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ABSTRACT

Presented are sections describing the use of the model. Included are: (1) Orientation; (2) Content Specifications; and (3) Implementation. These sections are intended as aids in orienting community educators and leaders to the integration of energy/environmental education and adult community leadership. It is intended that the model will provide the user with a conceptual framework within which to formulate and plan energy-focused environmental education programs which will transmit to others an understanding of the concepts and principles of energy and will enhance their ability to comprehend energy/environment problems and issues from a holistic, systemic perspective. (Author/RE)

COMMUNITY LEADERSHIP ENERGY/ ENVIRONMENTAL EDUCATION MODEL

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THE COMMUNITY LEADERSHIP ENERGY/ENVIRONMENTAL EDUCATION MODEL

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This document is one of a series of Teacher Training Models for Environmental Education. The titles of the individually available documents in this series are:

THE HIGH SCHOOL ENERGY/ENVIRONMENTAL EDUCATION TEACHER TRAINING MODEL
Orientation
Content Specifications
Curriculum Management Specifications
Implementation Model

COMMUNITY LEADERSHIP ENERGY/ENVIRONMENTAL EDUCATION MODEL
Orientation
Content Specifications
Implementation

THE SOCIAL SCIENCE ENVIRONMENTAL EDUCATION TEACHER TRAINING MODEL
Orientation
Content Specifications

THE NATURAL SCIENCE ENVIRONMENTAL EDUCATION TEACHER TRAINING MODEL
Orientation
Content Specifications

THE ENVIRONMENTAL EDUCATION SOURCEBOOK

Far West Laboratory would like to acknowledge the contribution of the Institute for Advanced Systems Studies, California State Polytechnic University at Pomona for the development of portions of the above materials. We would also like to acknowledge the contribution of the following consultants: George Michael Black, Richard D. Britz, Ronald G. Klietsch, Daniel Litowsky-Ducasa, Jr., and David B. Sutton.

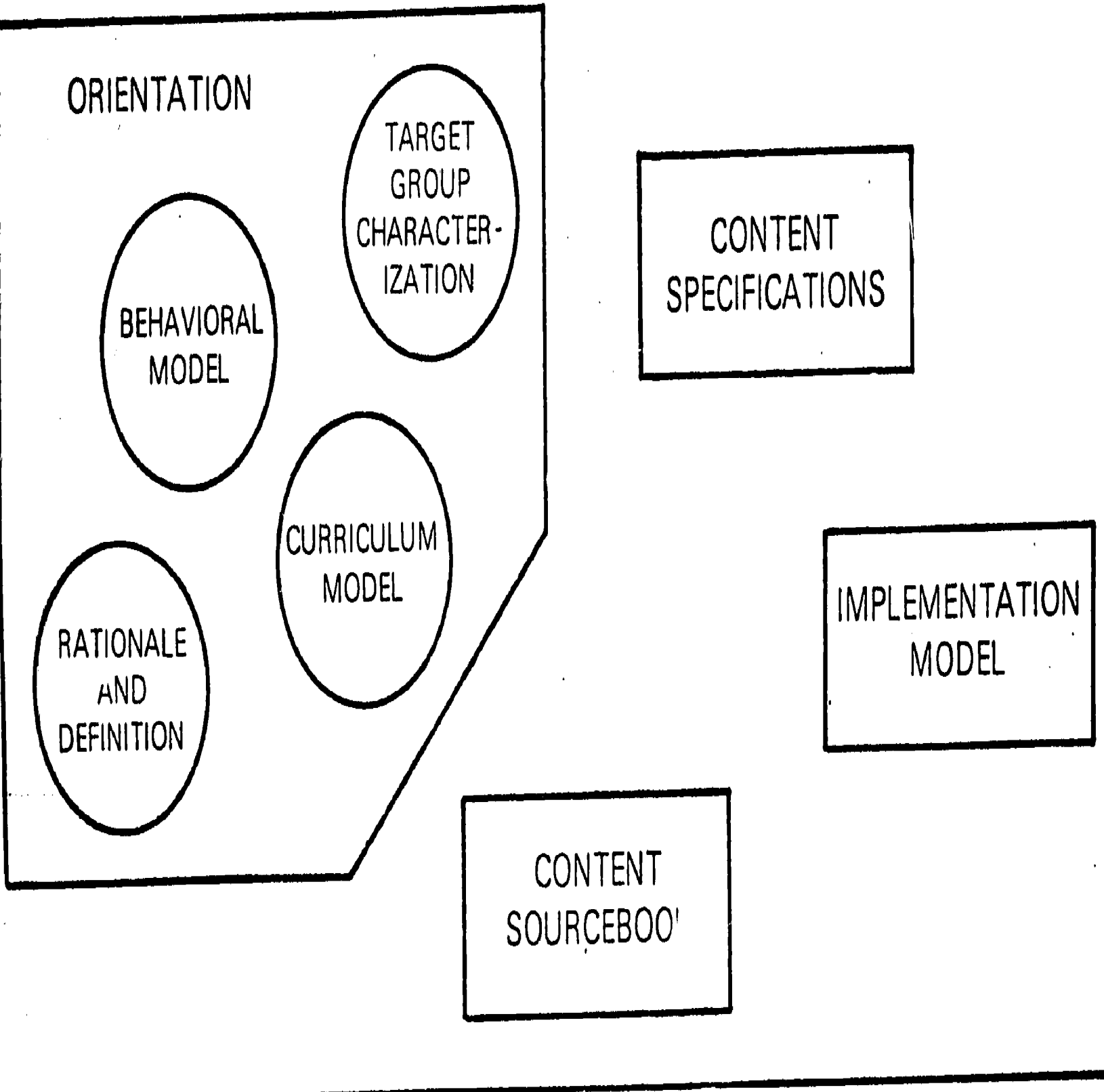
PREFACE

The Community Leadership Energy/Environmental Education Model is presented in the following documents:

- Orientation
- Content Specifications
- Implementation
- Content Sourcebook*

These documents represent an attempt to characterize and integrate the systems complex of energy/environmental education (EE) and adult community leadership. They are intended as orienting documents for community educators or leaders. Accordingly, it is hoped that this Model will provide the user with a conceptual map or frame of reference within which to formulate and plan energy-focused environmental education programs which will transmit to others an understanding of the concepts and principles of energy and will enhance their capability to comprehend EE problems and issues from a holistic, systemic perspective.

