greatly simplified explanation of the species-area curve idea may facilitate understanding of the procedure used.
Table 3-1

Key Characteristics of Environmental Education

1. Interdisciplinary: Environmental education should be part of every subject taught.

2. Multilevel: Environmental education should be taught at all grade levels from kindergarten through grade twelve and beyond.

3. Global view: Environmental education involves the development of an integrated global environmental ethic.

4. Concepts: Environmental education entails awareness and understanding of basic ecological-environmental concepts (e.g., limiting factors, carrying capacity).

5. Process development: Environmental education involves development of cognitive, affective, and skill-behavior processes, especially the development of attitudes and values which motivate people to become involved in environmental problem-solving.

6. Problem solving: Environmental education involves helping students develop processes of thinking which could be more effective in resolving complex environmental problems.

7. Values clarifying: Environmental education involves exploring personal assumptions, values, and feelings toward self and society as well as the relationship of these to the natural world.

8. Systems thinking: Environmental education implies that one must learn to think in terms of systems of interacting factors; that is, to think not only rationally about the parts of a complex system but to develop an intuitive feel for the dynamic behavior of such a system as a whole.

9. First-hand experiences and activities: Environmental education teaching requires a commitment to the development and utilization of all situations where learning can best be nurtured through first-hand experiences and activities which foster a deep respect and love for the natural world.

10. Environmental issue oriented: Environmental education entails use of local environmental issues, as well as case studies, role-playing, simulations and games which provide opportunities to examine and participate in the complexities of decision-making, understanding of personal and alternative values and the actual operation of systems—natural and man-made.

11. Present and future orientation: Environmental education does not exist in the reactive sense only but continually assesses the present and promotes an ideology which examines desirable images of the future.
12. **Active participation:** Environmental education emphasizes active participation in preventing and solving environmental problems.

13. **Individual learning:** The breadth of environmental education and variety among students implies that individual learning programs involving certain degrees of independent study of a diverse number of interdisciplinary environmental problems will be appropriate.

14. **Team approach to teaching/learning:** Environmental education involves teacher participation in environmental problem-solving learning situations as team members.

15. **New productive student-teacher relationships:** Personal responsibility and group interaction: Environmental education places an emphasis on problem-solving which implies many things including recognition of the values and biases of oneself and others and responsibility for working individually and collectively in a process of informed environmental decision-making.

16. **Community oriented:** Environmental education involves the entire community as a learning environment in the achievement of environmental education objectives.

17. **Field studies (urban and natural environments):** Environmental education includes provision of field experiences—that group of first-hand experiences which are best suited to areas outside the classroom and school.

18. **Communications networking:** Environmental education entails communication skills as a process which can provide more complete and accurate images about environmental problems. It is important to understand how environmental information flows through networks linking the members of a system together.

19. **Coordination and cooperation:** International, national, regional and local: Environmental education promotes the value of and necessity for local to international cooperation in the solution of environmental problems.

20. **Flexible administrative organizational patterns:** Institutional flexibility is required to cope with evaluation and provide adequate instruction, given the interdisciplinary problem-solving nature of environmental education.

21. **Reform of educational processes and systems:** Environmental education implies modification of existing educational structures.

22. **Curriculum development base:** Environmental education, because of its program component and support elements and strategies, implies active involvement in the development of new curricula.
23. **Curriculum evaluation base:** Evaluation is required for effective program development in environmental education so as to guide selection of adequate environmental education programs, examine all processes that lead toward achievement of intended outcomes and judge its appropriateness for support or adoption.

24. **Research base:** Environmental education requires more objective evidence of its benefits and effects in order to buttress rhetoric with instances of success and failure.

25. **Teacher education:** Environmental education involves continued improvement in professional development through inservice and preservice channels to assist in the development of an environmental ethic.

When sampling vegetation, using quadrats, the number of new species identified in each successive quadrat is added to the previous total species count and the result is a positive slope of varying inclination depending upon several factors including species heterogeneity in a particular terrain. At a certain point, after a number of quadrats are sampled, no new species are recorded and the graph levels off to a horizontal line. The point where the graph "breaks" to a horizontal line provides an index of species diversity.

In the present study, it was observed that, initially, the number of potential environmental education characteristics increased but that eventually no new characteristics were being recorded. Similarly, evidence of support for these characteristics gradually increased, until each criterion was satisfied for a number of the characteristics. A substantial amount of additional reading, while producing more support for already accepted characteristics produced little evidence to support new or as yet unaccepted potential characteristics. Thus, whereas the number of required individual source supports for character inclusion was quite arbitrarily set at ten, this number did not appear to be critical for
inclusion/exclusion, with the exception of two marginal cases. What happened was that certain characteristics became acceptable for inclusion quite rapidly, whereas others experienced great difficulty in gathering anything but meager support.

Several potential environmental education characteristics could not be included in the list of key environmental education characteristics because they did not meet the inclusion criteria. These additional elements included: inquiry approach, "core" program, humanistic approach, public involvement, incorporation and use of specialized disciplines, use of residential field centers, use of nature centers, understanding of science or science concepts, and concern with feelings and self-perceptions of learners.

It seems possible that, given different criteria or a different point in time, certain characteristics included or excluded or not yet even encountered may be considered as key environmental education elements. However, somewhat analogous to the eigenvalue cut-off point or break point in a species-area curve, the accepted key characteristics exhibited a much higher frequency of occurrence in the support literature than did excluded potential characteristics. Of the additional characteristics, only inquiry approach gathered enough support to merit attention as a possible key characteristic, given the arbitrariness of selection criteria. It had been expected that the inclusion/exclusion boundary line would have been considerably more "fuzzy" than what actually resulted.

**Determination of an organizational design**

An objective of this study, if key environmental elements could be identified, was to determine if meaningful relationships existed among these
these elements or distinctive features. Examination of the key environmental characteristics which resulted from the preceding analysis revealed that each element might be considered as a concept, a construct or a generalization (principle) within the generic structure of environmental education. The meanings associated with these terms require clarification.

Concepts are abstractions created in the process of categorizing. Conceptualizing involves abstraction (attention to common features while disregarding unique ones) and generalization (essential common features are found in new phenomena). It also involves selection of certain properties and an attempt to establish relationships among them (Brodbeck, 1963; Cronbach, 1954; Hunt, 1962). The process involved in this study is essentially a conceptualization of environmental education.

Constructs are names given to concepts to which it is thought that there is nothing corresponding in reality (Harré, 1961; Russell, 1912). They are deliberate abstractions such as value or multilevel, which are used to aid in the analysis and understanding of phenomena such as environmental education.

Principles are general statements or generalizations which specify relationships among two or more concepts (Brodbeck, 1963; Brownell and Hendrickson, 1950; Cronbach, 1954). General statements which do not make these relationships through the application of a principle or law which holds in more than one case are better defined as propositions or similar statements (Nagel, 1953). Principles can vary greatly in generalizability. Some may state relationships which are always true or are always true under specified conditions whereas other such generalizations may be probabilistic; that is, the relationship may hold only in a certain percentages of cases. Social scientists generally think of all principles or generalizations in the social sciences as only tendencies. Generalizations of
principles differ in terms of the certainty attached to them. Because they begin as conjectural statements or hypotheses, and because they go beyond observable instances, there always remains a shadow of a doubt surrounding them. As hypotheses are tested over and over by many individuals in different situations without being disproved, they become less tentative. They are, however, always subject to revision in the light of new evidence.

Rationale for an organizational framework

Concepts, constructs and principles are involved in theory building. The interrelationships, explanations and predictions of a theory are based on these fundamental components. It can be said that a theory or even a partially-formalized theory represented by a conceptual framework serves to identify the most important variables and relationships among theories, in the hope that these partial theories will facilitate the collection of data needed to develop more complete theories (Brodbeck, 1963; Easton, 1963).

It is often stated in textbooks on educational research and in references on the methodology of science that the observation and analysis of data should be based on some kind of theoretical formulation if it is to produce significant results (Cullinan, 1964). The criterion selected for development of a rationale for organizing key environmental education elements was that it should be consistent with the purposes for which the environmental education framework was to be used, namely, to improve conceptualization of environmental education and thus facilitate curriculum development, evaluation, and research. Thus, it was reasoned that an environmental education framework should be designed to emphasize, as far as possible, relationships between environmental education concepts and
generalizations and those essential concepts and generalizations of educational program development. Such a framework should be designed to:
1. aid individuals in discovering what environmental education entails;
2. help educators and curriculum workers develop appropriate objectives;
3. provide a basis for evaluation of existing programs which carry the environmental education label; and 4. provide educational researchers with a body of heuristic concepts.

The curriculum field: A metasystem for environmental education

The kinds of characters or elements used in the formation of concept categories depend on the nature of the material to be organized and on the purpose of conceptualization. The purpose of this study was to facilitate curriculum work in environmental education through better understanding of its specific characteristics. Thus, the curriculum literature was examined for organizational designs or systems which might illustrate meaningful relationships among environmental education characteristics. Certain criteria guided this literature search. First, curriculum components must be comprehensive—that is, they must span the entire scope of program development at the educational system level. Second, the curriculum framework should itself be a logically consistent conceptual system. This means that it should represent a system in which a limited number of basic concepts are identified and then employed or synthesized to define additional terms of a more sophisticated or complex nature which are then employed to define even more complex terms. Third, the concepts included should be those generally acceptable to the curriculum planning profession—that is, they should be consistent with practice in the curriculum field.

The review of the curriculum literature, summarized in the last
section of Chapter 2, revealed that, although several models and organizational schemes have been developed, few such designs take a broad or systems view of the curriculum field. This lack of comprehensiveness, in model design, which seemed mainly due to differing conceptions of curriculum, eliminated all but one of these organizational schemes. The one organizational design which satisfied each of the criteria was one proposed as a model which explored the dimensions of a setting for the development of educational programs. This model, proposed by Gibbons (1976), considers the program support system components which must be considered for effective change in educational programs. Personal communication with the originator of the model resulted in the expansion of these program support system elements to include program elements. This expanded model, presented in Figure 3-1, became the curriculum system within which environmental education characteristics were related.

The curriculum elements, listed as program and program support system elements in this diagram, may be considered as dimensions or concepts in the curriculum system. These elements or concepts were used to describe relationships among key environmental education characteristics. Given different purposes, other ways of examining relationships among these environmental education characters is believed possible. It was assumed that the method of organization chosen could come closest to producing a conceptualization of environmental education which could facilitate curriculum work in this area.

A curriculum task such as program development or evaluation may be analyzed in terms of the educational program and the program support system. Program objectives can be described as being macrocurricular (i.e., educational system and school program) and microcurricular (i.e.,
Figure 3-1

Educational Program and Program Support System Elements

*Meta-currr. - Meta-curricular
Macro-currr. - Macro-curricular
Micro-currr. - Micro-curricular
ED.SYS. PROGRAM - Educational system program
LH. - Lesson
M.E. - Methods and Materials
R.R. - Roles and Relationships
ENVS. - Environments
PLANNING & DN.MKG. - Planning and Decision Making
RESEARCH & DEV. - Research and Development
courses, units, and lessons). The program support system can be analyzed into teaching (i.e., methods, materials, roles and relationships), contextual (i.e., environments, conditions), and administrative components (i.e., organization, planning, and decision-making). According to Gibbons (1978), it may be hypothesized that the nature of student educational experience is determined by all of these elements and that the improvement of student experience will be limited by the degree to which all of the elements listed above are also improved and on the appropriateness of those improvements for the desired experience.

Once the curriculum metasystem was identified, key environmental education characteristics could be related in a meaningful context, given the purpose of the study. This involved the organization of environmental education elements as subsumers of curricular components. The result was the organizational schema for environmental education which is described in Chapter 4.

Some reflections on the methodology

The processes involved in interrelating environmental education and curricular components seem fairly straight-forward. These processes are, in reality, much more complex. They are the result of examination of organizational principles ranging from structural anthropology through biological classification to an examination of learning from the viewpoints of cognitive psychology, psycholinguistics, and systems theory.

Faced with a vast array of diversity in the natural world, man instinctively classifies (Heywood, 1976). He divides this diversity into smaller, more manageable groups. Early classifications were practical and were determined by conspicuous features. To be of general value, some adequate method is required to allow us to identify the parts and to
A particular concern confronting educators when they attempt to conceptualize a field of study is the organizational process. This process is related to the learning-thinking process. According to cognitive psychologists, learning is the process of elaborating and modifying cognitive structures. Cognitive structure, or any system for organizing information can be described in terms of three components: 1. a set of categories; 2. distinctive features which specify category membership; and 3. a network of interrelationships among the categories.

A category is merely a decision to distinguish certain objects or events from others. Given a unique name, the category becomes a concept. Such concepts are meaningless unless there are categories within the cognitive structure to which they can be attached. To make the category system functional, then, there must be some way in which the different categories can be related. These interrelationships are the core of the entire conceptual framework.

Cognitive interrelationships appear to be established hierarchically with categories embedded within one another. Such organizations are conveniently summarized as "tree" structures which represent system networks that indicate how an individual might conceptualize knowledge, and not a biological type of taxonomy:

Because individuals do not always organize knowledge logically in the most economical manner, many interrelationships are possible. Thus, any tabulation of different kinds of interrelationships among categories can only be illustrative rather than exhaustive. However, a valid and reliable proposition for a particular framework must attempt to make
the most probable and necessary connections among necessary elements.

In terms of the environmental education framework, given an understanding of learning of cognitive interrelationships, it may be assumed that, when organizing ideas, the learner (curriculum developer, educational practitioner, etc.) may take larger categories and break them down into successively smaller units in order to organize information into clearly understood conceptual components. The learner uses categories that provide optimal entry into cognitive structure via clues that make a wide range of associated ideas available. These ideas (e.g., instructional components) are scanned for items (e.g., problem solving) that meet the demands of the learner's intended purpose (e.g., curriculum development in environmental education).

Given certain key characteristics of environmental education, a goal in constructing a hypothetical framework based on meaningful curriculum concept categories was that it be comprehensible and useful to educators. Because learning and comprehension appear to be maximally facilitated through hierarchical relationships among meaningful concept categories, it was hypothesized that key environmental education elements could be most meaningfully conceptualized and understood within a curriculum-based hierarchy.

Given the organizational theory involved in ordering environmental education characteristics, a recognized limitation noted in Chapter 1 bears repeating. ERIC materials used to identify environmental education components are relatively barren of non-educational material. This limitation of scope within Harvey's (1976) specific substantive structure of environmental education was deemed necessary and was intended to complement Hungerford and Peyton's (1977) examination of non-educational components
of environmental education. Thus, limiting the scope of this study does not deny the importance of non-educational aspects of environmental education, but merely attempts to fill a void which exists with respect to articulation of curricular elements of environmental education as a complement to non-curricular materials.
CHAPTER 4: FINDINGS OF THE STUDY

A major objective of this study was to attempt a conceptualization of environmental education based on the identification of its major characteristics. Using procedures described in Chapter 3, 25 key environmental education characteristics, ranging from program concepts and objectives to teaching strategies and learning environments were identified. These characteristics or elements are listed in Table 4-1 together with their frequency of occurrence according to the previously discussed criteria for inclusion.

A complete listing of the sources from which the frequency data for Table 4-1 were taken is provided in Appendix A.

It can be seen from Table 4-1 that certain environmental education characteristics occur more frequently in the literature than others. This may be interpreted to mean that some key characteristics are more important than others, especially because criteria for inclusion were somewhat arbitrarily chosen. For example, interdisciplinary might be regarded as more important than systems thinking. However, such interpretations must be made with caution. Analysis of the environmental education literature revealed that some characteristics such as systems thinking or communications networking are just now beginning to receive more attention. Whereas concepts such as interdisciplinary and problemsolving have been discussed since the inception of environmental education, other concepts and ideas have emerged more recently as part of the theoretical and practical development of environmental education.