*The Environmental Education Content Sourcebook will be available as a separate publication.



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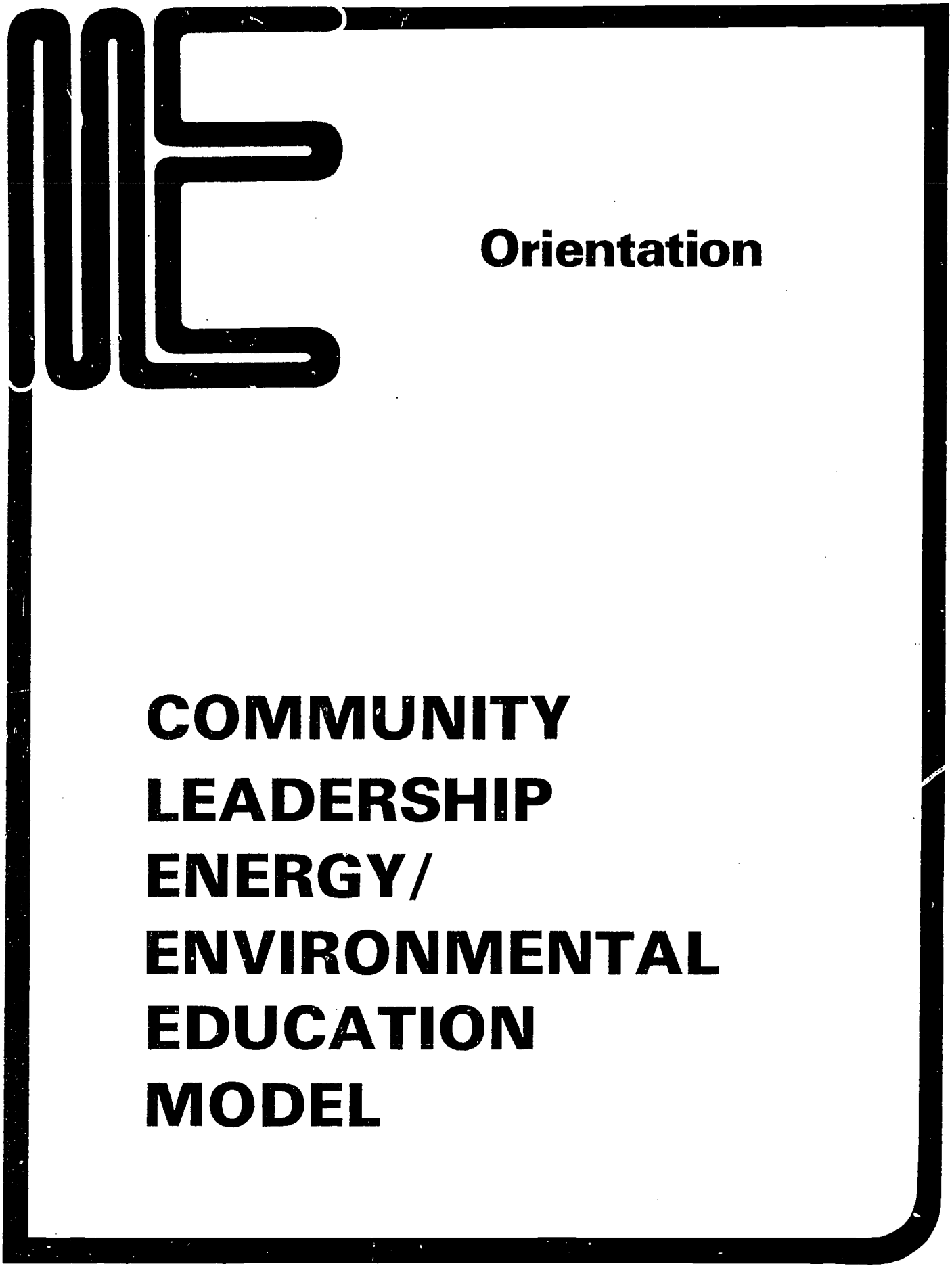