There has been a much larger number of national-level environmental education conferences, when compared to international-level environmental
Table 4-1

Frequency of Occurrence of Key Environmental-Education Characteristics
According to Criteria for Inclusion

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>International Conferences</th>
<th>National Conferences</th>
<th>Journal* Articles</th>
<th>Program** Articles</th>
<th>Research Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary</td>
<td>6</td>
<td>3</td>
<td>47</td>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td>Multilevel</td>
<td>5</td>
<td>2</td>
<td>16</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Global view</td>
<td>3</td>
<td>1</td>
<td>21</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Concept understanding</td>
<td>4</td>
<td>4</td>
<td>33</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td>Process development</td>
<td>3</td>
<td>3</td>
<td>23</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>Problem solving</td>
<td>4</td>
<td>2</td>
<td>22</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Values clarifying</td>
<td>3</td>
<td>2</td>
<td>23</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Systems thinking</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>First-hand experience</td>
<td>2</td>
<td>2</td>
<td>23</td>
<td>18</td>
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<td>1</td>
<td>16</td>
<td>15</td>
<td>2</td>
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<tr>
<td>Present-future oriented</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Active participation</td>
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<td>10</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>New productive relationships</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Community involvement</td>
<td>3</td>
<td>2</td>
<td>27</td>
<td>23</td>
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</tr>
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<td>Field studies</td>
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<td>21</td>
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<td>6</td>
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<td>Communications networking</td>
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<td>1</td>
<td>14</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Coordination and cooperation</td>
<td>5</td>
<td>2</td>
<td>14</td>
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<td>1</td>
</tr>
<tr>
<td>Flexible administration</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Reform of educational processes</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>10</td>
<td>4</td>
</tr>
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<td>20</td>
<td>4</td>
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<tr>
<td>Curriculum evaluation base</td>
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<td>16</td>
<td>14</td>
<td>4</td>
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<td>Curriculum research base</td>
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<td>2</td>
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<tr>
<td>Professional development base</td>
<td>5</td>
<td>3</td>
<td>21</td>
<td>22</td>
<td>5</td>
</tr>
</tbody>
</table>

*CIJE journal articles or published books
**RIE abstracts or published books
education conferences than the first two columns of Table 4-1 would seem to indicate. Priority in this literature analysis was given international-level consensus as opposed to regional or national consensus. This is not to say that national conferences were not an extremely important data source. Such conferences and their reports and recommendations provided much insight into environmental education. However, many of these national and regional conferences, such as the National Outdoor and Environmental Education Conference at Fort Qu'Appelle, Saskatchewan, Canada, did not publish reports or recommendations that could be analyzed according to procedures established for this study. This may be considered as a weakness of the study or a failure of such conferences to draw together findings. In fact, some conferences were simply not designed to question or examine the definition of environmental education or to produce recommendations concerning its nature.

Although frequency of occurrence of research articles in environmental education was small and these articles were not actually used as criteria for inclusion or exclusion of environmental education characteristics, this category is regarded as an important future criterion for such studies. Considering the attacks that are being levelled at environmental education for the lack of an adequate research base upon which to support its claims concerning teaching strategies and learning environments, the situation in this young field is improving (Roth, 1976; Roth and Helgeson, 1972). Thus, Table 4-1 contains a frequency list of identified research articles which specified the importance of various key environmental education characteristics.

The asterisks following journal and program articles in Table 4-1 represent an important procedural point which was discussed in Chapter 3.
In many cases, in order to find statements which actually indicated the importance of a particular characteristic to environmental education, especially in RIE articles, references had to be traced to an original source. This tracing was done in an attempt to limit observer bias.

There do not appear to be any other research studies which have attempted to identify characteristics of environmental education programs. However, there are indications that environmental educators are beginning to explore this potential research area. A working group of environmental educators at the recent North American Regional Seminar (NARS) on Environmental Education, organized by the Alliance for Environmental Education, at St. Louis, came up with a list of characteristics which may contribute to a well planned environmental education program. The list included interdependence, on-site learning experiences, problem-solving techniques, problem prevention, global view, futuristic outlook, relevance to learner, positive attitude, environmentally ethical, values clarification, attitude formation, cost/benefit/risk analysis and energy "budget" (Aldrich, Blackburn and Abel, 1977). That working group related these characteristics to certain content themes such as population, energy, resource conservation, preservation of biological diversity, ecology and environmental economics. Many of these themes were similar to themes identified by the Delphi surveys of the Alliance for Environmental Education prior to the NARS. These themes were originally derived from the Belgrade Workshop on Environmental Education sponsored by Unesco-Unep.

It seems reasonable that a list of key environmental education characteristics, identified by a fairly systematic, objective procedure could facilitate understanding about what constitutes environmental education. However, to increase the probability that environmental education
is a meaningful concept around which sound programs can be developed, evaluated, and researched; some means of organization seemed appropriate. Thus, a second major objective of this study was to provide an organizational framework which could represent metasystematically the relationships among environmental education components. Such an organizational framework for environmental education was intended to facilitate program development work in environmental education, and thus a curriculum framework was sought from the curriculum literature which would satisfy certain criteria for organizational systems identified in the last section of Chapter 2 and in Chapter 3. Key characteristics of environmental education, organized within dimensions of the curriculum field, are shown in Figure 4-1.

Figure 4-1 represents a metasystem, in this case a curriculum system, which illustrates relationships among purposes (functions, domains, goals, or objectives), organizing structures (macrocurricular), organizing elements (microcurricular), and specific learning opportunities, activities and environments. The environmental education characteristics may be seen as program and program support system elements, all of which may influence or affect specific learning opportunities. Each of these environmental education characteristics is described more fully later in this chapter. The various environmental education elements of Figure 4-1 should be considered as descriptors of concepts, constructs and principles which are subject to interpretation by educators and individuals interested in environmental education. These elements are not to be considered as parallel or equivalent because they represent concepts at all levels of education from program objectives to the necessity of research activities to the well-being of environmental education.
Environmental Education

Educational Program Elements

<table>
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Organizational Elements

| Flexible administrative organisational patterns | Reform of educational processes and systems |

Research and Development Elements

| Curriculum development base | Curriculum evaluation base | Research base | Professional development base |

Figure 4-1

Environmental Education Characteristics:
Curriculum Organizational Framework
Description of key environmental education characteristics as elements in a curriculum organizational framework

The purpose of the curriculum framework is to attempt to illustrate how a list of apparently nonhomologous or noncongruent environmental education characteristics can be related by considering a higher level of organization. Environmental education characteristics may be discussed in terms of a curricular system of program and program support elements, each of which may be analyzed into a number of dimensions which should be considered when developing educational curricula. Each element obviously influences the program but also influences all other elements.

The curricular components of Figure 4-1, familiar to curriculum theoreticians and school practitioners, are all believed to contribute to specific learning opportunities. Environmental educators have constructed arguments concerning each of these curricular dimensions. This system is an open system both in terms of curricular elements and specific environmental education characteristics. Additions, deletions and changes are always occurring as our understanding of education, curriculum and environmental education deepens.

What follows is a brief description of key environmental education characteristics as elements in the curriculum system. Descriptions of each of the major environmental education characters will attempt to synthesise viewpoints drawn from the references used to identify that element as a component of environmental education. A more complete list of supporting references, grouped according to environmental education characteristic and criteria used to screen potential environmental education components is found in Appendix A.

There is obviously a danger of bias or of misrepresentation in the description of environmental education characteristics. To minimise
the sources of error, each environmental education character was considered as a descriptor for a literature review of that character. Thus, a number of points of view are considered under each category heading in an attempt to find a representative description of each characteristic. The "definitive" description of each environmental education element was not a goal of this study. Rather, descriptions which would contribute to the understanding of each component, even though quite incomplete depending on the state of the art of environmental education regarding that component, were attempted.

Educational program elements will be considered first, followed by program support system elements, moving from left to right across each of the five rows of elements in Figure 4-1.

Educational program elements

Curriculum can be conceptualized at different levels of generality depending upon whether the structure involves macro-or micro-elements. Macro-elements can also occur at different levels of generality ranging from the school program to considerations which involve the entire school system. Micro-elements consist of those curricular elements, such as courses, units and lessons, which fall within the realm of actual teacher and student experience.

Macrocultural elements

Three characteristics of environmental education were identified as belonging to the macrocurricular level. These are: interdisciplinary, multi-level, and development of a global or integrated environmental ethic.
Environmental educators have written extensively about the horizontal dimension of curriculum organization. According to Tyler (1950b), this dimension involves consideration of the relationship among opportunities in concurrent classes, in subject matters, and in situations both within and out of school.

Environmental educators tend to agree that horizontal organization must involve integration of subject material or what they refer to as interdisciplinarity learning. However, some differences appear to exist among such educators concerning the degree of integration necessary for effective environmental education. For example, Stapp (1976) states that interdisciplinarity, with regard to environmental education, simply means that it should become part of every subject taught. To'McClaren (1978), interdisciplinarity implies transdisciplinarity, a new structuring of knowledge. Jinks (1974) describes a totally integrated and cross-disciplinary approach to environmental education as pan-disciplinary, whereas Emmelin (1975), following others, attempts to distinguish multidisciplinary from interdisciplinarity.

Recently, several authors have attempted to remove some of the confusion surrounding the interdisciplinary concept by describing the goal of knowledge integration. Interdisciplinarity attempts to unite the separateness that marks a disciplinary approach to knowing. It may be argued that this separateness has resulted in a perceptual inability to perceive wholeness and in turn has contributed to ill-advised decisions about man-environment transactions (Miles, 1976). Interdisciplinarity does not deny the validity and usefulness of disciplinary knowledge, but attempts to re-establish the existence of the disciplines.
as a tool, rather than something in and of themselves (McGowan and Kriebel, 1975). Elements of all disciplines need to be applied to environmental problems in one or another parts of the curriculum or student learning experience. Thus, interdisciplinarity implies reliance on whatever particular areas of knowledge are useful and valuable to the problem objectives at hand (Weidner, 1976).

According to Tanner (1974) interdisciplinary environmental education attempts to make the connections between social problems that might not seem connected to someone who lacks an environmental/ecological perspective. For example, the study of unemployment, as a part of a social studies or economics class, per se, is not environmental education. But if students learn the environmental/ecological significance of activities such as the environmental effects of make-work projects (the supersonic transport, certain highways and dams, certain wars) then the study of unemployment becomes part of environmental education.

In many current environmental education programs, organizing principles call for increasing breadth of application and range of activities. Sometimes the learner's problems and interests serve as a framework or organizing center within which knowledge from many fields can be brought together. Similarly, opportunities to attack social problems and to conduct projects call for integrating concepts and methods from different fields of knowledge. Some attempts to provide an integrated holistic approach have resulted in oversimplification, an inherent danger of such an approach to which environmental educators are now addressing themselves.

The need for synthesis of knowledge and methods from many disciplines, usually described as interdisciplinarity, continues to be perhaps the most interesting methodological consideration of environmental education.
Examination of sources listed in Appendix A for this descriptor may lead to a better understanding of its meaning.

Multilevel (Integration)

Tyler (1950b), in discussing vertical relations of learning opportunities, stresses that when there is vertical continuity throughout the years of schooling, learning opportunities reinforce each other so that the learner acquires both deeper and broader understanding of important elements. When environmental educators state that environmental education is a multilevel concern, they are saying that it should be treated as a K-12 or even K-16 concern in school systems. That is, environmental education should be taught so that a continuity in learning proceeds from kindergarten through grade 12 and beyond. According to Tanner (1974), there seems to be universal agreement among environmental educators that environmental education should be multilevel.

Some recent principles for sequencing learning in existing environmental education programs have made use of psychological models such as the hierarchy of ideas (Gagné, 1971), spiraling (Bruner, 1960), progression (Anderson, 1971) and of developmental schemes such as those of Havighurst (1972), Piaget (1950) and Kohlberg and Whitton (1972). For example, Stapp and Cox (1974) emphasize the interaction of feeling (affective), knowing (cognitive) and skill-behavior (psychomotor) domains in a sequence through all grade levels in their comprehensive model for environmental education.

Existing instructional materials seem to reflect philosophical
differences about what childhood experiences are necessary for a deep, abiding concern for the environment. Environmental educators are not unanimous in their opinions regarding the scope and sequence of multilevel environmental education activities. However, they do generally tend to agree that certain organizing elements such as concepts, generalizations, skills or values, selected in light of goals and objectives, should be used to provide vertical coherence to environmental education curricula.

Global view (Integrated environmental ethic).

The ultimate purpose of horizontal and vertical articulation of environmental education curriculum is the development of individuals who are aware of, and concerned about, the environment and its associated problems, and who have the knowledge, skills, attitudes, and commitment to work individually and collectively toward solutions to the current problems and the prevention of new ones (Unesco-Unep, 1976). This developmental process, according to many environmental educators (see Appendix A and the literature review), must lead to a global perspective which is characterized by "holistic" thinking (Perelman, 1976). This involves development of the ability to see more clearly the properties of whole systems, the interlinked patterns that connect things (Bateson, 1972). It involves rethinking our basic assumptions and exploring the idea that it may not be possible to arrive at real truths through science and technology alone (Lowe, 1971).

According to Perelman (1976), a global perspective has several characteristics in addition to holistic thinking. It involves: learning to deal with the structures and dynamics of complex systems; understanding the causes and consequences of growth in a finite world; understanding
the global process and its relation to human thought and action (human nature); and understanding the basic concepts and fundamental processes of communication, control, and learning. It involves definition of long-term global goals and appropriate, effective means for pursuing them. The challenge, states Willard (1976), is how can we best harmonize necessary human activities with the dynamics and processes of earth's ecosystems, so as to foster the well-being of all mankind together with the ecosystems of earth for generations to come.

This environmental education characteristic seems to be the one which provides the environmental rationale for all curricular decisions in environmental education. Environmental educators appear to be striving to find the kind of education that will maximize the probability of a global view or integrated environmental ethic which Odum (1974) describes as an extension of general man-man and man-society ethics to include man-environment relationships. According to McInnis (1972), only when we see that all existence is mutual, only when we see ourselves as part of a larger community, will we understand what is necessary for environmental quality.

Microcurricular elements

As was mentioned in the previous section, in order for learning opportunities to be related, whether vertically or horizontally, there must be some common elements between them. These elements are the threads of the curriculum—their understanding, a distinguishing attribute of curriculum expertise. Such elements, used as the basis for organization, are usually concepts, generalizations, skills, and values. Environmental education characteristics which involve curricular considerations at the
micro-level, the level of courses, units, and lessons include: awareness
and understanding of basic concepts (ecological, environmental) and
development of processes (cognitive, affective, and skill-behavior).

Environmental educators, faced with information overload, tend
to avoid traditional academic approaches which categorize content and
tend to advocate conceptualization (McInnis, 1975). However, there appears
to be a healthy disagreement over which concepts are most important as
unifying elements or themes. The most extensive research on environmental
concepts is Roth's (1969) identification of 112 concepts appropriate to
environmental education (K-16). These concepts were divided into 14
categories, nine of which included concepts selected by teachers as
important and suitable for grades K-6. Allman (1972) identified 113
concepts to be included in elementary environmental education curricula
by surveying a national sample of education and curriculum specialists
considered to be experts in the field. Unifying concepts have been used
by many environmental education curriculum developers (see Bennett and
Willink, 1975; National Park Service, 1975; Ståpp and Cox, 1974) as the
basis of their environmental education programs.

According to Emmelin (1975), some individuals have attempted to
use ideas from other fields such as systems theory, ecology, geography
and outdoor education to develop a research paradigm for environmental
education. Examination of the literature for this study revealed that
in most of the cases where the underlying conceptual basis for environ-
mental education was being proposed, ecology was advocated as the ultimate
source of underlying concepts. For example, Kupchella and Hyland (1977)
state that one of the main principles to have emerged from The Journal of Environmental Education over almost ten years of publication was that the principles of ecology constitute the paradigms on which all environmental education must be built. The keynote speaker at the fifth annual conference of the National Association for Environmental Education reiterated that ecological principles are the integrating mechanism for environmental education (Willard, 1976).

The assumption that ecology is a useful base for all kinds of environmental education programs irrespective of level and location of teaching needs further study. According to Swan (1974), the teaching of the principles of ecology in the traditional methods may do little for environmental quality. A distinction must be made between understanding ecosystem principles and thinking ecologically or holistically. It means one must learn to think in systems of interacting factors using problem solving as a process of thinking.

The idea of ecological thinking can be developed at the classroom level, according to McInnis (1975), by developing: conceptual understanding of the natural environment organized around conceptual areas such as diversity, organization interaction, continuity, change, and limitation; conceptual understanding of the man-made environment organized around the same conceptual areas but also including man's sociocultural systems, environmental issues and problems, and an understanding that man's activities are ultimately governed by natural phenomena; as well as attitudes, values, perceptual awareness and problem-solving and decision-making skills which make use of all available disciplinary knowledge. The use of such readily identifiable concept areas makes it easier for the classroom teacher to deal with them as they relate to the typical public school disciplines (Teeley, 1976).
As educators we are continually seeking to implement those basic principles and organizational frameworks that enable us and our students to be more effective throughout life. Environmental education has a body of principles and concepts that undergird its operation. Some are shared with the physical, biological and social sciences from which it must draw heavily. Some are unique to environment (Willard, 1976).