Orientation

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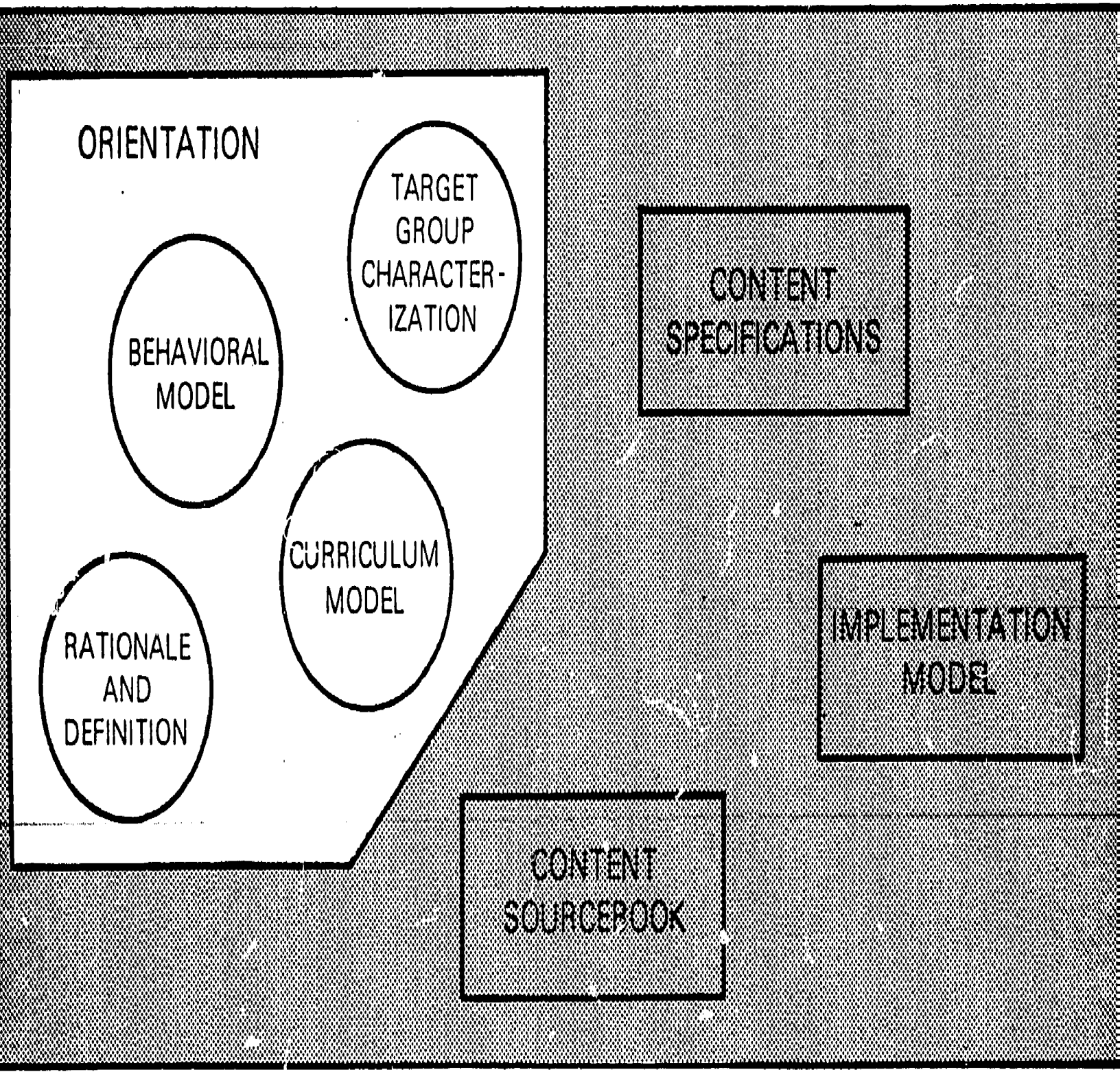

COMMUNITY LEADERSHIP
ENERGY/ENVIRONMENTAL EDUCATION MODEL

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INTRODUCTION

> We have not yet learned, of course, to balance all our environmental objectives against the other social goals that must concern us. But it is now clear that the American people believe our needs for food, for shelter, and for the necessities as well as the amenities of civilization can be met without continuing the degradation of our planet. It is clear that they wish, as Congress stated in the National Environmental Policy Act, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.
>
> President Carter's message in transmittal of the Eighth Annual Report of the Council on Environmental Quality

While the idea of environmental education is well known, widely supported and the subject of much discussion internationally, nationally, regionally and locally, its implications and characteristics have been somewhat elusive and, until recently, less than clearly understood. The debate on the characteristics and implications of environmental education was initiated in policy terms upon introduction of the education bill that was to become the Environmental Education Act. The debate centered on the need for the Act and specifically on the question of what the Act might contribute to the "idea" of environmental education that was not being addressed by existing activities and programs. The results of that debate are reflected in the language and reports on Public Law 91-516 and its amendment, PL 93-278, the Environmental Education Act.

The implications and characteristics identified and hence the substance of the Act were derived from the most comprehensive and

cogent perceptions of the problems to be addressed on the one hand and the prerequisites and potential capability of general education on the other.

In brief, the Act in its original and amended form emphasizes:

1. A concept of environment which includes man, his activities, values and perceptions (the total human environment) as well as the biological/physical.

2. The interrelatedness of "systems" aspects of environment, environmental problems, and environmental impact.

3. The need for policies concerned with long-range or future consequences as well as immediate impacts of plans and activities on environmental quality.

4. The need to consider psycho-social, economic, cultural and other subjective (man-centered or perceived) factors in addressing physical environment problems. (The only substantive change introduced by the 1974 amendment to the Act was the explicit inclusion of economic consideration.)

5. The need for informal public participation in the support of policies and programs (decision/actions) concerned with environmental quality.

6. The need for new educational approaches capable of dealing with holistic problems in holistic contexts.

Given the above, and equally important, the experience to date in environmental decision-making indicates that:

- environmental <u>problems</u> might more accurately be characterized as environmental <u>issues</u>;

- <u>resolution</u> would be a more appropriate objective than <u>solution</u> since the term "solution" assumes a far greater level of consensus and knowledge (scientific and non-scientific) than is the case;

- more informed and rational consideration of the relationships between mutual and respective impacts of environmental, economic and social concerns is required;

- informed, broader-based public dialogue is necessary to elicit the appropriate <u>questions</u> and thus better statements of the issues.

While the challenge inherent in these requirements is both intellectually and operationally enormous, it is being addressed in increasingly meaningful ways by a number of governmental and private entities. These requirements, the knowledge base that is evolving to meet them, and the constraints and opportunities for its application/adaptation in a wide range of educational contexts are the basis of the environmental education program strategy.

The evolving knowledge base addresses problems of content, context and processes/methodologies for technical treatment of content/context. The areas of commonality between the approaches and/or outcomes of efforts such as those cited below can be summarized as follows. They are concerned with the identification, articulation, and portrayal of:

- opportunities and constraints in multidimensional ways, taking into account social, natural and psychological (values) factors;
- relationships between dimensions rather than focusing on each as a separate and unrelated factor, as is traditional;
- a range of choices for possible action rather than insisting on a single best solution or reducing choice to a minimum;
- opportunities and constraints in an interactive, futures-oriented context--e.g. in a manner that portrays what is now known without prejudicing the use of what might be learned in the future.