Development of processes (Cognitive, affective, skill-behavior)

Although some environmental educators have chosen to stress either cognitive or affective objectives, most tend to agree that there is a relationship between the learning domains and that there is a need for today's citizens to possess the knowledge and values necessary to make and influence decisions concerning environmental problems (Aird and Tomera, 1977). That education is a process by which individuals can acquire and clarify values through an ongoing process of learning is one of the main ideas to emerge from the first eight of publication of The Journal of Environmental Education (Kupchella and Hyland, 1977).

In general, environmental educators agree with Bloom et al. (1956), Krathwohl (1964) and Harrow (1962) that the affective processes (interests, attitudes, and values) are inseparable from cognitive and psychomotor or skill-behavior processes. By taking a broad view of curriculum, they seem to stress the interrelationships among these process domains and consideration of moral principles (Kohlberg and Whitten, 1972), stages of intellectual development (Piaget, 1950) and bio-socio-psychological tasks (Havighurst, 1972). They have also repeatedly stated that environmental education activities at each grade level should encompass each of the domains of learning (Stapp, 1974b). However, emphasis appears to be
placed on certain processes by certain authors. For example, Stapp and Cox (1974) stress problem solving and valuing which they relate to process skills of critical thinking, social change planning, and interpersonal communication. Decision making and valuing are emphasized in Cummings' (1974) proposed methodological model for environmental education. References listed in Appendix A indicate other preferences.

C. Roth (1971) discusses a variety of inquiry processes which appear to be useful in exploring complex environmental issues. His concern for the sequencing of these processes within environmental education programs appears to be a general concern among process-oriented environmental educators (see McInnis, 1975). A fairly typical sequence begins with experiencing a variety of environments, then progresses to abstracting, conceptualizing, and synthesizing these experiences on the basis of knowledge and understanding. Emphasis is on attitude formation, particularly in relation to development of a positive self-image, and respect for other life forms and the natural environment. Bennett (1975b) summarizes these process skills in his evaluation model for educators who advocate a process approach to environmental education. He reasons that if education is a process, then an ecological value system and the ability to act on such a value system composed of decision-making skills can be used, according to psychological theory, to evaluate environmental education programs.

Although there is not unanimous agreement on which processes are most important, process development appears to be an important component of environmental education. According to Swan (1971), if the purpose of environmental education is to develop attitudes which motivate people to become involved in environmental problem solving, the emphasis must be placed
on developing individuals who are capable of processing and integrating information, who are capable of continuously learning and thinking in systems models.

Educational program support system elements

To function successfully, the environmental education program requires an appropriate support system. This support structure consists of instructional, contextual, administrative and research and development processes, each of which represents a major influence in the program by determining whether the learning events will occur, how easy it will be to conduct them in a desired manner, and how successfully their goals and objectives will be achieved. Those program support elements believed to exert the greatest control over the others will be considered last so that least pervasive items can be described in an increasingly broad context and can be seen to be related to and coherent with the larger organizational levels.

Instructional elements

These are the elements over which teachers have some control. They include the methods and materials and the roles and relationships directly related to the teaching/learning experience.

Methods and materials

Environmental educators emphasize the following as characteristics concerning the selection and development of teaching methods and materials in environmental education: problem solving, values clarifying, and systems thinking through the use of firsthand experiences and activities
with an orientation toward environmental issues and present and future environmental quality.

Problem solving

As can be seen from sources listed in Appendix A under problem solving, environmental educators view problem solving as an important instructional method for environmental education programs (see Withrington, 1977). Problem solving as a teaching technique or strategy has been associated with a variety of educational endeavors, including subject areas such as science and social studies. In environmental education, problem solving is often associated with attempts to find solutions to complex environmental issues and as such makes use of methodologies from a variety of disciplines (Kelly, 1977). Thus, it may go beyond the inquiry/discovery methods of the natural scientist to include an element of decision making. According to Stapp (1971), environmental problem solving includes the development of a strategy to produce change because once conclusions are drawn concerning an environmental issue, political insight is often required to constitute a solution.

Kelly (1977) describes problem solving in environmental education by listing in detail many of the qualities involved. A simplified version of this process consists of defining the problem, becoming informed and analyzing alternative solutions, choosing the most rational alternative, designing a plan of action, implementing the plan, then evaluating it (Glasser, 1974). According to Stapp (1971), these processes help the learner develop skills of critical thinking because they involve: recognizing underlying assumptions; evaluating evidence or authority which includes recognition of biases, emotional factors, and stereotypes; and distinguishing between verifiable and unverifiable data and relevant
and non-relevant factors. Swan (1974b) also considers problem solving as a process of thinking where solutions to problems are based on the recognition of the values implicit in any problem solution.

In terms of implementation, many programs appear to use Stapp's (1974b) reasoning that although recognition and solution of relevant problems are appropriate for all grades, the honing of problem-solving skills is more appropriate for the upper grades. Differences of opinion regarding implementation seem to stem from more basic differences in educational philosophy and are beyond the scope of this description. Consensus that problem solving is an important instructional method in environmental education is well documented.

Values clarifying

Review of the literature of environmental education reveals a general awareness among writers that values should be of central concern to environmental educators, yet there is, at the same time, evident reluctance to delve deeply into this controversial and difficult-to-qualify realm (Miles, 1976).

Raths, Harmin, and Simon (1966) regard traditional approaches to teaching values such as example-setting, persuasion, and appeals to conscience as inadequate. They suggest a process that allows people to examine the range of alternative value positions available to them and gives them a chance to choose from them. Valuing is a process which can provide perceptual organization of the relationships of man to nature, man to man and man to self. Although Miles (1976) describes alternative methods for examining values, he notes that most environmental educators who have addressed themselves to values clarification have adopted the
values clarification process of Raths et al. (1966).

Stapp (1974b) and Bennett (1975) have published examples of values clarification activities in the environmental education literature. The process consists essentially of posing a problem of valuing to the student in an environment which is open and free from threat, urging the student to identify a position, given the opportunity to view a range of alternatives, and allowing affirmation and action on the position taken. Students gain skill in decision-making which is essential to working on problems of all kinds. It is the act of choice involved in decision making that is the central behavior of this approach and which should, in Cummings' (1974) view, be of central concern to environmental educators.

Students of environmental problems tend to regard environmental disruptions as symptoms of underlying social and cultural problems of belief and value (Hansen, 1975; Leomarj, 1972; Theobald, 1972). They attribute many environmental problems to faulty human self perceptions and myths concerning man's relationship to the natural environment (see Daly, 1973; Ferkiss, 1974; Schumacher, 1973). They conclude that examination of underlying sociological and psychological aspects of environmental problems leads to values present in decision makers. Values held by decision makers affect their perception of the natural environment and may lead to poor decisions from the environmental quality standpoint. Thus, environmental educators generally believe it is important to study values and their relationship to environmental problems (Miles, 1976).

Systems thinking (Holistic, ecological)

Compared to many other environmental education characteristics, systems thinking appears to be a relatively new instructional strategy.
However, the basis for this method is evident in the early writings of environmentalists. Commoner's (1971) basic laws of ecology began with the statement that everything is connected to everything else. The statement appears to draw on the philosophy of Aldo Leopold and, in turn, on John Muir and on all orthodox ecology.

The approach taken by environmental educators appears to draw concepts of operation from the field of systems analysis (OECD/CERI, 1974). But, as Hansen (1975) mentions, such an approach is still victimized by the tendency to atomize information and to focus on the inner workings of the system rather than on the overall meaning or holistic function.

Other environmental educators looked to the science of ecology for systems models. While many of the concepts were useful, a much broader approach was needed to study environmental problems. According to Miles (1976), the conception of a natural world that operates in a simple linear fashion is seen by ecologists and systems thinkers to be incorrect. Swan (1971) and C. Roth (1971) stated that what was needed was an ecological, as opposed to a linear, pattern of thought.

Perelman (1976) describes a "softworld perspective" based on Bateson's (1972) conception of the ecology of mind. Central to this new environmental perspective is holistic thinking which is an ability not only to think rationally about the interactions among the parts of a complex system, but to develop an intuitive feel for the dynamic behavior of such a system as a whole.

McInnis (1972) attempts to provide a rationale for the development of systems thinking in students by their instructors. He argues that while analyses, specialization and departmentalization have made possible humankind's technological progress, we must not become so preoccupied
with this process that we forget to perceive and relate to our natural, social, and technological environments as systems. Environmental education, he states, is uniquely qualified to meet this need because it refers us to the most fundamental source of systematic insight this planet has to offer—ecosystems. Systems thinking strategies in environmental education are important because they focus attention on the interactions of human and natural systems at all levels of organization.

Firsthand experiences and activities

Review of the literature in environmental education revealed that firsthand experiences and activities with both environments and materials are essential to effective environmental education. The nature of these experiences and activities depends on the level, background, and location of the learner.

The desire to provide direct experiences as attractive means for learning is a legacy of Julian Smith, Lloyd Sharp, and others who initiated outdoor education methodology. Conservation educators and naturalists promoted wise use of nature and natural resources. Environmental education entails similar methods and goals. However, its frame of reference is larger in that it is also concerned with man's socio-cultural environment. As such, environmental education programs provide learning experiences in natural settings but use any environments where firsthand experience may be obtained (Vivian, 1973).

For teachers, environmental education requires a commitment to developing and using all situations where learning can be nurtured. Learning environments are found not only in the classroom. The firsthand experience, the opportunity to use all senses in observing or investigating,
the opportunity to raise questions and get answers directly—all these are available to any school (Vivian, 1973).

Many environmental educators stress the importance of sensory or perceptual awareness, especially among young children. If a child learns to appreciate and respect environmental resources, he may want to learn more and be willing to protect what he appreciates (Stapp and Cox, 1974). Regardless of the readiness of young children to respond to a study of problems, it seems reasonable to suppose that positive experiences which foster a deep respect or love for the natural world would be a reasonable part of their environmental education curriculum. For example, studies of Piaget consistently demonstrate that young children need plenty of concrete, firsthand experience; abstractions are not possible without prior experience (Tanner, 1974).

McInnis (1975) indicates that perceptual awareness—knowledge of and emotional responses to the environment resulting from experiences involving the senses—is an essential component of environmental education. Many environmental education programs make use of such materials as Van Matre's (1972) Acclimatization to introduce students to sensory awareness of the environment.

Thus, depending on program objectives and the level of the learner, environmental educators tend to favor direct contact with real-life situations where this is feasible.

Environmental issue oriented (Case studies, role-playing, simulations and games for integration)

Environmental educators recommend the use of problem-solving instructional methods and materials based on real-life environmental issues and exercises involving role-playing and simulation (OECD/CERI, 1974).
Environmental issues provide the real-life situations in which problem-solving techniques can be applied. In some instances in the literature, examination of such issues may take the form of a case study.

Finseth and Schaefer (1976) discuss simulations, games and role-playing situations as learning strategies in which students simulate a situation having environmental significance. Often the situation is a public hearing in which a student decision-making body is listening to witnesses (role played by students) representing various sides of an issue. Students take the roles of the various parties, and learn by studying and then arguing their positions, or by making decisions based upon the arguments. Many simulations are based upon fictitious but realistic issues, some are based on actual ones (Tanner, 1974).

In a number of studies cited by Bandura (1969), role enactment techniques proved to be one of the most effective means of inducing stable affective and attitudinal changes. Moreover, while one might regard the behavior changes in playing an "imaginary" role as superficial or non-lasting, the contrary is found to be true experimentally. The opportunity to develop or elaborate on a fictitious role enhances its capacity to bring about attitude change in the role player (Hovland, Janis and Kelly, 1953).

Environmental education programs seem to embody several features, such as values orientation and a complex systems approach, which make issue-oriented case studies, simulations, role-plays, and games attractive as educational techniques. Alternatively, studies of environmental issues enhance environmental education programs because they: facilitate presentation of complex concepts, often interdisciplinary in nature; permit compression of large-scale effects such as time; and involve students
in activities which require active participation and problem-solving skills (Finseth and Schaefer, 1976).

Guidelines for the use of simulations and games in education give suggestions for increasing student understanding of strategy through perception and use of analogies to comprehension of the situation simulated by the game and finally to an ability to understand the more general case, the real-world situation. Ecology is a natural for simulations. It is the study of the interrelatedness of things, and simulations are the experiencing of interrelatedness as a learning method (Tanner, 1974).

Use of environmental issues as case studies, simulations and to some extent, games, are believed to be necessary for environmental education because they give opportunities for increased understanding of many viewpoints, as well as the operation of systems—natural and human; provide possibilities for examining problems on a variety of scales and levels; provide practice in decision-making; and increase the possibility of enhancing personal concern (OECD/CERI, 1974). Thus, environmental issues, real-life or simulations, are believed to be an important curriculum component of environmental education.

Present and future oriented (Environmental quality focus)

Environmental educators do not appear to be negating the importance of historical study when they emphasize that environmental education must focus on current and future environmental situations (Unesco-Unep, 1976). What they seem to be stressing is that environmental education cannot exist in a reactive sense only but should instil the skill and desire to constantly question the present based on images of alternative futures. Accordingly, a prime need is for instructional methods and materials to
help students in the search for a synthesizing ideology and positive image of a desirable future which can motivate and direct efforts toward enhancing environmental quality.

Environmental educators have proposed a number of skills designed to lead to better images of potential future social and biophysical environments. These include: surveying the territory, remaining open-ended, describing in terms of degrees, personalizing viewpoints, checking locations, and dating events (Horn, 1975). The focus, rather than being prescriptive, is on how to use thinking and communicating skills to increase long-range effectiveness.

In terms of the classroom, present-future orientation seems to imply that rather than exclusively concentrating on the past, which is nevertheless useful in developing ideas about human values and ideals, environmental education must also be forward-looking and concerned with the imagination, design, and realization of alternative, sustainable futures. This requires self-awareness kinds of activities because we see the world as a projection of our inner selves as much as we see it the way it is (Swan, 1975). It also involves the development of problem-solving and critical or ecological thinking skills (consciousness) through persistent and critical questioning about why things are the way they seem to be and what they might be (Perelman, 1976; Swan, 1974b). The ultimate goal is to educate people to be competent in finding solutions to the problems of growth and equilibrium. According to Perelman (1976), the future global/social/ecological system, to achieve and maintain a state of equilibrium, must be capable of higher levels of learning such as those described by Bateson (1972).

Environmental educators appear to be aware of certain pitfalls of
future thinking. For example, Swan (1974b) states that the danger with linear projection futuristic thinking such as Toffler's (1970) *Future Shock* is that it can become a self-fulfilling prophecy. Perelman (1976) criticizes the anthropocentrism of classical utopias and the failure of modern dystopias such as *Brave New World*, 1984, and *A Clockwork Orange* to deal with significant ecological constraints. Environmental educators seem to favor exploration of a wide variety of alternative futures and a more balanced consideration of the human and total systemic factors.

Roles and relationships

The research procedure of this study identified several key elements that relate to teacher/learner roles and relationships. These characteristics include: provision for active participation and individualized learning, a team approach to teaching/learning, and development of new productive student relationships such as personal responsibility and group interaction.

Active participation (Environmental action oriented)

Environmental education must emphasize active participation in preventing and solving environmental problems. This involves adjusting priorities and assuming personal responsibility for improving environmental quality (Unesco-Unep, 1976).

Active participation implies the provision of educational experiences where students can assume an active role in the art and science of decision-making concerning environmental matters. As was discussed under the heading "problem solving", decision-making involves value clarification and a predisposition to become actively involved in decisions.
concerning real environmental issues, especially on the local level. Thus, teaching/learning methods that actively involve students, such as field studies, community involvement, firsthand experiences and simulation/role playing are necessary to environmental education because they provide opportunities for increased understanding of: many viewpoints, the operation of natural systems, examination of problems on a variety of scales and levels, and processes of decision-making and enhancing personal concern (OECD/CERI, 1974).