As suggested above, development of the knowledge base requires not only in depth knowledge of the well-defined components of the knowledge base (disciplines, subject fields) and of the parameters/characteristics of the ill-defined components (e.g. values), but also the ability to appropriately select, organize, and apply these

knowledge components in creative new ways, to create a synthesis of knowledge areas appropriate to the needs, to generate or identify questions from which new knowledge can be generated.

Finally, and specifically because no single discipline, subject field, or information source is adequate for characterizing, understanding or informing the problem area(s), both the content/context and process/methodological development thrusts are dependent upon continuing interactions/co-learning among broad networds or environmental information sources for purposes of assuring appropriate consideration of all principal "reality" factors (well-defined and ill-defined) and hence elucidating more clearly the parameters for decision-making. Education is deemed to be the most, if not only, appropriate "institution" for meeting the <u>educational</u> needs related to environmental quality since it embraces directly or indirectly most of the critical philosophical and practical concerns of the nation, in both current and futures contexts.

These premises are based on the belief that education continues to be the primary vehicle for meeting needs in a democratic society; and that education is a continual process through which the individual should acquire sufficient knowledge, decision-making/problem-solving skills and motivation to <u>responsibly</u> participate in the planning and management of a democratic society and its concerns. More specifically, there was and continues to be a rather widespread concern that the clearly evident public interest in environmental quality matters become more informed, less superficial or over-simplified in perspective and approach.

The long-term and complex requirements for meaningful improvement in and maintenance of environmental quality necessitate the development among citizens of a functional understanding of these requirements as well as motivation and skills for responsible, informed participation in environmental planning and decision-making. Short-term, generalized, or adversary public information campaigns are not adequate to meet either the short or long-term needs.

The Environmental Education Act mandates the support of a range of developmental activities as needed to create the resources required to meet these educational needs. It was recognized in enactment of the legislation that such resources were not in existence, nor at that point in time could they even be defined beyond the general requirements embodied in the law and suggested in the findings of the Congress. It was noted, however, that development of resources appropriate to the need would require the synthesis of current knowledge, traditional disciplines or subject fields.

One of the objectives of the Environmental Education program, therefore, is to develop and deliver Environmental Education resources that are responsive both to the knowledge base as it evolves and target group needs and "readiness" over time. The basic activities entailed in this objective are the continuing assessment and analysis of developmental needs and resources vis a vis content requirements; development of conceptual and generic models; and assistance in development and implementation of programs (learning designs) derived from the models.

PART ONE
A SYSTEMIC APPROACH TO ENVIRONMENTAL EDUCATION

The approach of the Environmental Education Act of 1970 is based on the philosophy that all persons be given the information they need to develop a broader perception of their self-interest. It does not sanction an attempt to change the attitudes or values of the population, but rather to provide "models of instruction" that will clarify and make visible values, issues, and alternatives.

> There should be available [to program developers] a variety of tested, relevant, and useable models that they can use or adapt to provide structure, process and substance.[1]

Both the Office of Environmental Education RFP 75-31 and the Arizona State University Report specify that a general systems approach can serve as an organizing vehicle about which a holistic and transdisciplinary model could be designed.[2,3] "Holistic models" and "systems approach" are nearly synonomous in that they both deal with components and the interactions among components. The nature of the interactions varies from subtle "influences" which are difficult to detect, to actual physical "couplings" familiar in the study of physical models. "Models of instruction" are "soft" models in that the nature of the major interactions of their components are "influential" as opposed to physical.

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[1] Federal Register, Vol. 39, No. 99, May 21, 1974, Sec. 3.2 (a).

[2] RFP 75-31, U. S. Office of Education, Office of Environmental Education.

[3] Arizona State University Center for Environmental Studies and Association of American Geographers, Environment-based Environmental Education: Inventory, Analysis, and Recommendations, June, 1975.

A "holistic" model of instruction has an entire range of possible interaction characteristics from influences (soft connections) to actual physical couplings (hard connections) such as limited physical classroom arrangements and inflexible hierarchies of authority and policy. A holistic model of instruction includes these components: content modules, instructional resources, implementation strategies, and curriculum management methods.

It is important to mention here the hierarchical nature of the language of holistic, transdisciplinary models. Models are abstract constructions of reality and can be regarded as a "map" of the territory. The language used to describe the map of the territory is different from that used to describe the territory. The language of the model (or map) is, by necessity, more abstract and abbreviated than the language of the whole reality (or territory). If this were not the case, models would not be more convenient to use than the reality itself. So, the requirement for model languages to be more abstract and abbreviated than the language of reality forces them to be more general, to avoid getting lost in the detail of reality; and to be more abstract, to avoid getting tangled in the narrowness of specific concepts about reality. Thus, by necessity, the language of the model must be at least one level higher hierarchically than the reality it is attempting to describe.

In the specific case of EE, an effective multidisciplinary, systemic and holistic educational model must be constructed in a holistic, generally systemic and transdisciplinary language. From the definition of this need, and through the efforts of the Office of Environmental Education such a language is emerging.

A model of instruction that is based on a general systems approach can display well the many interactions that exist within our natural environment:

- Interactions within the total human system (social, economic, technological)
- Interactions within the total natural system (physical, biological, ecological)
- Interactions between these two systems

The following discussions expand on the nature of each of these interactions.

A. HUMAN SYSTEM INTERACTIONS

Interactions within the total human system can be represented very generally by the classifications of "ekistics," a body of thought originated by the Greek planner Constantinos Doxiadis which addresses the whole of humanity's culturation process.[4] Ekistics observes the cultural/urbanization process from an anthropocentric point of view. It regards the institutions of society as aggregates of individual decisionmakers, and as such, they are responsible for the interactions among five major areas of society.

The Environmental Education Act (PL 91-516 as amended) also identifies the major areas of society that are the concern of EE: population dynamics; pollution; resource allocation and depletion; conservation; transportation; technology; urban and rural planning; environmental quality and ecological balance. In addition, three more entities have been added: natural resource related careers and vocations, economic and technological development, and environmental ethics. These areas are called the Key Environmental Entities in the Environmental Education Teacher Training Models and are correlated with the ekistics model in the following diagram.