Hungerford and Peyton (1977) describe a number of generic paradigms or models which use environmental action as a means of active participation in environmental education. For example, Stapp and Cox (1974) propose environmental action as a part of the overall program whereas others (Allman, Kopp and Zufelt, 1976; Loret, 1974) imply a need for environmental action training or at least a need for examination of processes inherent in action strategies (Harvey, 1976; Hawkins and Vinton, 1973). Hungerford and Peyton (1977) propose a paradigm which would permit curriculum developers and others to specifically plan for training in environmental action as an integral and substantial component in this field. The model identifies and defines specific categories of action and illustrates the levels at which these actions can be taken.

Within any curriculum structure there are many and varied ways of facilitating active participation by students. Applied monitoring projects, concentrated internships, real problems research, resource inventorying, scenario construction, legal critiques, and professional meeting attendance and participation can help to provide the combination of experience, understanding, imagination, and skills development that would facilitate participation in the environmental quality movements on an extended, lifelong basis (Harblin and Maynard, 1976).
Many environmental educators are concerned that awareness of environmental issues and a positive environmental attitude may not be enough to ensure behaviors that will lead to improving environmental conditions (Winston, 1974). Some hypothesize that this concern may, to some extent, be alleviated by providing active participation specifically directed at environmental action strategies (Hungerford and Peyton, 1977; Stapp, 1971; VandeVisse and Stapp, 1975).

Individual learning (Independent study)

Another apparent environmental education preference concerning roles and relationships among learners and teachers is provision for individual learning. The breadth of environmental education and the variety among individual students requires that efforts be made to diagnose individual differences and to produce individual learning programs to help rectify shortcomings (OECD/CERI, 1974). There is no program sequence that will meet the needs of all groups of youth. Therefore, a curriculum program should be flexible in design so that material can be presented in different ways depending on the backgrounds, needs, and aspirations of the students (VandeVisse and Stapp, 1975).

Perrott (1977) characterizes environmental education by its suitability for involvement of pupils in individual studies. Work of this kind is suitable for all grades and this method complements active participation, community and field studies, and firsthand experiences of a problem-solving nature. For example, field investigations may be undertaken on an individual or small group basis. Research studies have shown that such individual investigations, when organized by a teacher, can play an important role in stimulating the recall of factual information, in
providing training in the application of knowledge, and in the development of problem-solving techniques (Perrott, 1977).

Independent study may contain the following characteristics: pupils work alone or in small groups which accommodate individual differences among learners; pupils are encouraged to choose their own topic of study and are involved in the decision-making concerning their work; the individual pupil is free from constant supervision by the teacher (self-discipline and self-evaluation are necessary); pupils can interact with each other when they need to; and a wide range of activities and resources is available (Perrott, 1977).

Blackwelder (1976) describes a senior high school program using independent study as an avenue to environmental education. Students choose environmental problems of particular interest and conduct in-depth studies. Presentation of the investigation to some audience such as a school class or civic group is a necessary part of the exercise which takes the form of a contract between supervising teachers and students. There are difficulties in defining problems, budgeting time, and building a background. However the results appear to justify the expenditure of energy on the part of teacher and student.

Implementation of different methods of class organization may require that teachers be given prior opportunities to study, model and practise these teaching skills. For example, in the independent study situation some students, given a wide interest and ability range, may require closer supervision, reassurance and encouragement. Pilot tests on planning independent studies have shown that effective teacher education self-instructional programs have shown techniques described by Perrott (1977) to be effective not only in improving teachers' organizational
skills but also in improving the results achieved by pupils engaged in independent studies, measured in terms of pupil participation and achievement.

Many environmental education programs appear to be rather unorganized collections of projects for individual or group study. What must occur, according to Tanner (1974), is that for such projects to be considered part of environmental education, students must be directed to the environmental-ecological significance of these activities. Failure to make the necessary connections could lead to the kind of criticisms that were directed at the project method or activity approach of the 1920's and 1930's.

Team approach to teaching/learning

Careful examination of what environmental educators mean by a team approach revealed that they are generally referring to the roles and relationships which teachers and students assume in the learning situation. Except at the postsecondary level (Emmelin, 1975) a team approach to teaching/learning involves re-examination of the teacher's role in the education process and provision for training in student-teacher team work for the examination of environmental problems (OECB/ CERI, 1974). The reasoning behind the advocacy of this environmental education characteristic appears to be that one of the necessary roles for teachers and students involved in interdisciplinary, problem-oriented studies, which includes looking at particular situations from many angles, is cooperation in a team approach to environmental problem solving.

According to the recommendations of a recent international environmental education conference, many teaching/learning strategies are appropriate for environmental education. Each teaching method has advantages
and disadvantages and an appropriate balance, given the different needs of various groups of students, is desirable. Favorable teaching/learning methods include active student involvement, lecturing in some circumstances, seminars, discussions, fieldwork in actual problems which involves decision-making, role-playing and simulation, and individual learning programs which almost by implication requires teachers and students with various strengths and weaknesses to work in teams (OECD/CERI, 1974). Admittedly, research is required on problems of interdisciplinary teaching which includes conditions that permit or prevent cooperation of teachers and students.

In terms of what this role re-examination means to environmental education programs, Stapp (1974b) provides some specific information. On the basis of a literature review of the theories of learning which might serve to guide environmental education program development, he proposed a teaching model where the instructor does not serve as the principal source of information. The role of the teacher is to create a learning environment, assist students in acquiring information relevant to environmental issue study, provide guidance, and participate with the student in the learning experience. Research studies have shown that teachers are highly effective when they participate in such learning projects as team members (Stapp, 1974b).

The kind of team approach favored by many environmental educators thus complements and facilitates other environmental education characteristics, such as independent study, and is closely related to the kind of new productive student-teacher relationships discussed in the following section.
New productive student-teacher relationships: Personal responsibility and group interaction

The literature of environmental education makes frequent reference to the fact that new student-teacher relationships are prerequisite to effective environmental education. In addition, many individuals and groups (see Appendix A) go on to specify the characteristics of such relationships. Two characteristics, personal responsibility and group interaction, are identified as being particularly important in the development of such relationships (Weidner, 1973).

Environmental education places an emphasis on problem solving, and problem solving implies many things including recognition of the values and biases of oneself and others and responsibility to work individually and collectively in the process of informed decision-making. In addition to subject matter, this requires some experience by the learners in taking the initiative. It also requires re-examination of the traditional classroom as a student/teacher relationship with the student taking notes in a largely passive role. There so much of the learning involves application and the exploration of problems that have not yet been fully identified. Teachers and students have substantial opportunities to participate in group interaction (Weidner, 1973).

However, fostering such relationships places a large amount of personal responsibility for learning on the students and for creating learning environments on the teacher. Freedom of choice and maximization of the diversity of educational experiences does not imply license to "do your own thing". Rather, it probably more closely resembles Ashby's law of requisite variety as described by Beer (1974).

According to Bateson (1972), the major focus of education has remained at the information-processing level when we should be carrying
this further to problem solving, which involves thinking in systems and
going beyond the scientific method to generate projective models of the
environment that are judged in utilitarian terms, and finally to learning
to separate our conceptions of self (our models) from our real self and
the real world. This highest level of learning amounts to clarification
of Schumacher's (1977) four fields of knowledge. This is the essence of
personal responsibility.

While the materials and experience for most potential components
of an adequate environmental education curriculum already exist, it is
the skills and considerations involved in putting these pieces together
that are lacking. Programs which are at least attempting to achieve a
balance between management and diversity include the university program
at the University of Wisconsin, Green Bay and the K-12 curriculum mater-
ials developed by Stapp and Cox (1974).

Contextual elements

Contextual elements include logistical concerns such as learning
environments and operating conditions. Although teachers do not tradi-
tionally have much control over contextual matters, environmental eduation
involvement necessitates consideration of appropriate learning en-
oronments and participation in the curriculum development process.

Learning environment elements

Identification of the broadest possible range of environments
to select the most appropriate context for particular learning experiences
is central to environmental education philosophy. Characteristics such
as community orientation and field studies (in urban and natural environ-
ments) are key elements in environmental education.
Community oriented

There appears to be general consensus among environmental educators that the entire school community must be considered in provision of appropriate environmental education learning environments (Unesco-Unep, 1976). Although environmental education must include a global perspective, it begins, according to McInnis (1972), with local environments which are part of everyday experience. However, few educational procedures really consider the potential of the entire local community as a learning resource. Thus, discovery processes that might best happen out in the community happen in the classroom or library, if at all (Milmine, 1975).

Several environmental educators have described what a community-oriented learning experience entails. In the process of examining community problems, students seek information not only from texts and lessons, but also from the community. Individuals progress from a general awareness of community problems to in-depth investigations of particular problems. Students begin to acquire the skills, tools, and knowledge that they find necessary to conduct a thorough investigation. For example, they may need to learn how to use statistical sampling techniques, the public library, an air sampling device, or how to contact community resource people.

Finding and gathering information and materials about the community for use in an environmental education program involves several deeper mental processes not unrelated to valuing, problem solving, and decision making. These include examination of the role which values have played in the examination of community concerns, effects of news media and local organizations on municipal government decisions and effects of changes in individual life styles on others. Thus community involvement is intricately
associated with several other elements of environmental education.

Bennett (1975a) indicates that increasing interest in community environmental education programs for public and private schools at K-12 levels is creating a need for volunteer assistance in areas such as the following: making classroom presentations; helping to lead field trips related to local and natural history; finding and gathering instructional materials about the community (e.g., historical data); identifying pertinent people and organizations in the community and defining ways each can be of assistance; identifying community environmental improvement projects; and developing outdoor learning sites.

Service-type activities provided by community participants appear to heighten community interest in school environmental programs and to provide working links with the community. Students appear to have more interest in school, better grades, greater employment opportunities, improved relations at home, and awareness of new concerns in the community (Watkins, 1975).

Field studies: In urban and natural environments

Field studies which make use of a variety of environments are recommended by many environmental educators because students can be confronted with natural environmental problems and experiences directly (OECD/CERI, 1974).

Field studies include that group of firsthand experiences which are best suited to areas outside the classroom and school although they can and do include the school yard and beyond. In addition to examination of human habitations, field studies include a wide variety of investigations of natural communities and ecosystems.
Although content is important to environmental education, a sound methodology is essential for it to have carry-over value into discrete subject areas. Summarizing research in curriculum and program development in environmental education up to 1976, Roth (1976) observes that positive relationships have been noted between outdoor or field experiences and cognitive achievement.

Some environmental educators believe inner-city children should study the environments in which they must live each day. That is, environmental education must be relevant to the child's world and the child's experiences and must deal with problems of the child's immediate habitat—rats and cockroaches, garbage-littered streets, crime, drugs, and chronic unemployment (California State Department of Education, 1972). Taking the city child out into the world of nature will not suffice, since he lacks the previous experience that would enable him to gain much of value from such ventures (Reid, 1970).

Other environmental educators believe society owes city children direct contact with the natural world from which their lives are so divorced. There is a need for children to understand the dependence of the city upon other habitats. Children must not be constantly exposed to noise, ugliness and garbage in the street, thereby conditioning them to accept public squalor as the normal state of affairs. They must at least see nature if they are to value their heritage. According to Southern (1969), as more people become producers of services or deal with resources secondarily, fewer have the opportunity for meaningful contact with the land. A feeling of alienation, or lack of purpose may be the result. People must be reunited, must "identify" with the natural environment if they are to recognize its inherent value.
Tanner (1974) believes questions such as: what childhood experiences are necessary for a deep, abiding, and intelligent concern for the environment? and what group experiences in the out-of-doors are satisfactory? remain to be answered but until we do know, it seems wisest to provide a judicious mixture of urban and rural field experiences as an integral part of all environmental education programs.

Operating conditions

Environmental educators have indicated that key characters such as communications networking and coordination and cooperation at, local through international levels are fundamental to the continuous improvement of environmental education programs.

Communications networking

At a much broader level than provision of certain kinds of materials and learning environments, environmental educators view the establishment of communications networks as an essential operating condition for success of local innovative programs.

Schramm (1973) defines communication as the process that allows us to form the images in our heads that map our environments and guide our behavior. Thus, the purpose of developing better communicating (and thinking) skills is to give us more complete and accurate images about environmental problems (Horn, 1975). Horn and Rogers (1975), Perelman (1976) and Dvasi (1977) describe the application of communication skills to information flow at the interpersonal and mass levels in terms of networks—a network being a set of elements linked by communication flows.

At the interpersonal level, a grasp of how ideas flow from person
to person in local systems facilitates design of communication strategies. Through interpersonal contacts, a change agent can solicit support of relevant opinion leaders, bridges, or liaisons in the system and begin demonstrating to them the merits of a new program. While the mass media can provide people with background information, most people seek interpersonal verification of that information before being persuaded to adopt the idea suggested. Thus, the most effective strategy, from a communications standpoint, to implement environmental education into a school or other social system is to combine mass and interpersonal communication channels (Horn and Rogers, 1975).

At the mass communications level, there is substantial, but by no means conclusive, evidence to indicate that mass media have little chance of changing attitudes compared to interpersonal communication (Witt, 1975). However, it is essential that information be provided to alert audiences to new environmental issues. According to Schoenfeld (1974), we, in the environmental mass communications ecosystem, will increasingly be put to the test of discovering and outlining viable options in an unemotional, objective, self-disciplined manner.

From an international viewpoint, networking is necessary in environmental education to facilitate the cooperation and coordination process. It can consist of newsletters, journals, pamphlets, and other forms of printed or filmed material; it can be clubs or societies; it can also be cadres or task forces or a number of institutions engaged in various aspects of a project. But all of this is not sufficient without willingness to voluntarily share experiences, ideas, and materials. Networking is an expression of family resemblance in an infinite number of items while recognizing a diversity of needs and priorities (Dyasi, 1977).

Thus, for change in the form of new environmental education
to occur, three kinds of activities must take place: networking (to bring all of the necessary ingredients of innovation into active communication); research (on curriculum design and the structure and dynamics of educational settings and systems); and development (of new curricula and models of educational institutions) (Perelman, 1976). Without the communication aspect, all of the other endeavors of environmental education are fruitless. Thus, environmental educators continually strive to understand and make use of the communication process.

Coordination and cooperation (International, national, regional and local)

Another essential operating condition for effective environmental education programming is coordination and cooperation at all levels of the education system from local through international. The international United Nations environmental program (Unep) was established to provide such coordination at the international level. The Unesco-Unep sponsored Belgrade Workshop, 1975, identified areas where greater international coordination was needed including: exchange of ideas, information, teachers, and students; promotion of environmental education research; formulation and evaluation of new environmental education methods, materials, and programs; and provision of teacher training and advisory service to all member states.

At the regional level there were needs to establish regional and subregional centers to collect information about existing environmental education programs, initiate environmental education training programs, and launch pilot environmental education programs with a regional focus. At national and local levels there were needs to provide greater coordination among government and nongovernment bodies associated with environmental
education, introduce legislation to provide sufficient backing for environmental education at national and local levels, and reinforce community and educational support for local or national environmental education programs. Needs were also identified in areas of research, program development, teacher training, funding and program evaluation (Stapp, 1976). The ultimate goal of international cooperation is integration and implementation at the national level (Dyasi, 1977). In turn, environmental education at national or local levels, however global its terms of reference, must be geared to providing the individual with experiences which enable him to appreciate a personal relationship to his total environment (Aldrich and Blackburn, 1975b).

Because the scope of environmental issues transcends national boundaries and requires new concepts of man's relationship with his environments, education that deals with these environments offers unique opportunities for educational and environmental renewal. Worldwide problems call for concerted, global communication and cooperation. There are differences as well as similarities between environmental problems and solutions from one nation to another, and these need to be recognized. These differences, however, can be another aspect of a global synergism. There are clearly dimensions of environmental problems that must be perceived and resolved locally. The question is, what can we do with and for each other that helps us better perform our individual, national, and international roles (Aldrich and Blackburn, 1975b).

Administrative elements

Environmental education characteristics at the administrative/organizational level would probably exhibit a larger standard deviation and
standard error of measurement, were a normal curve constructed illustrating opinions about administrative/institutional change, than all of the other environmental education characteristics combined. However, there is agreement that within existing institutions more flexible administrative patterns are required and in the longer run there is a need for reform of educational processes and systems.