[4] Doxiadis, Constantinos, Ekistics, An Introduction to the Science of Human Settlements, New York: Oxford University Press, 1968

	KEY ENVIRONMENTAL ENTITIES	EKISTIC VIEW	EKISTIC SYSTEM MODEL
TECHNO SYSTEMS	Pollution Resource Allocation Technology Transportation Urban and Rural Planning	SHELTERS Housing Community facilities NETWORKS Public utility systems Transportation systems Communication systems	
HUMAN SYSTEMS	Population (dynamics) Natural Resource related Career and Vocations Environmental Ethics Economic Development	THE INDIVIDUAL Physiological needs Safety and security Affection Knowledge and esthetics SOCIETY Public administration and the law Social relations Population trends Cultural patterns Economic development	
NATURAL SYSTEMS	Resource Conservation Resource Depletion Environmental Quality Ecological Balance	NATURE Climate, water, soil Plants, animals Geology, topography Resources, land use	

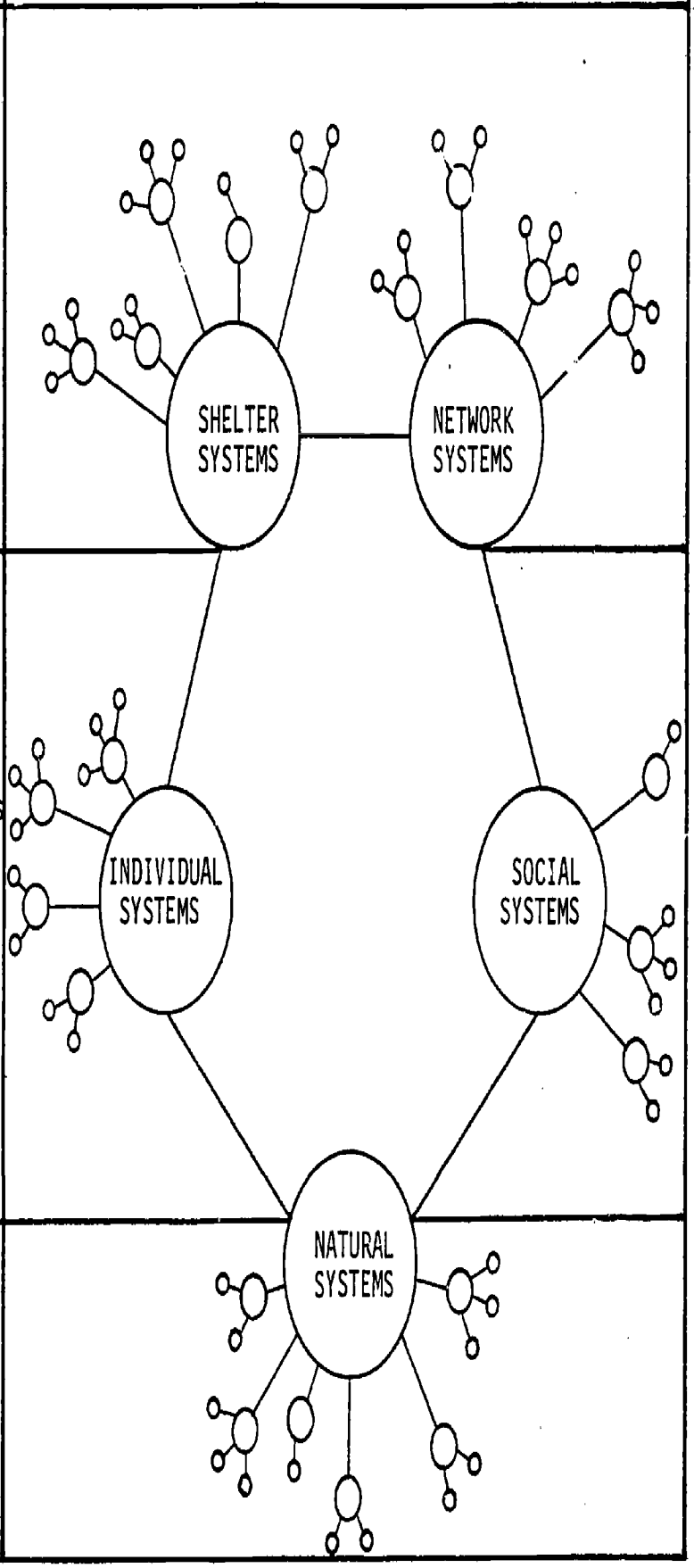

FIGURE 1. Relationship of the Key Environmental Entities to the Ekistic System Model

In order to be manageable, the classifications are very general, and therefore, readily debatable. The essential point is, however, that according to ekistics, society is responsible for the management of all societal sectors. The dynamic nature of these interactions cannot be shown by ekistics models which tend to be node-link diagrams identifying proximal relationships between specific aspects of components.

The dynamics of interactions within the human system can be understood, however, by studying the results of computer simulations of models developed by Jay Forrester and his colleagues of the Systems Dynamics Group at MIT.[5,6,7,8] The graphical outputs illustrate the effects of interactions in the human sectors as portrayed by mathematical equations. These models cannot be manipulated without a sophisticated knowledge of mathematics and computer technology; in their graphical diagrammatic form they lend little to the intuitive understanding of the reality they portray.

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[5]Forrester, Jay, Urban Dynamics, Cambridge, Mass.: MIT Press, 1969.

[6]Forrester, Jay, World Dynamics, Cambridge, Mass.: Wright-Allen Press, Inc., 1973

[7]Meadows, Dennis et al, Limits to Growth, New York: Signet Books, 1972.

[8]Mesarovic, Mihajlo, and Pestel, Eduard, Mankind at the Turning Point, New York: E. P. Dutton & Co., Inc., 1974.

B. NATURAL SYSTEM INTERACTIONS

Interactions with the total natural system can be shown by several methods of graphic display. The most holistic system of graphical diagramming is presented within the context of energetics, developed primarily by Howard T. Odum.[9] Energetics follows the laws and constraints of physical science and insists that all flows of energy be accounted for. Every piece of material, information or money interacting in the real world has an energy aspect and the movement of these substances requires further expenditures of energy.

Originating in the "hard" sciences related to the holistic field of systems ecology, energetics is continually developing explanations of cultural events that include "soft" sciences like economics and planning.

Utilizing a set of simple symbols for stages of energy flow and storage, complex systems can be graphically depicted as the following diagram illustrates:

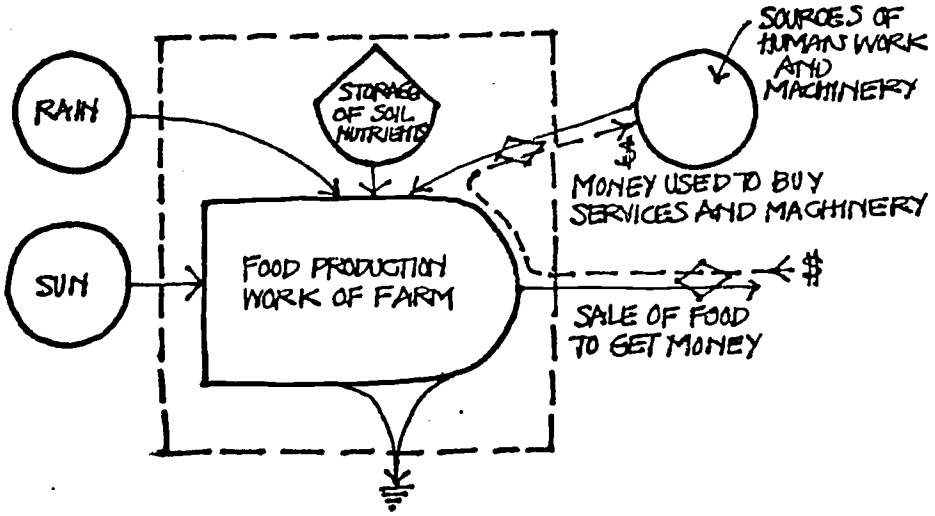


Fig. 2. A Farm System

[9]Odum, Howard T., Environmental Power and Society, New York: Wiley Interscience, 1968.

C. HUMAN AND NATURAL SYSTEM INTERACTIONS

Interactions between the total systems of humans and nature are obviously very complex and unwieldy to imagine, let alone to attempt to portray. This task is the main thrust of developing environmental education models of instruction.

Two factual realities are present with respect to these systems:

- Man belongs to both the human system and the natural system.
- The human system is contained physically and temporarily within the natural system

This arrangement is an example of the concept of nested systems: one system (humanity) is contained within another system (nature). Until recently, these nested systems manifested no important conflicts or contradictions. Individual humans and the human system survived and developed, sustained by the natural system often referred to as the bio-life support system.

During the present century, however, the expansion of the human system in size, complexity, and especially in energy consumption has brought about impacts on the natural system that have resulted in system dysfunctions in both the human and natural systems.

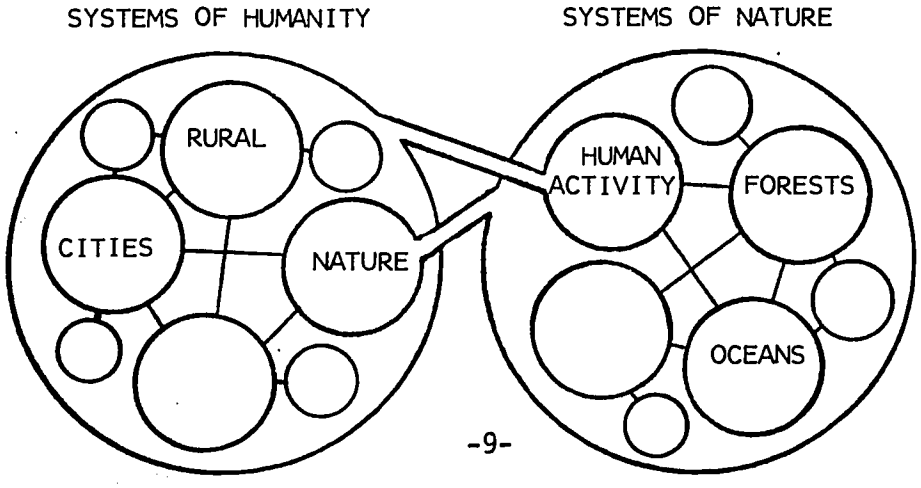
Almost ten years after the Earth Day activities of the late sixties, three "truths" have emerged after considerable cultural introspection by the most powerful and power-consuming nation on earth:

1. Humanity's physical health is dependent upon the health of the whole environment
2. Humanity is responsible for the condition of its environment
3. Humanity is polluting its environment

It has become apparent that behavior patterns such as unrestricted growth, failure to establish restorative cycles, mismatches of human and natural systems energy levels and rhythms--all of which have become standard operating procedure for survival and success in the human system--were damaging to the whole natural system of the biosphere. Apparently, the nested system of humanity is in conflict with its host system, the context of the natural system.

The systems approach of environmental education searches for the original cleavage in a "core belief" or in a set of primary value constructs that facilitates the cascading experiences of events that eventually generate conflicts in human/nature relationships. Understanding this set of values is essential for initiating a re-integration of the teacher/educator and his or her relationship to the holistic fabric of environmental education.

As previously mentioned, the language of model making must be of a higher hierarchical order than the reality being modeled. In this case, the model being developed represents the wedding of two holistic points of view. The perceptual field of interactions seen by both the total human system and the total natural system appear to each to be complete. Each "field" contains the other "field" as a component within its own jurisdiction. The following diagram illustrates this:



With the two systems joined in this manner, they form a synergistic suprasystem from the point of view of holistic environmental education. Rather than seek a solution to an apparent paradoxical confrontation between mutually co-defined bodies of thought, environmental education occupies a third mediating position with this suprasystem. This strategy will develop a position of balance and literally enable environmental education to mediate or facilitate a mutually agreeable re-solution by defining the apparent paradox within a holistic, transdisciplinary body of thought. The language and theory of general systems can provide a basis for understanding these interactions between the systems of humans and nature.