Flexible administrative organizational patterns

Several previously mentioned environmental education characteristics almost by definition require institutional flexibility, especially in terms of instruction and evaluation of environmental education programs (OECD/CERI, 1974). More specifically, administrators were encouraged to become aware of and involved in environmental education programs by: being open-minded to students' and teachers' ideas for learning; encouraging attempts to help children learn in different ways; working at loosening the structure of operating schools to allow students and teachers to utilize the resources of the community; recognizing that much of learning takes place outside the school; examining the possibility of some students creating their own curricula under the direction of the teacher; and recognizing the importance of giving students responsibility for their own learning (Cook and O'Hearn, 1971).

Similarly, various individuals and organizations have stressed that more flexible school organization is necessary for environmental education (Glasser, 1974) and that administrators must be more immediately involved in the development and evaluation of environmental education programs (Roth, 1976). VandeVisse and Stapp (1975) recommended that a suitable strategy for developing and implementing an environmental education program, K-12, should include an advisory committee whose membership
would include administrators from the most initial stages of program development. This would help to facilitate communication at all school levels, and between environmental education and other school programs, as well as lead to a more flexible design once environmental education objectives are fully understood.

Environmental education programs require what many current administrators would probably label special considerations. According to Sedgewick and Watkins (1974), such considerations are justified in that students who are involved in environmental education activities show a marked overall improvement in their academic work. Conditions such as longer blocks of time, more space, transportation, cost, and liability when leaving school grounds can be facilitated or hindered by attitudes of administrators. Thus, environmental educators appear to recognize the importance of administrative cooperation and the necessity of providing these administrators with information and the opportunities to become involved in environmental education experiences.

Reform of educational processes and systems (Change)

As a longer-term strategy for future development in environmental education, environmental educators tend to agree that some modification of existing educational processes and structures will be necessary (OECD/CERI, 1974). However, there appears to be fairly wide disagreement on the nature and extent of such change. For example, one American national conference recommended overhaul of the curriculum to a problem-solving, community-school approach as a means of reorienting our whole concept of teaching and learning (Cook and O'Hearn, 1971). Stapp (1971) advocated complete curricular reform to an encounters-based program centered on
processes of valuing and problem solving and the development of heightened motivation to participate in coping with environmental problems.

Michael (1974) describes an approach to educational reform by describing the necessary emotional and intellectual skills, beyond those presently provided, that would lead planners and decision makers toward wise long-range perspectives, to cope with information over-load, and to an understanding of our present motives.

Perelman (1976) outlines an educational institutions paradigm shift for an equilibrium society. Some components of a new educational paradigm include: future-focused goals concerned with adaptive transformation of society; an evolving as opposed to a fixed model of an educated person; educational programs that are more responsive to the needs of individual, institution, and larger social/ecological systems; and an interactive, experience-based, individual and group learning criterion-referenced school system.

In general, environmental educators tend to regard change in educational institutions in degrees ranging from incorporation of environmental education materials into all aspects of the existing curricula to the sweeping, more radical changes described by Perelman (1976) whose strategy for change involves re-appraisal and development of a new partnership and system of interaction between educational institutions and various sectors of the outside world. Although there is no consensus among environmental educators regarding the kind and degree of institutional change required for effective environmental education, all agree that significant changes in present educational operating systems must occur, and must occur in the direction of interdisciplinary problem-solving curricula geared to individual learning and based on sound research which provides evidence to support teaching activities and materials.
Research and development elements

Processes by which educational programs are designed, evaluated, and implemented are essential, necessary components of environmental education. At the highest level of generality of educational support systems, environmental education key characteristics include a base in curriculum development, evaluation, and research as well as an important input into professional development of teachers at all levels of the educational system—both in preservice and inservice education.

Curriculum development base

Curriculum development in environmental education is difficult to describe because it has been so diverse. Examination of ERIC's Resources in Education (an abstract journal of articles, programs, activities, and documents of educational significance) using environmental education-related descriptors (Liston, 1975) reveals thousands of elementary and secondary environmental education programs and materials. In addition to curriculum materials developed by local schools and universities, many state and provincial Departments of Education or Instruction have produced master plans and developed environmental education materials.

A certain amount of criticism has been levelled at a number of these programs for loose organization, little sense of direction, and contradictory guidelines (Roth, 1976). Thus, recent international (UNESCO-UneP, 1976) and national (Aldrich, Blackburn and Abel, 1977) conferences, workshops and seminars recommend re-examination of some existing programs and increased development of new programs based on international or at least regional consensus on the direction, content, and processes appropriate to environmental education. Programs must
be based on consensus but also on effective evaluation and research related to program effectiveness and on more effective teacher training programs (OECD/CERI, 1974).

One of the most comprehensive models for curriculum development, proposed by William Stapp (VandeVisse and Stapp, 1975), has been used to develop an environmental education program (Stapp and Cox, 1974) which appears to have achieved success, at least as evidenced by the number of references made to these materials. The model proposes a strategy for curriculum development, implementation, and evaluation based on establishment of goals and objectives. The instructional model is set in a situation by which strategic selection of advisory committees, teacher inservice programs, and evaluation criteria are designed to maximize the chances of success, procedurally and politically.

Environmental education, in light of its characteristics such as real-issue involvement, problem solving, and firsthand experiences, implies that curriculum development departs from "read and discuss" curricula. Curriculum work in environmental education entails the design of processes which help students to become informed decision makers concerning environmental problems ranging from local to global scale. It involves consideration of program materials as well as program support, including administration, teacher training, community cooperation and involvement and developing a communications network that keeps the program up to date. According to Stapp (1974b), a conceptual approach to curriculum methodology is one meaningful way to implement environmental education theory. Other curriculum development approaches discussed in the literature review appear to have followed similar concept-activity methodology (e.g., Jinks, 1974; National Park Service, 1975).
In general, the nature of environmental education necessitates consideration of curriculum development from a broader perspective than microcurricular materials and instructional strategies. The lack of prescribed environmental education curricula and the uniqueness of school locations and environmental concerns means that teachers must become informed participants in responsible environmental education curriculum development.

Curriculum evaluation base

Environmental educators agree, according to the literature examined, that curriculum evaluation is necessary for more adequate environmental education programs (Unesco-Unep, 1976).

Educational evaluation has been defined as the process of collecting and using information pertinent to making decisions about the merits of a program (Cronbach, 1963; Taylor and Maguire, 1966). According to Stake (1967), it consists of the processes of analyzing or describing and of judging the quality of a program and its appropriateness for support or adoption. However, the term evaluation is used fairly loosely, to the dismay of many environmental educators (Hendee, 1972).

One difficulty in evaluating environmental education programs has been failure to agree on common goals (Swan, 1971). Another difficulty stems from the fact that environmental education programs vary greatly in both general topics and approaches, thus limiting the usefulness of standardized tests (Passineau, 1975). Thus, in the environmental education field, evaluation is embryonic at best. Reliable evaluation instruments have been developed to measure specific factors within environmental education such as student and teacher changes in community orientation,
environmental perception, teacher-student interaction as well as concept understanding and attitude formation (Stapp, 1974b). However, the only instrument that could be found which was designed for comprehensive program evaluation was that of Bennett (1974).

In an attempt to provide guidelines for the application of evaluation in environmental education, Passineau (1975) describes several models which are useful in the evaluation of any educational program or system. He notes that while the "game" of evaluation includes reductionism, quantification, and objectivity, its major components include discovering new knowledge and making value judgments about the worth of programs. Thus, criticisms that characterize evaluation as a mechanistic process devoid of understanding and comparison may not be important. In fact, it appears that a thorough understanding of goals, objectives, performance criteria, effectiveness of educational sequence, and management of resources is essential to education characterized as compassionate and humane (Hawkins, 1974).

Doran (1977), upon examination of the state of the art for measurement and evaluation of environmental objectives, concludes that the largest task facing the field is one of external validity. He suggests establishing goals and objectives on which one can make statements about an instrument's validity base. Roth (1976) agrees that there is a need for further research in techniques for evaluating environmental education curricula.

Once general consensus has been reached regarding broad environmental education goals and objectives, such as those agreed upon at the international environmental education conference at Belgrade (Unesco-Unep, 1976), evaluation, according to the environmental educators examined in this study, will be greatly facilitated.
Environmental educators appear to be well aware of the need for more objective evidence of the effects and benefits of environmental education given the failure of the largely rhetoric-based progressive education movement. In the early years, environmental educators described one of their greatest problems as the lack of meaningful research (Gillenwater, 1969), and suggested that a sound research basis was necessary to support some of the claims of environmental educators, especially those claims related to attitudes and values (Swan, 1971).

Roth and Helgeson (1972) reviewed the research related to environmental education to 1972. They reported that although development of philosophy and goals for environmental education was still in its infancy, studies related to concept development, organizing principles and concepts, and curriculum development represented a significant movement toward achieving definition, structure, and organization for purposes of teaching environmental concepts. These researchers made a number of recommendations for research related to instructional concerns, program evaluation, materials, sites, and facilities. Their concluding concern stressed the need for research designs appropriate for developing, implementing, and evaluating environmental education from a global viewpoint.

In a review of research related to environmental education from 1973 to 1976, Roth (1976) noted that since 1972 considerable effort had been expended to develop an environmental education research base on a variety of fronts. Recommendations for further research were related to more specific concerns than the 1972 recommendations. For example, Roth (1976) recommended the development of an inventory of instruments already developed, including rigorous evaluation of their validity and reliability and further development of simulation and gaming strategies for cognitive
and affective development. However, many recommendations were related to clarification of usage of terms and delineation of concepts as well as refinements of research techniques.

Representatives at the Unesco-sponsored Belgrade workshop on environmental education made specific recommendations regarding research directions in environmental education. There was a need expressed to extend research related to: 1. environmental education development of young learners, with emphasis on developing the earliest childhood awareness of the environment; 2. use of inexpensive materials and applicable teaching methods and educational techniques in learning and instruction as related to environmental education; 3. the strategic role of information in the decision-making process as a part of the development of environmental education (Unesco-Unep, 1976).

Evidence for the worthwhileness of their programs was something that progressive education of the 1920's and 1930's lacked, and it is said that this contributed to the partial failure of that movement. Ironically, research evidence is now appearing which supports a number of the arguments of progressive educators (Tanner and Tanner, 1975). Environmental educators, convinced of the utility of an interdisciplinary, problem-solving, value-laden approach to education, appear to be making a somewhat-serious effort to buttress their rhetoric with evidence of its successes and failures.

Professional development base (Teacher education—preservice and inservice)

The review of the literature of environmental education, as indicated in Appendix A, provides ample support for the notion that teacher education programs, which consider the kind of curriculum development needed in environmental education, are essential to effective environmental
education programs (OECD/CERI, 1974; Stapp, 1974b; Unesco-Unep, 1976).

There have been numerous attempts to describe the type of preservice or inservice teacher programs that will lead to better environmental education in schools. According to Stapp (1975), preservice teacher education should provide teachers with background in areas such as principles of curriculum development, learning theory, attitude formation, handling of values and controversial issues, the role of instructors in creating learning environments, and many others. He also describes a comprehensive inservice teacher education program consisting of four phases which take teachers from philosophy of education through firsthand experiences in problem solving to development of curriculum materials and presentation of student-teacher workshops (Stapp, 1974b).

Bennett (1975b), Engleson (1975), and Ritz (1977) describe purposes, guidelines, and characteristics, respectively, of inservice environmental education. For example, it should: provide training in the concepts and methods of environmental education including evaluation; bring teachers into direct involvement with particular environments; have a strong motivational impact; and encourage teachers with a wide range of backgrounds and interests to environmentalize their teaching (Maldague, 1977; Ritz, 1977).

Liston (1975) describes some of the ways open to teachers who wish to easily access environmental education materials and thus enhance their own individual professional development in environmental education. Tanner (1974) describes a sample of environmental education inservice programs and workshops available to teachers.

Much of the research conducted in the area of teacher education has resulted in the development of model programs, guidelines, and attitude assessment. For example, Theis (1974) described a strongly student-centered program, utilizing competency-based instruction, developed to
prepare students to teach environmental education. Several recommendations resulted from the research including provision in teacher training programs for field experiences and practice in developing environmental education courses that use inquiry methods with hands-on, student-centered activities. In summarizing research efforts in this area, Roth (1976) recommends more rigorous evaluation and analysis techniques.

Because the foundation of an environmentally responsible citizenry rests, in part, in schools and educational institutions, teachers and administrators must be trained to create learning environments where youth are encouraged to investigate their surroundings in problem-solving situations. Colleges and universities should provide training for all teachers so that they might become better able to assist learners in acquiring environmental information, recognizing and clarifying values concerning the environment, and developing attitudes, values, actions, skills, and a commitment that will enable them to solve environmental problems (Stapp, 1975).

Discussion and interpretation of findings

The methodology used to examine the environmental education literature resulted in the identification of 25 key environmental education characteristics. These characteristics are meaningful to the extent that the research process was able to avoid the mistakes, oversights, and biases discussed in the first chapter. It was anticipated that close adherence to methods of historical research would contribute to the validity and reliability of the results. However, several apparently unique features of the study must be considered in the interpretation of the results.
This study appears to have been the first to attempt to systematically identify what Harvey (1976) describes as the specifics of the substantive structure of environmental education. Thus, criteria had to be developed to identify environmental education characteristics. The possibility exists that other criteria could be used and would provide a different set of characteristics. However, because the sample used was broad and because priority was given those types of information sources which depended on consensus among individuals, the characteristics identified appear quite meaningful. In addition, the fact that there was such a distinct difference in recorded support between included and excluded potential characteristics seems to indicate that there are a distinct number of environmental education characteristics which environmental educators have advocated over the past ten years.

The study has attempted to use terminology which is consistent with the language of professional environmental educators. In some instances, descriptor labels, such as multilevel, appear to be somewhat imprecise and to lack meaning. These labels were retained in this study for reasons of fidelity and accuracy in recording. Brief and more detailed explanations for each of these descriptors are presented in Chapters 3 and 4 respectively. This somewhat primitive first attempt to identify environmental education characteristics was not believed to be the place to invent or attempt to change the language of environmental education. In fact, descriptions of these characteristics are attempted in the spirit of explanation and as a forum for discussion and revision rather than as detailed definitions because of the extreme dangers of observer bias and distortion.

The study also appears to have been unique in that it attempted to provide meaning to environmental education not by defining the field or
its identified characteristics but by examining the research results from the metasystematic point of view. Given the purpose of the study, the curriculum system was deemed most appropriate for conceptual organization. Other organizational systems are undoubtedly possible depending on one's purpose. The curriculum system was not simply "selected" as an appropriate organizer for environmental education characteristics. One important intent of the study was that the framework be understandable to teachers. An extensive review of the literature, including learning theory, anthropological organizing schemes, and psycholinguistics, led to the search for a framework that attempted to satisfy certain criteria for understandability. Once this literature had been explored, the idea for searching the curriculum literature emerged, based on the fact that the curriculum field, as a metasystem for all educational endeavors, is one that is to some degree already understood by teachers. The curriculum as a system seemed to be a useful organizing framework for a collection of environmental education characteristic concepts. It appeared to represent the views of environmental educators concerning wide ranging facets of education.

The total conceptualization of environmental education includes the generic substantive structure, the specifics of substantive structure or implementation, a superordinate goal, and a base (Harvey, 1976). The generic substantive structure includes philosophy, precept, and expected outcomes. From a philosophy which considers the man-environment relationship within a values context, environmental education is described in terms of the environmentally literate, competent, or dedicated person. Such a person is characterized by a value system which is consistent and compatible with homeostasis between quality of life and quality of environment.
An outgrowth of the generic structure is the specific substantive structure of environmental education consisting of curriculum and instruction and action implementation strategies. It is at the level of specific substantive structure that the organizational framework described above attempts to analyze environmental education in terms of the formal educational system.

There is one crucial point in the goal of environmental education that Harvey (1976) does not appear to have emphasized; namely, change. Environmental educators emphasize that there must be a change in the man-environment relationship if a homeostatic equilibrium goal is to be met. Education at the formal level is believed to be instrumental in this change process. The change involves a change in values, as Harvey (1976) discusses but it also involves a change in the entire education system. In terms of curricular change, curriculum theorists hypothesize that the improvement of student experience will be limited by the degree to which all the curricular elements indicated in the framework above are also improved (Gibbons, 1976). While the school teacher can only control the microcurriculum and the teaching of it, to significantly improve those elements he must influence the other dimensions of program and the support system.