A model of instruction for EE must also have an educational domain which presents the requirement for a systems education point of view to be contained within the mediative EE "field." Such a model currently exists in a well-developed form and is readily adaptable to the additional requirements of environmental education.[10] The field of systems education has been consistently developed for several years utilizing a systems approach. It draws heavily from concepts in the traditional "hard" sciences like cybernetics as well as the "soft" sciences of psycho-sociology and organizational development.

Clearly, two holistic comprehensive channels of thought are joined in the development of a "model of instruction" for environmental education: a channel devoted to the substance or content of EE, and

[10] Banathy, Bela, Developing A Systems View of Education: The Systems-Model Approach, Belmont, California: Fearon Publishers, 1973.

a channel devoted to the instruction/learning methodology of EE. These two channels of thought are analogous--like in form or pattern--and homologous--like in origin.

Designing an Environmental Education Teacher Training Model (EETTM) based on our understanding of the principles on which human and natural systems operate and interact dictactes that the model be open-ended and readily revisable, since our understanding is incomplete and always changing. It must be an adaptive model, building in a corrective way on the experiences accrued in its application.

Further, because of the comprehensive and holistic nature of the subject matter, it is not readily subsumed into any one specialized discipline, and therefore, the EE model must be integrative--a useful framework for showing the environmental relationships disciplines have with one another.

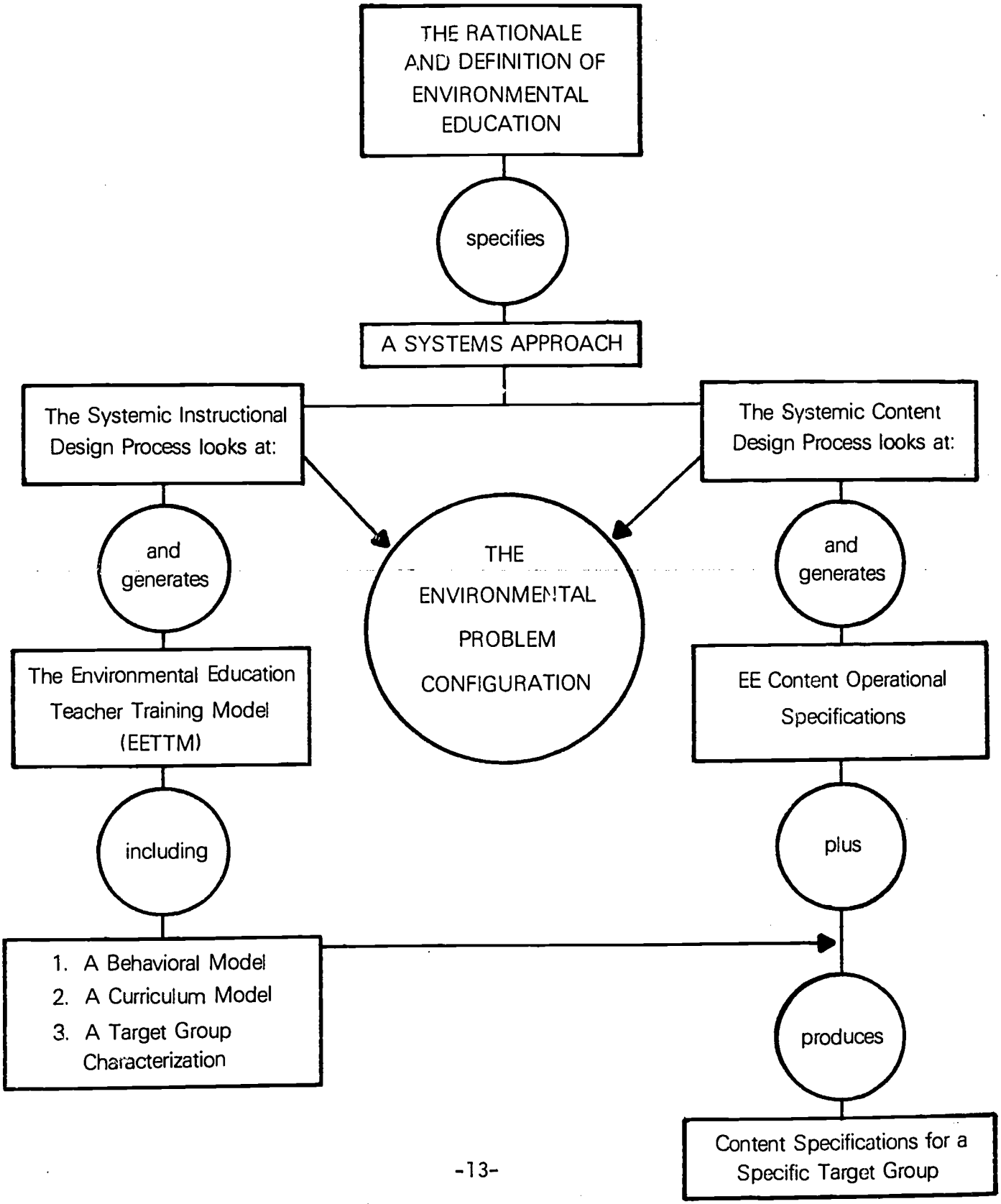
The model must also allow for informing worldview and attitudinal differences by displaying the entire spectrum of environmental values and revealing their implications, consequences and impacts in various environmental contexts. This is the affective aspect of the model.

Also, as an instructional/learning tool, the model must be designed to convey the integrated knowledge and skill components of environmental education which constitute the definition of and guide the development of an environmentally aware person. These components portray the cognitive aspects of the model.