It is interesting that environmental educators have considered all of these aspects of the program and program support system but have never articulated them into a meaningful framework which not only allows all components to be examined together but more importantly considers the relationships that exist among these elements of environmental education and their implications for the improvement of environmental education programs. It seems that environmental educators, who have advocated
holistic thinking, have not been able to do so in their own field. There are a number of promising conceptual frameworks and methodologies suitable for instruction. These statements, however, will do little to integrate environmental education into the total curriculum. Perhaps they could not accomplish integration until now, until a point was reached in the evolution of environmental education that permitted the synthesis of its elements into a meaningful framework. The organizational framework described here may be a start toward such a synthesis.
Evaluation of the curriculum framework

Environmental education characteristics were elucidated from an analysis of the literature and were interrelated within a curriculum organizing system. The resulting curriculum framework for environmental education may be theoretically evaluated in terms of its logical consistency with the analysis process and with the rationale for organization. It may also be evaluated in terms of its potential usefulness—its validity and reliability.

Theoretical evaluation: Analysis of environmental education characteristics

The purpose of analysis was to identify characteristics of the concept of environmental education which would improve understanding of the concept and facilitate program development, evaluation and research. Thus, the intent was not to examine the environmentalist view of reality such as that described by Thoreau, Muir, Leopold, and others and interpreted in the educational context by Schoenfeld, Stapp, McInnis, and others. This generic substantive structure of environmental education has been delineated by those such as Harvey (1976). Rather, this analysis sought to clarify, and make more precise and intelligible, key characteristic concepts of the environmental education curricular system.
Generic-type analyses attempt to identify those basic features which make a species, such as the environmental education concept, into a genus by providing criteria which distinguish what can and what cannot be considered as environmental education. Harvey (1976) presented such criteria for environmental education. His analysis however, does not provide the detailed hints and clues which are required to operationalize environmental education. Environmental educators have thus been left to attempt to operate on too great a level of generality.

The present study identified key environmental education characteristics which provide more detailed criteria for distinguishing what can or cannot be considered features of environmental education programs. It provides the details which Harvey (1976) would classify under the curriculum and instruction component of the generic structure of environmental education. Questions concerning which components are absolutely necessary and sufficient for effective environmental education programing remain difficult to answer although identification of key characteristics does appear to provide a firmer basis for understanding the environmental education concept and for making value decisions about environmental education curricula.

The purpose of analysis is to clarify conceptual issues in the search for a conceptual perspective that will be helpful in theorizing, practising or problem solving. Becoming more fully aware of the various types of environmental education components may provide a more direct and efficient way to think about potential objectives for program and support systems. Component descriptions might help to determine actual conditions which must be met if a particular program is to be strictly applicable in the environmental education context. Analysis of curriculum components
seems to provide an opportunity for practitioners to construct their own conceptual maps.

Developing a conceptual map may provide a clearer view of environmental education. In this way analysis into components may be used without necessarily being negative or destructive. Thus, although there are limits to analysis and different results might be expected from this technique than from the holistic world-view building practised by many environmental educators, the two approaches are not necessarily antithetical. Clarification of component concepts can facilitate understanding of broad systems by placing abstract and vague ideas in concrete and more meaningful contexts.

The analytic approach also involves an attempt to maintain a neutral stance concerning the beliefs and attitudes of individuals who persist with a view in spite of or due to lack of supporting evidence. This limitation is reduced when component selection is based on criteria which require a large consensus.

Identification of components of environmental education may facilitate the examination of answers to practical questions of how and what to teach. For example, identification of environmental problem solving as a key environmental education characteristic provides a context for asking some important questions that may give practical meaning to this term as an instructional method. What is environmental problem solving and how does problem solving differ from other kinds of learning? To make the language work involves being clear about intent and meaning and not being swayed only by its imagery and poetry. Examination of environmental education by key characteristics applied to curriculum should prove useful to practising educators in getting them to think through with care and precision just what it is they are buying from environmental
education theorists and, more importantly, what it is they are after and how best that might be achieved.

Component analysis may help to clarify the language of environmental education. To environmental educators and others, this language carries many complex and assumed meanings—a potentially confusing situation. However, if the language is used to provide understanding to teachers about the functions, operations, and goals of environmental education, it can be a more effective instrument in the planning and implementation of environmental education programs. Words, such as environmental systems thinking and valuing, do not possess much power in themselves. To attain their power, the total framework of the ideas that these words represent must be fully understood by those who use them. Environmental educators must appreciate to what assumptions, values, theories, procedures, and strategies for teaching these words commit them. Analysis of environmental education into curriculum components seems to provide the opportunity for understanding what environmental education implies in curricular terms and for translating these components into more effective educational practice. Without such understanding, these words may become empty slogans and provide the license for doing anything under the protective blanket of impressive names.

Theoretical evaluation: Organization of environmental education characteristics as curriculum elements

A theoretical test can be used to examine whether the organizational framework for environmental education is consistent with the rationale for the study which is itself a kind of theoretical formulation.

Several criteria were used to arrive at curriculum elements which could be used to meaningfully relate environmental education characteristics
(see Chapter 2, pages 51-68 and Chapter 3, pages 76-78). These criteria could potentially be used to develop a number of different organizational frameworks. However, the purpose of this study was to provide a conceptualization of environmental education which would facilitate program development work in this area. Thus, use of these criteria was considered in a manner that was consistent with the expressed purpose of the study.

Identification of key environmental education characteristics resulted in a wide range of concepts representing many levels of structure and function within the educational system. Thus, a curriculum "system" was sought to accommodate this concept variability. To maximize the probability that teachers could understand or comprehend the organizing system, criteria for meaningful learning as well as those related to concept attainment were used as first and second level filters for consideration of curriculum organizational schemes. Thus, the choice of an organizing system for key environmental education characteristics was not an arbitrary decision. It is only in recent years that the curriculum field has been considered as a system and even more recently that attempts have been made to identify components of that system. Of course, there are undoubtedly many curriculum theorists who would disagree with the idea of curriculum as system. It seems that the curriculum concept which is most useful to practitioners is one which best facilitates conceptualization of the field of curriculum. In this study, it is the broad conception of curriculum as system which is most useful as an organizing framework.

Consideration of the curriculum as a system appears to facilitate conceptualization of educational programs in terms of micro- and macro-level subsystems. Thus, educational programs can be analyzed in terms of components which operate at the student-teacher level and those which
operate in terms of the wider school program or the entire educational system. Similarly, the curriculum system can accommodate elements which function to support the educational program including instructional, contextual, administrative, and research and development components. From such a broad curriculum perspective, identified key characteristics can be considered within a metalevel organizational framework encompassing all levels of inclusiveness from individual classroom lessons to international cooperation.

The type of organizational framework used to provide some additional meaning to identified key environmental education characteristics appears to be consistent with the purpose of the study. However, this organizational scheme is considered to be in a rather early stage of development. In this tentative organizational framework, which is summarized on page 84, environmental education characteristics are arranged in a hierarchy of curriculum elements. This curriculum system hierarchy is relatively new and merits further exploration including specification of additional levels of hierarchical organization. Environmental education characteristics such as problem solving and systems thinking, which probably represent different levels of conceptual understanding, are lumped together under methods and materials. Much work remains in this area.

Practical evaluation

Propositions of the sort presented in the curriculum framework for environmental education should also be evaluated in terms of their validity and reliability. In general, validity refers to the degree that the environmental education framework represents that which it is intended to represent, the environmental education curriculum field. Reliability
refers to the consistency with which the framework represents environmental education. Reliability is required for the framework to be valid.

Bruner, Goodnow and Austin (1962) provide a number of criteria for determining the usefulness, that is, validity and reliability, of conceptual categories such as the environmental education framework. These criteria are stated in question form and are used to organize this section of the evaluation.

1. To what extent does the environmental education framework represent the entire field of environmental education and reduce its complexity?

The "rules" that were employed to judge inclusion-exclusion of environmental education key characteristics were designed to provide representation from the entire field of environmental education. These specific selection criteria were based on more fundamental rules for the relevant choice of characters such as repetition, uniform occurrence throughout the literature, consistency or resistance to rapid change, limited variation in approach and ease and consistency in interpretation. Component analysis and organization reduces the complexity of environmental education providing the concepts and the web of connections which allows relationships to be established among defined environmental education characteristics and the larger curriculum field.

2. To what extent does the environmental education framework reduce the necessity of constant learning?

The framework provides a number of concepts and generalizations which may, when understood in terms of their definitions, descriptions, and historic-philosophical orientations, provide the basis for the principles of curriculum development in environmental education. Because isolated facts, opinions, and research results have been drawn together and
synthesized in terms of curriculum theory, the resulting environmental education concepts and generalizations may provide guidelines for answering questions concerning the entire spectrum of curriculum development decisions. Individual teachers, considering development of an environmental education program can focus on key characteristics and associated principles without detailed examination of the literature or acceptance of the biases of one convenient program. The environmental education framework might provide evaluators with a standard, however tentative and incomplete, or at least with several environmental education components on which comparisons between programs could be made. For example, the framework might be useful in indicating commonalities among program objectives despite widely differing emphases or biases in teaching strategies or other program or support system components.

3. To what extent does the framework permit ordering and relating classes of events, not just individual events, and so make possible the development of explanatory generalizations?

The environmental education framework emphasizes the relationship between key environmental education characteristics and a curriculum system whose components may be of use in curriculum development, evaluation and research. An important advantage of defining the problem of what constitutes environmental education in more general terms is that it helps to integrate various specific concepts into patterns. The field of curriculum, by providing data from which the environmental education framework can be constructed, provides theoretical validation for the resulting organization. The curriculum field provides an organization of the theoretically possible ways in which educational change can be effected. Such a framework, translated in terms of key environmental education elements, anchors the resulting organizational scheme in the
empirical knowledge provided by the field of curriculum. Although there is no universally accepted model, curriculum workers generally agree on the components which describe and explain the processes of curriculum development and evaluation. Thus, environmental education characteristics were ordered within common curriculum guidelines and placed in a pattern of relationships which permitted connections to be made at all levels of program development from the program or support system in general to more specific elements such as concept understanding or teaching methods and materials. Development of explanatory generalizations was thus made possible by grouping related environmental education characteristics according to their place in the program or support system. The principles developed in the section of this chapter related to use of the framework in developing environmental education programs illustrate this point.

4. To what extent does the environmental education framework represent the means by which the objects and events of environmental education are identified and evaluated?

The environmental education framework contains the key environmental education characteristics which allows for the identification and evaluation of environmental education programs. Curriculum evaluation might be considered in terms of change in student behavior as a result of implementation of various program or support system components. However, evaluation could also take the form of assessment of the relative standards of programs as reflected by characteristics of alternate programs. It is difficult to state what is necessary and impossible to state what is sufficient to identify environmental education programs. The key elements of the framework facilitate consideration of what is necessary because they provide a beginning to generic curriculum structure given the generic
substantive structure of environmental education. Thus, within the substantive structure, as a given, and stated program components, the assumption is that the more support characteristics that can be achieved at various levels, the greater will be the chance of effective environmental education.

5. To what extent does the framework provide direction for instrumental activity, that is for what is appropriate and inappropriate in curriculum development, evaluation, and research?

The answer to this question is addressed in three subsections which follow: i) Use in developing environmental education programs; ii) Use in evaluation of environmental education programs; and iii) Use in generation of research questions.

i) Use in developing environmental education programs

Developing educational programs calls for imagination within a framework of ordering principles and constraints. Purposes, goals, objectives, learning experiences, subject matter, social contexts as well as administrative and research and development elements are among the important components to be considered and related. This section examines the principles of application and generation which can be derived from the organizational framework for environmental education and which may be useful in constructing environmental education curricula. Basic elements of the program and of the program support system necessary for environmental education can be identified and can be used to specify the more general components of curriculum development. That is the purpose of this section.

Four criteria governed the manner in which the set of principles is stated. First, it should be evident that the curriculum components of environmental education are expressions of an underlying general theory
with an internal structure of its own. Second, each principle should be supportable by data and useful in accounting for data. Third, it should be possible to reduce the total number of generalizations by stating principles so as to expose basic similarities between apparently different types of programs or situations. Finally, the set of principles should be deliberately designed to be practical.

The evidence on which each principle is based is presented in Chapter 4 and in Appendix A. Thus, brief comments on the special implications for curriculum development in environmental education are made in the short section following the statement of each principle.

Principle 1: At the macrocurricular level of program development, environmental education is an interdisciplinary, multilevel endeavor designed to develop an environmental perspective or global view.

Environmental education is not another subject to be added to the already crowded school curriculum. Rather, it is a philosophy involving a re-examination of man-environment relationships which must be integrated vertically and horizontally into the entire school curriculum. Environmental education should be the means by which subject matter fields are linked and by which relevance for some existing curricular matter may be established. Certain concepts, processes and skills are believed to be more important than others in the integration of the school curriculum.

Principle 2: At the microcurricular level of program development, environmental education involves awareness and understanding of certain basic concepts and the development of certain cognitive, affective, and skill-behavior processes.

It is fruitless to debate how many process angels can dance on the head of a content pin. Environmental education involves full development of students' cognitive processes (including problem solving),
affective processes (including valuing), and skill-behavior processes (including active participation in community decision making). It also entails conceptual understanding of the natural and man-made environments which includes understanding of ecological concepts such as diversity, change, interaction, continuity, organization and limitation as well as man's sociocultural systems and environmental issues and their inter-relationships to natural phenomena.

Principle 3: In terms of program support elements at the instructional level, environmental education includes methods and materials which facilitate processes of problem solving, values clarifying, and systems thinking through the use of first-hand experiences involving issue-oriented activities of a present-future orientation.

The range of potential learning experiences is infinite, which is why curriculum-making and teaching can be creative fields. It is possible to distinguish certain types of learning opportunities that are common to environmental education. Criteria for guiding and justifying the selection of learning activities tend to be based on philosophical (value), psychological (learning) and practical principles although some technological underpinnings are evident in the statement of objectives and evaluation procedures of some courses.

Principle 4: Roles and relationships in environmental education include new productive student-teacher responsibilities, a team approach to learning and, at the same time, increasing student active participation in and responsibility for individual learning.

Processes of valuing and problem solving involve a type of student-teacher contact where, because of the interdisciplinary nature of environmental problems, the teacher cannot be expected to provide all of the information needed to examine an environmental issue. The teacher becomes
a facilitator in terms of organization strategies and information access and a learner in terms of information accessed by students in the solution of an environmental problem. Students can assume greater or lesser degrees of responsibility for learning about the complex issues that arise as a result of man's interaction with the natural environment.

Principle 5: Environmental education assumes the use of learning environments that are most appropriate for the particular learning experiences whether it be classroom, a place in the community or a place in the natural environment.

Firsthand experiences in a variety of real-life settings are believed to be important for people of all ages. This implies more frequent departure from textbook and classroom learning than presently exists. Examination of local environmental issues involves resolving value questions and gathering supportive data for particular points of view which are likely not found within the school. Leaving school premises during school hours to visit a variety of environments involves a high degree of teacher and student responsibility.

Principle 6: Environmental education involves the establishment of certain conditions of operation including a communications network and coordination and cooperation at international, regional, national, and local levels.

Many environmental issues/problems ultimately involve ecosystems which transcend local or national boundaries and require cooperation to resolve. Environmental education must establish the communication linkages which facilitate information flow concerning cultural values and attitudes so that coordination can occur in the resolution of small and large scale environmental issues.
Principle 7: Concerning the institutions which have been designed to administer current educational programs, more flexibility in organization and overall reform of educational processes and systems are (believed to be) prerequisites of effective environmental education.

There are presently major constraints to development, implementation, and evaluation of environmental education programs which advocate an interdisciplinary, problem-solving, value-clarifying approach to the investigation of issues in community and natural contexts. Reorganization of educational priorities is necessary to remove constraints such as inflexible scheduling, funding constraints for transportation, lack of information on the community environment and so on. Environmental educators vary in opinion as to whether environmental education operates to some extent within the existing educational system or whether total administrative/institutional reorganization is necessary.

Principle 8: Environmental education requires a sound research and development basis which includes sound research procedures to question materials and techniques, continual improvement in curriculum development and evaluation, and more effective professional development programs for preservice and inservice teachers.

Environmental education is innovative with respect to current educational practices. Any demand for change must be backed by evidence which provides support for the change whether philosophical or empirical. Environmental educators are becoming more critical of environmental education programs and methods. They are establishing research and curriculum (development and evaluation) literature which attempts to examine the assumptions, values, theories, procedures, and strategies for teaching that underlie environmental education. They are also attempting to develop more effective preservice and inservice teacher training programs which emphasize curriculum development and evaluation techniques and encourage
educational research to determine their effectiveness as environmental educators.

ii) Use in evaluation of environmental education programs

The field of evaluation includes many different views as to the purposes of evaluation and how it is to be carried out. In a general sense, curriculum evaluation attempts to answer two questions: 1. Do learning experiences and programs actually produce desired results? and 2. How can curriculum offerings best be improved (McNeil, 1977). It must provide information that is useful to decision makers. Thus, evaluative models should be chosen in light of the kind of decisions to be made.

Several theorists have described their conceptions of what should be involved in evaluating. A number of these schemes advocate more than a determination of a curriculum program's goal achievement. For example, Stake (1967) emphasizes two operations, descriptions and judgments. Identification of key environmental education characteristics may be of use in describing what is being evaluated. According to Cronbach (1963) identifying the real "what", which depends on the purpose, is of significance because resulting evaluation procedures will differ greatly. According to Alkin and Fitz-Gibbon (1975), in the first stage of evaluation, the evaluator tries to find out the difference between what is and what is not desired in order to determine educational need and to identify educational goals.

The principles of curriculum development listed in the previous section of this chapter may prove useful in describing what is desired in environmental education. These principles may serve as criteria for examination of existing environmental education programs. More specifically,
these criteria may be useful as the basis for evaluation instruments such as the one described below. The degree to which criteria are satisfied may be determined by responses to questions which may or may not be grouped into categories related to each of the environmental education principles. Examples of types of questions that may apply to principle criteria for environmental education are listed below.

Principle 1: 1.1 Does the program attempt to develop an environmental perspective or global view?

1.2 Is the program truly interdisciplinary?

1.3 Does the program provide for vertical articulation of environmental education concepts and processes K-12?

1.4 Does the program make the ecological-environmental connections between widely separated issues such as resource use and transportation costs?

1.5 Does the program provide study of cultural, racial, religious and ethnic differences with regard to local and global environmental issues?

Principle 2: 2.1 Does the program emphasize valid concepts, principles and theories of environmental education?

2.2 Does the program develop students' environmental problem-solving ability?

2.3 Are valuing and social participation (e.g., in community problem solving) adequately represented in the objectives of the program?
Principle 3:  3.1 Does the program develop proficiency in methods of problem solving, value clarification and systems thinking?
3.2 Do activities involve students in firsthand experiences?
3.3 Are learning experiences organized in a such a fashion that students learn how to continue to learn?
3.4 Does the program include analysis and attempts to formulate potential resolutions of present and future environmental issues or problems such as resource use and pollution?

Principle 4:  4.1 Do students have choices within programs?
4.2 Are students involved in the formulation of goals, the selection of activities, and the assessment of curriculum outcomes?
4.3 Do students perceive their teachers as fellow inquirers?
4.4 Are activities carried on in a climate which supports students self-respect and opens opportunities to all?
4.5 Do provided materials accommodate a wide range of abilities and interests; do they incorporate many learning activities and sources?

Principle 5:  5.1 Does the program build upon the realities of the immediate school community?
5.2 Is participation both in school and out considered a part of the program?
5.3 Does the program have available many kinds of work space?
5.4 Do activities use community and natural settings as learning places?

Principle 6: 6.1 Does the course draw upon the contributions of many kinds of resource persons and organizations representing many points of view?
6.2 Are students given opportunities to examine the communication process involved in various levels of government, industry, and private organizations?

Principle 7: 7.1 Does the school (system) provide appropriate time, materials, and facilities for environmental education?
7.2 Can teachers and schools rely on district policy for support on academic freedom and professional responsibility?

Principle 8: 8.1 Do teachers participate regularly in activities which foster their competence in environmental education?
8.2 Are curriculum evaluation and research procedures for environmental education regular, comprehensive and continuous?
8.3 Are evaluation data used for planning environmental education curricular improvement?

Taken together, a set of questions such as those listed may become the basis for the rules of criticism or evaluation of environmental education programs. Analysis of the items of a checklist may provide evidence for general curricular revision or may highlight patterns of problems such as failure to adopt a problem-solving methodology or to consider the
importance of valuing. Whatever the case, what is learned from the program analysis provided by such a checklist must be put to use in improving the environmental education program being evaluated.

Although healthy disagreement still exists among authorities in environmental education over what emphases and directions are most important, the existing organizational framework and resulting principles expose components of environmental education which must be critically evaluated. This environmental education framework seems to provide the evaluator with the material, in the form of key environmental education characteristics, needed to identify more precisely "what" is being evaluated. With such information, environmental education decision-makers may be able to decide on the degree to which programs approach their metacurricula for environmental education.

iii) Use in curriculum research

Some curriculum workers do research, adopting various methods for throwing light on what can and should be taught to whom under given circumstances. Ideally, research should aid practitioners by providing principles for formulating desirable outcomes and designing instructional means. At least, it should provide practitioners with intellectual tools for conceptualizing their situations and raising questions that should be asked (McNeil, 1977).

The present study appears to suggest a number of areas for productive curriculum inquiry. In terms of comprehensive curriculum inquiry, the present study has attempted to identify significant features of environmental education curricula. According to Walker (1974), this could be related to determination of: personal and social consequences
of given environmental education curriculum features; what accounts for stability and change in such features; what accounts for people's judgments of the merit or worth of such features; and what sorts of environmental education curriculum features ought to be included in a curriculum intended for a given purpose in a given situation.

Identification of key environmental education characteristics may also provide the information required to conduct an analysis of all possible relationships among these characteristics. Horsfall (1978) described a process whereby all characteristics are listed in identical order on both vertical and horizontal axes of a two-dimensional grid. The squares that form the diagonal of the resulting matrix square are redundant so are no longer considered. Random selection of remaining grid squares, one at a time, is made with the purpose of generating many hypotheses, some quite divergent, concerning potential relationships among intersecting grid characteristics. It is also possible to include, by expanding grid coordinates, many additional variables which may be deemed of interest in program development. Such factors may include: learner variables, such as learner's perceptions of the curriculum event, or a learner's cognitive style; teacher variables, such as a teacher's attitude toward the curriculum and the learners, or teacher pressure for conformity rather than learner independence; and school or classroom ambient variables such as, peer group interactions, morale, expectations, and consistency with home and community values.

If the environmental education principles stated in this chapter were used as a standard or representative schema for environmental education, it would be possible to use categorical analysis procedures such as latent partition analysis or hierarchical clustering analysis with Q-sort
or Free-sort methodology (Toews, 1975). In this way it would be possible
to compare sort patterns among statements related to these environmental
education principles from groups of environmental educators, students,
teachers, administrators or the general public. This could provide in-
formation about such factors as the level of cognitive functioning or
environmental perceptions of these groups of individuals. This area of
research is of particular interest to the writer.

Another promising direction for research which may be facilitated
by an organizational framework in environmental education involves the
use of path analysis to guide multiple regression models toward causal
inferences (Walberg, 1970). The curriculum framework in environmental
education provides not only key environmental education characteristics but
also potential organizational pathways. Such paths may provide useful
insight into formulation of certain more specific hypotheses related to
a particular path of inquiry. For example, one might examine or compare
the relationship of particular learning environments to effectiveness in
environmental problem solving. Path analysis based on multiple regression
models permits examination of a large number of independent variables
on a dependent variable, thus facilitating examination of many additional
factors which are related to environmental education characteristics and
curriculum elements examined in this work. Path analysis seems to offer
much in the way of providing direction in terms of problem generation and
delimitation so that seemingly unrelated "bits" of research can be inter-
preted within a much larger framework, guided, for example, by the objectives
of environmental education.

It would seem profitable to consider the identified environmental
education characteristics as the first phase of a Delphi process (Aldrich,
Blackburn and Abel, 1977). In this phase, identifiable issues or
characteristics can be considered as components of a large problematique. Once such characteristics have been identified, questions can be asked of "experts" on a number of rounds to force consensus and a rank-ordering of importance. Respondents can also be asked to suggest programs, activities, or actions by which we might deal with characteristics. This process would seem promising in providing more information about priorities which environmental educators might place on identified environmental education characteristics.

Thus, identification of key environmental education characteristics and establishment of some potential curricular relationships seem to provide groundwork for needed curriculum inquiry and consideration of some research questions which seem important to the future of environmental education. It is almost inevitable that development of learning opportunities will continue at both macro and micro-levels. It is not known which set of procedures will predominate. Research is needed to study what happens when different procedures are followed. Environmental educators must question whether different ends are promoted when different procedures are followed. Clarification of basic assumptions about curriculum ends and means in environmental education can facilitate educational research in the curriculum area and vice versa.

Conclusion

The primary purpose of this study was to identify, within the broader curriculum context, the key characteristics of environmental education. Two questions provided the principal point of focus. Can the literature be used to identify major environmental education elements? Furthermore can a meaningful relationship be found between key elements of
environmental education and dimensions of educational curricula in general?

An extensive comprehensive review of the literature related to environmental education revealed that there are several key characteristics of environmental education. These characteristics do not include the specification of a particular body of content for environmental education, although certain concepts are believed to be fundamental to environmental education. Instead, the characteristics delineate the general objectives for environmental education programs.

Examination of the literature on the organization of cognitive structure in light of the purpose for analysis of environmental education—to facilitate curriculum development and evaluation in environmental education—led to the conclusion that organization of the elements of environmental education should be based on a more general reference system—the dimensions of a setting for the development of educational programs. The elements of the curriculum development process were found to provide a meaningful basis upon which to organize key environmental education components.

Research methodologies such as various survey techniques and the Delphi process have been used extensively to gather opinions or information for inference and generalization. Extensive examination of the literature also appears to provide a meaningful way to determine if consensus has been reached when ideas are subject to scrutiny of others at working conferences and seminars and in refereed periodicals.

One method of determining if patterns exist within a field is to consider the metasystem that is operating on that field. By examining patterns of patterns or environmental education patterns in the context of
general curriculum patterns, the key to organization for this study was found.

Perhaps the most meaningful conclusion of the entire study, from a personal standpoint, was the realization of the process of ecological thinking—that process which involves seeing the pattern which connects, the metapattern of interacting parts which are only secondarily seen as component entities. Environmental educators have been talking about components for years, with specific entities in particular relation to one another, but they have missed the larger patterns, in this case the curricular patterns, which provide the sense which the parts play in the larger whole. Without the larger pattern or framework, a somewhat empty understanding of components, such as "interdisciplinarity", seems certain.

This study appears to be significant from several points of view. It demonstrates a technique for identifying key characteristics through systematic examination of some literature. It indicates the importance of considering environmental education from a broader perspective; it points up the perhaps inevitable similarity among environmental educators positions on many aspects of the curriculum; and it provides a framework for curriculum development, evaluation, and research in environmental education.

Suggestions for future study

Many suggestions for examination of research and evaluation questions were provided in this chapter. However, these suggestions were related to the curriculum framework developed herein. Some broader questions remain.

Principles for curriculum development and evaluation were developed using a literature search method. Given the utility of this method, future studies should attempt to identify key environmental education
characteristics by other methods and from other sources via survey and Delphi procedures.

Certain potential environmental education characteristics did not meet the criteria for inclusion as environmental education components. Further examination of these elements may reveal new or recent trends in environmental education which, given the rapid evolution of the young field, may provide for the expansion and updating of the present framework.

Other environmental education elements which were included in the overall framework did not achieve as much support as did concepts such as "interdisciplinary" and "values clarification". Re-examination of weaker components may also provide a basis for future updating.

The curriculum field is dynamic and evolving. Perhaps new curricular dimensions, believed to be important for change in educational programs, will be identified by research or by other means. Such identification may lead to reorganization of environmental education components within a curriculum framework.
APPENDIX A

References Supporting Key Characteristics for Environmental Education
PROGRAM ELEMENTS

Key element or major theme in environmental education according to:

Macrocumricular
Interdisciplinary

International and Regional Conferences
Unesco-Unep, Belgrade, 1975
OECD/CERI, Rungsted, 1974
UN Conference on the Human Environment, Stockholm, 1972
OECD/CERI, Tours, 1971
EUCN/EESC, Nevada, 1970
OECD/CERI, Nice, 1970

National Conferences
EE* Farnborough, England Conference, 1976
AIBS/NSF, 1970
NCEE/UWGB, 1970

Individuals Writing in Refereed Journals (CIJE) or Published Books
Brogdon and Rowsey, 1977
Carson, 1977
Doran, 1977
Kelly, 1977
Perrott, 1977
Kupchella and Hyland, 1977
Nash, 1976
Perelman, 1976
Saveland, 1976
Stapp, 1976
Willard, 1976
Aldrich and Blackburn, 1976
Buchtel, 1975
Burton, 1975
Editors' Declaration, 1975
Glenn and Gennaro, 1975
Johnson, 1975
Knapp, 1975
Martin and Wheeler, 1975
McGowan and Kriebel, 1975
Milmine, 1975
Shaw, 1975
Smith, 1975
Agne and Nash, 1974
Bennett, 1974
Tanner, 1974
Hawkins and Vinton, 1973
Roth, 1973
Voelker and Koib, 1973
Lowe, 1972
Sale and Lee, 1972
Converse et al., 1971
Labinowich, 1971
Linsky, 1971
Lowe, 1971
Stainbrook, 1971
Allen, 1970
Bryson, 1970
Schoenfeld, 1970
Streif and Arnstein, 1970
Wang, 1970
Winn, 1970
Covert, 1969
Havelick, 1969
Hill and White, 1969
Hungerford and Knapp, 1969
Train, 1967

*EE will be used to denote environmental education in Appendix A.
Key element or major theme in environmental education according to:

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**

- Ambry, 1977
- Brennan, 1977
- Hickey, 1977
- Hodges, 1977
- LaHart and Tillis, 1977
- Magnoli, 1977
- McCabe and Bouwsma, 1977
- Moore and Wong, 1977
- Naylon, 1977
- Ritz, 1977
- Roberts, 1977
- Warpinsky, 1977
- Wilson, 1977
- Zalewski, 1977

- Hepburn, 1976
- McColl and Nicholas, 1976
- Wong, 1976
- NEED, 1975
- Maine EE Project, 1975
- Nolde Forest EE Center, 1973
- Milwaukee EE Program, 1973
- Topeka EE Project, 1973
- Vivian, 1973
- Lines and Bolwell, 1971
- C. Roth, 1971
- Scholastic ECSP, 1971
- Weidner, 1971

- Cohen, 1975
- Jinks, 1974
- Thies, 1974
- Ulrich, 1974

- Isabell, 1973
- Allman, 1972
- Lucas, 1972
- Peden, 1972

**Research in Environmental Education**
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Research in Environmental Education

| Allman, 1972 |
Key element or major theme in environmental education according to:

**International and Regional Conferences**
- Unesco-Unep, Belgrade, 1975
- OECD/CERI, Rungsted, 1974
- IUCN/WES, 1972

**National Conferences**
- NCEE/UWGB, 1970

**Individuals Writing in Refereed Journals (CIJE) or Published Books**
- Kupchella and Hyland, 1977
- Miles, 1976
- Perelman, 1976
- Saveland, 1976
- Stapp, 1976, 1974a
- Willard, 1976
- Aldrich and Blackburn, 1975b
- Burton, 1975
- Storm, 1975
- Strong, 1974
- Tanner, 1974
- Hawkins and Vincent, 1973
- Humphrey, 1973
- Colton, 1972
- McInnis, 1972
- Sale and Lee, 1972
- Linsky, 1971
- Lowe, 1971
- Swan, 1971
- Schoenfeld, 1970b, 1969
- Winn, 1970

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**
- Brennan, 1977
- Harshman, 1977
- Hickey, 1977
- Moore and Wong, 1977
- Warpinsky, 1977
- Wong, 1976
- Maine EE Project, 1975
- NEED, 1975
- Vivian, 1973
- C. Roth, 1971
- Weidner, 1971

**Research in Environmental Education**
### Key element or major theme in environmental education according to:

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Key element or major theme in environmental education according to:

**International and Regional Conferences**
- Unesco-Unep, Belgrade, 1975
- OECD/CERI, 1974
- IUCN/EESC, Nevada, 1970

**National Conferences**
- EE Farnborough, England Conference, 1976
- EE Act United States Congress, 1970
- NCEE/JWGB, 1970

**Individuals Writing in Refereed Journals (CIJE) or Published Books**
- Carson, 1977
- Doran, 1977
- Kupchella and Hyland, 1977
- Roth, 1977
- Withrington, 1977
- Bowman, 1976
- Harblin and Maynard, 1976
- Nash, 1976
- Perelman, 1976
- Roth, 1976, 1973
- Saveland, 1976
- Stapp, 1976
- Willard, 1976
- Aldrich and Blackburn, 1975a
- McGowan and Kriebel, 1975
- Shaw, 1975
- Tanner, 1974
- Hawkins and Vinton, 1973
- Sale and Lee, 1972
- Balzer, 1971
- Lowe, 1971
- Stainbrook, 1971
- Swan, 1971

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**
- Ambry, 1977
- Brennan, 1977
- Hickey, 1977
- Hodges, 1977
- LaHart and Tillis, 1977
- Moore and Wong, 1977
- Ritz, 1977
- Wartinsky, 1977
- Zalewski, 1977
- Hepburn, 1976
- McColl and Nicholas, 1976
- Wong, 1976
- Bennett, 1975, 1974, 1971
- Maine EE Project, 1975
- NEED, 1975
- Lines and Bolwell, 1971
- McDonald, 1971
- C. Roth, 1971
- Eastman, 1973
- Leith, 1973
- Perkes, 1973
- Quinn, 1973
- Roth and Helgeson, 1972

**Environmental Education Research**
- Bohl, 1976
- Richmond, 1976
- Cohen, 1975
- Eyers, 1975
- Noeske, 1974
- Parker, 1974

**Microcurricular Development of Processes**
(Cognitive-Affective-Skill/Behavior)
### PROGRAM SUPPORT SYSTEM ELEMENTS

#### Instructional

- Methods and Materials
- Problem Solving

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Liston, 1975
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Smith, 1975
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Swan, 1974a, 1974b, 1971
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Lowe, 1972
Labinowich, 1971
Winn, 1970

McColl and Nicholas, 1976
Wong, 1976
Bennett, 1975, 1974, 1971
Maine EE Project, 1975
NEED, 1975
C. Roth, 1975, 1971
Topeka EE Program, 1973
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  - OECD/CERI, Rungsted, 1974

- National Conferences
  - NCEE/UWGB, 1970

- Individuals Writing in Refereed Journals (CIJE) or Published Books
  - Bazan, 1976
  - Nash, 1976
  - Perelman, 1976
  - Willard, 1976
  - Aldrich and Blackburn, 1975a
  - McInnis, 1975
  - Wheeler, 1975
  - Hawkins and Vinton, 1973
  - Bateson, 1972
  - Swan, 1971

- Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books
  - Hickey, 1977
  - Weidner, 1976
  - Maine EE Project, 1975
  - NEED, 1975
  - Francis, 1973
  - Newbould, 1973
  - Wolf et al., 1973
  - Bryson, 1970
  - Converse et al., 1970
  - Wang, 1970

Research in Environmental Education
Key element or major theme in environmental education according to:

**Program Support System Elements**

**Instructional**

**Methods and Materials**

**Firsthand Experiences**

**International and Regional Conferences**

- UNESCO/UNEP, Belgrade, 1975
- OECD/CERI, Tours, 1971

**National Conferences**

- AIBS/NSF, 1970
- NCEE/UWGB, 1970

**Individuals Writing in Refereed Journals (CIJE)**

- Carson, 1977
- Harblin and Maynard, 1976
- Kupchella and Hyland, 1976
- McInnis, 1976
- Perelman, 1976
- Saveland, 1976
- Stapp, 1976
- Willard, 1976
- Aldrich and Blackburn, 1975a
- Johnson, 1975
- Knapp, 1975
- McGowan and Kriebel, 1975

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**

- Hickey, 1977
- Hodges, 1977
- Ritz, 1977
- Zalewski, 1977
- Atlanta EE Program, 1976
- Hepburn, 1976
- McColl and Nicholas, 1976
- Wong, 1976
- Bennett, 1975, 1974, 1971

**Environmental Education Research in Environmental Education**

- Thies, 1974

- Shaw, 1975
- Smith, 1975
- Glasser, 1974
- Tanner, 1974
- Ball and Ball, 1973
- Hawkins and Vinton, 1973
- Mellowes, 1972
- Sale and Lee, 1972
- Kerlin, 1971
- Kluge, 1971
- Labinowitch, 1971
Key element or major theme in environmental education according to:

Environmental Issues Oriented

International and Regional Conferences

OECD/CERI, Rungsted, 1974
OECD/CERI, Tours, 1971

National Conferences

NCEE/UWGB, 1970

Individuals Writing in Refereed Journals (CIJE) or Published Books

Carson, 1977
Bazan, 1976
Finseth and Shaefer, 1976
Burton, 1975
Eckman and Layden, 1975
Knapp, 1975
Martin, 1975
Glasser, 1974

Stapp, 1974b
Swan, 1974b
Tanner, 1974
Hawkins and Vinton, 1973
Sale and Lee, 1972
Kerlin, 1971
Labinowich, 1971
Winn, 1970

Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books

Ambry, 1977
Harsman, 1977
Hickey, 1977
Hodges, 1977
Magrill, 1977
Haakosen et al., 1977
Ritz, 1977
Hepburn, 1976

McColl and Nicholas, 1976
Maine EE Project, 1975
NEED, 1975
Converse et al., 1971
Lines and Bolwell, 1971
C. Roth, 1971
IEE, Cleveland

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Roth, 1976
Sibley, 1974
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- OECD/CERI, Rungsted, 1974
- IUCN/WES, 1972

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Individuals Writing in Refereed Journals (CIJE) or Published Books
- Carson, 1977
- Harblin and Maynard, 1976
- Perelman, 1976
- Aldrich and Blackburn, 1975a
- Buchtel, 1975
- Burton, 1975
- Horn, 1975
- Michael, 1974
- Swan, 1974a, 1974b
- Tanner, 1974
- Carson, 1977
- Hawkins and Vinton, 1973
- Lowe, 1972
- Sale and Lee, 1972
- Goodale, 1971
- Hill and White, 1969

Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books
- Brennan, 1977
- Harshman, 1977
- Hickey, 1977
- Moore and Wong, 1977
- Zalewski, 1977
- Weidner, 1976, 1971
- Wong, 1976
- Maine EE Project, 1975
- NEED, 1975
- Vivian, 1973
- Wolf et al., 1973

Research in Environmental Education
- Cohen, 1975
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Key element or major theme in environmental education according to:

**PROGRAM SUPPORT SYSTEM ELEMENTS**

### Instructional

#### Roles and Relationships

#### Individual Learning

**International and Regional Conferences**

- OECD/CERI, Rungsted, 1974
- IUCN/WES, 1972
- OECD/CERI, Tours, 1971

**National Conferences**

- NCEE/UWGB, 1970

**Individuals Writing in Refereed Journals (CIJE) or Published Books**

- Perrott, 1977
- Perelman, 1976
- Saveland, 1976
- Liston, 1975
- Michael, 1974
- Offut, 1974
- Stapp, 1974b
- Francis, 1973
- Hawkins and Vinton, 1973
- Sale and Lee, 1972

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**

- Ambry, 1977
- Haakosen et al., 1977
- Harshman, 1977
- Hickey, 1977
- McCabe and Bouwsma, 1977
- Atlanta EE Program, 1976
- Blackwelder, 1976
- Blackwelder, 1976
- Hayford, 1976
- McColl and Nicholas, 1976
- Weidner, 1976
- Berry, 1975
- C. Roth, 1975, 1971
- Wert, 1974
- Converse et al., 1970
- Oregon EE Center

**Research in Environmental Education**

- Thies, 1974
Key element or major theme in environmental education according to:

**PROGRAM SUPPORT SYSTEM ELEMENTS**

- **Instructional Roles and Relationships**
- Team Approach to Teaching/Learning

**International and Regional Conferences**

OECD/CERI, Rungsted, 1974
OECD/CERI, Tours, 1971

**National Conferences**

NCEE/UWGB, 1970

**Individuals Writing in Refereed Journals (CIJE)**

Brogdon and Rowsey, 1977
Nash, 1976
Podewell, 1975
Shaw, 1975

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**

Harshman, 1977
Hickey, 1977
Magnoli, 1977
Naylon, 1977
Ritz, 1977
Wilson, 1977

**Altanta EE Program, 1976 Hayford, 1976**

**Reports and Publications**

McCull and Nicholas, 1976
Stapp and Cox, 1974
Milwaukee EE Program, 1973
Lines and Bolwell, 1971
McDonald and McDonald, 1971
Weidner, 1971
IEE, Cleveland
PROGRAM SUPPORT SYSTEM ELEMENTS

Instructional Roles and Relationships

New Productive Student-Teacher Relationships

Key element or major theme in environmental education according to:

International and Regional Conferences

- Unesco-Unep, Belgrade, 1975
- IUCN/WES, 1972
- OECD/CERI, Tours, 1971

National Conferences

- EE Farnborough, England Conference, 1976
- NCEE/UWGB, 1970

Individuals Writing in Refereed Journals (CIJE) or Published Books

- Brogdon and Rowsey, 1977
- Carson, 1977
- Withrington, 1977
- Stapp, 1976
- Aldrich and Blackburn, 1975
- Engleson, 1975

- Hickey, 1977
- McCabe and Bouwsma, 1977
- Naylon, 1977
- Ritz, 1977
- McColl and Nicholas, 1976
- Maine EE Project, 1975

Research in Environmental Education

- Watkins, 1974
## Program Support System Elements

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Contextual Learning Environments

Field Studies

Key element or major theme in environmental education according to:

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OECD/CERI, Tours, 1971

National Conferences

NCEE/UWGB, 1970

Individuals Writing in Refereed (CIJE) or Published Books

Brogdon and Rowsey, 1977
Carson, 1977
Kupchella and Hyland, 1977
Withrington, 1977
Holt, 1976
Saveland, 1976
Stapp, 1976
Burton, 1975
Johnson, 1975
Liston, 1975
Shaw, 1975

Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books

Hickey, 1977
Hodges, 1977
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McCull and Nicholas, 1976
Wong, 1976
Maine EE Project, 1975
NEED, 1975
Kullman, 1973
Milwaukee EE Project, 1973

Research in Environmental Education

Roth, 1976
Hosley, 1974
Howie, 1974

Tanner, 1974
Hawkins and Vinton, 1973
Clark, 1972
Ezersky, 1972
Kerlin, 1971
Roth, 1971
Reid, 1970
Hill and White, 1969
Schoenfeld, 1970b, 1969
Southern, 1969

Topeka EE Project, 1973
Vivian, 1973
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Beirne, 1971
Lines and Bolwell, 1971
McDonald and McDonald, 1971
C. Roth, 1971
IEE, Cleveland

Thies, 1974
Brady, 1972
Slater, 1972
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## PROGRAM SUPPORT SYSTEM ELEMENTS

### Contextual

Operating Conditions

Coordination and Cooperation

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## PROGRAM SUPPORT SYSTEM ELEMENTS

### Organizational

#### Flexible Administrative Organizational Patterns

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| Individuals                           | Stapp, 1974b               |
| Writing in Refereed Journals (CIJE)    | Ball and Ball, 1973        |
| or Published Books                    | Hawkins and Vinton, 1973    |
| Environmental Education               | Sale and Lee, 1972         |
| Programs Abstracted in RIE or Written by Individuals in Published Books | Menesini, 1971             |
| Research in Environmental Education   | Francis, 1973              |
|                                       | Weidner, 1973              |
|                                       | Lines and Bolwell, 1971    |
|                                       | C. Roth, 1971              |
|                                       | IEE, Cleveland              |

| Perelman, 1976                        |                           |
| Saveland, 1976                        |                           |
| Young, 1976                           |                           |
| Shaw, 1975                            |                           |
| Glasser, 1974                         |                           |
| Michael, 1974                         |                           |
| Bossanyi, 1977                        |                           |
| Wilson, 1977                          |                           |
| Hayford, 1976                         |                           |
| VandeVisse and Stapp, 1975            |                           |
| Sedgewick and Watkins, 1974           |                           |
| Roth, 1976                            |                           |
| Hildebrand, 1972                      |                           |
Key element or major theme in environmental education according to:

**Organizational Reform of Educational Processes and Systems**

**International and Regional Conferences**
- Unesco-Unep, Belgrade, 1975
- OECD/CERI, Rungsted, 1974
- OECD/CERI, Tours, 1971

**National Conferences**
- AIBS/NSF, 1970
- NCEE/UWGB, 1970

**Individuals Writing in Refereed Journals (CIJE) or Published Books**
- McClaren, 1978
- Withrington, 1977
- Perelman, 1976
- Stapp, 1976
- Aldrich and Blackburn, 1975
- Glasser, 1974
- Michael, 1974
- Hawkins and Vinton, 1973
- McInnis, 1972
- Arvill, 1971
- Lowe, 1971
- Wang, 1970
- Winn, 1970

**Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books**
- Brennan, 1977
- Hickey, 1977
- LaHart and Tillis, 1977
- Moore and Wong, 1977
- Wilson, 1977
- Roth, 1976
- AbilIon, 1973
- Peterson, 1973
- C. Roth, 1971
- Weidner, 1971

**Research in Environmental Education**
- Roth, 1976
- Ulrich, 1974
- Hildebrand, 1972
- Rentsch, 1971
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**Key element or major theme in environmental education according to:**

#### Research and Development

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### Research and Development

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- **International and Regional Conferences**
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  - OECD/CERI, Rungsted; 1974

- **National Conferences**
  - NCEE/UWGB, 1970

#### Individuals Writing in Refereed Journals (CIJE)
- Cohen, 1977
- Doran, 1977
- Schoenfeld and Disinger, 1977
- Keach, 1976
- Perelman, 1976
- Roth, 1976, 1971
- Stapp, 1976
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- Bennett, 1974
- Glasser, 1974
- Tanner, 1974
- Hendee, 1972
- Sale and Lee, 1972
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- Swan, 1971
- Winn, 1970

#### Environmental Education Programs Abstracted in RIE or Written by Individuals in Published Books
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- Harshman, 1977
- Hickey, 1977
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- Magnoli, 1977
- Naylon, 1977
- Warpiński, 1977
- Wilson, 1977
- Hepburn, 1976
- Maine EE Project, 1975
- Vivian, 1973
- Helgeson, 1971
- McDonald and McDonald, 1971

#### Research in Environmental Education
- Childress, 1976
- Ulrich, 1974
- Hildebrand, 1972
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#### Environmental Education

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#### Programs Abstracted in RIE or Written by Individuals in Published Books

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Key element or major theme in environmental education according to:

International and Regional Conferences
- Unesco-Unep, Belgrade, 1975
- OECD/CERI, Rungsted, 1974
- IUCN/WES, 1972
- UN Conference on the Human Environment, Stockholm, 1972
- OECD/CERI, Tours, 1971

National Conferences
- EE Farnborough, England Conference, 1976
- AIBS/NSF, 1970
- NCEE/UWGB, 1970

Individuals Writing in Refereed Journals (CIJE) or Published Books
- Carson, 1977
- Kelly, 1977
- Kupchella and Hyland, 1977
- Maldague, 1977
- Perrott, 1977
- Ritz, 1977
- Withrington, 1977
- Finseth and Shafer, 1976
- Holt, 1976
- Perelman, 1976
- Saveland, 1976
- Stapp, 1976
- Aldrich and Blackburn, 1975
- Bennett, 1975
- McInnis, 1975
- Milmine, 1975
- Smith, 1975
- Sale and Lee, 1972
- Lowe, 1971
- Winn, 1970
- Hill and White, 1969

Environmental Education Programs Abstracted in RIE Written by Individuals in Published Books
- Ambry, 1977
- Brennan, 1977
- Hickey, 1977
- Hodges, 1977
- LaHart and Tillis, 1977
- Magnoli, 1977
- Moore and Wong, 1977
- Naylon, 1977
- Ritz, 1977
- Warpinisky, 1977
- Wilson, 1977
- Maine EE Project, 1975
- Tanner, 1974
- Milwaukee EE Program, 1975
- Nolde Forest EE Center, 1973
- Topeka EE Project, 1973
- Vivian, 1973
- Bennett, 1971
- Lines and Bolwell, 1971
- McDonald and McDonald, 1971
- C. Roth, 1971
- IEE, Cleveland

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- Hamann, 1973
- Wright, 1971
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