Two processes for use in EE teacher training will be introduced next: the Systemic Instructional Design process which generates the instructional/learning arrangements and the Systemic Content Design

process which generates the Content Specifications. Both processes are originated by interpreting the educational requirements of the environmental problem configuration and by analyzing the systemic nature of the problem from their respective points of view. The following diagram illustrates this point.

Figure 3. AN IMAGE OF A SYSTEMS APPROACH TO ENVIRONMENTAL EDUCATION



PART TWO
SYSTEMIC INSTRUCTIONAL DESIGN

The field of educational development is a goal-directed disciplined inquiry concerned with "...creating new alternatives that contribute to the improvement of educational practice."[1] There are several approaches to this form of disciplined activity.[2] The most recent and comprehensive approach is that of systems development which includes the following activities:[3]

- Analysis and specification of requirements
- Design of alternative solutions and selection of design to be developed
- Development, testing and revision
- Production of the validated form
- Implementation/monitoring and evaluation

From this general development schema, a systemic approach to instructional design has emerged. This approach provides a procedural framework for developing the Environmental Education Teacher Training Model (EETTM). The following sections will: (1) briefly characterize

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[1] John K. Hemphill, et al., Educational Development, A New Discipline for Self-Renewal, Eugene, Oregon: University of Oregon Printing Department, 1972.

[2] Hemphill has identified and described two of these approaches: (1) the product development approach which seeks to bring about improvement in educational practice by creating products designed to yield specified outcomes, and (2) the change support approach which attempts to change directly behaviors of those involved in education.

[3] Bela H. Banathy, "On the Contribution of Systems Science to Educational Development," paper presented at American Association for the Advancement of Science, 1976.

this systemic approach, (2) define the conceptual and philosophical principles which guided this endeavor, and (3) describe the manner in which the components which comprise the EETTM were developed.

A. GUIDING PRINCIPLES

A systemic approach to designing the Environmental Education Teacher Training Model enables one to comprehensively address the instructional design challenge represented by the environmental problem configuration addressed by the model.[4] Such an approach, which conceptualizes education as a system, provides a procedural framework for analyzing and synthesizing effective educational research and design strategies into a comprehensive method of planning and development.[5] Within this procedural framework, the purpose and goals of holistic environmental education as defined in the EE Act and portrayed in the environmental configurations are transformed at the model level into components which represent the elements and functions needed to achieve those goals.[6]

Before describing the components which comprise the EETTM and the manner in which they were developed, it is important to identify four major premises or principles related to teacher/learner functions and curriculum design which guided this instructional design endeavor. These principles are:

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[4]See Part Four, Systemic Content Design, for definition of the environmental problem configuration.

[5]Bela H. Banathy, Instructional Systems, Fearon Publishers, Belmont, CA, 1968. Banathy also points to a decision-making structure offered by a systems approach and the manner in which such an approach provides the basis for planned change. For a further discussion of a systems-model approach see Bela H. Banathy, Developing a Systems View of Education, the Systems Model Approach, Fearon Publishers, Belmont, CA, 1973.

[6]EE Act (P. L. 91-516), October 30, 1970.

- teaching as a decision-making process
- learner is the key entity
- integrate rather than re-educate
- curriculum is anticipatory

The first principle is the formulation of teaching as a decision-making process which assigns the selection of instructional/learning arrangements as the significant function of teaching.[7] Within this process, the teacher considers and evaluates the outcomes of alternative instructional/learning arrangements and selects those most likely to accomplish specific learning objectives. Based on an assessment of student needs and interests, the teacher, therefore, is actively involved in making decisions throughout an instructional management sequence of purposing, planning, implementing and evaluating.

This principle of teaching as a decision-making process:

- is based on an analysis and definition of the knowledge, skills and attitudes required by the literate, competent, and aware energy/environmental education teacher
- considers initial trainee competence and previous teaching experience
- develops competences that will enable a teacher to purpose, plan and implement alternative instructional/learning arrangements and to predict and assess relevant learner outcomes
- provides application experiences in which a teacher can plan, design, implement, and see the effects of selected instructional/learning arrangements
- provides for the assessment of instructional/learning outcomes and adjustments in performance based on the assessment

[7] Berliner, David, To Develop an In-Service/Pre-Service Teacher Training Program Demonstrating the Adaptation of Research to Teaching, San Francisco: Far West Laboratory for Educational Research and Development, 1975.

The second principle, highly complementary to the first, is that the learner is the key entity of his/her own instructional/learning system. In the EETTM, the learner is the teacher and instructional/learning arrangements are designed around and in response to his/her assessed needs in order to facilitate mastery of identified tasks. Designing such instructional/learning arrangements involves:

- selection and organization of content and resources which best represent the learning task
- selection and organization of instructional/learning experiences
- assessment of progress
- selection of program formatting elements

The third guiding principle addresses the function of the curriculum specified in the EETTM which seeks to integrate rather than re-educate the teacher. The design is such that teachers can use what they already know to achieve a more holistic understanding and awareness of environmental education. The goal is not to discard previous conceptions and resources but to reorient and reorganize them in a more systemic manner.

Related to and supportive of this integration principle is the fourth principle which specifies the importance of a curriculum which is anticipatory. Such a curriculum displays three characteristics:

- Instructional/learning arrangements are designed to teach organization of information fields, not just to teach information
- Instructional/learning arrangements are experience oriented, not syllabus dominated
- Instructional/learning resources are designed to facilitate the internalization of the development of higher levels of awareness

All of these interrelated principles have contributed to the conceptual design and philosophical orientation of the Environmental Education Teacher Training Model.

The procedural framework for the development of the actual model has been guided by the following broad set of questions which have been identified from a practitioner's (teacher's) point of view:

1. What do I need to know in order to develop a holistic understanding of "man's relationship with his natural and manmade surroundings?"

2. What learning materials and resources do I need to have in order to acquire this understanding?

3. What instructional/learning arrangements need to be made to transmit this understanding to (my) students?

4. What physical and logistical arrangements need to be made for me to master (1) and (3) above?

5. What general guidelines can I use to assess my progress in mastering (1) and (3) above?

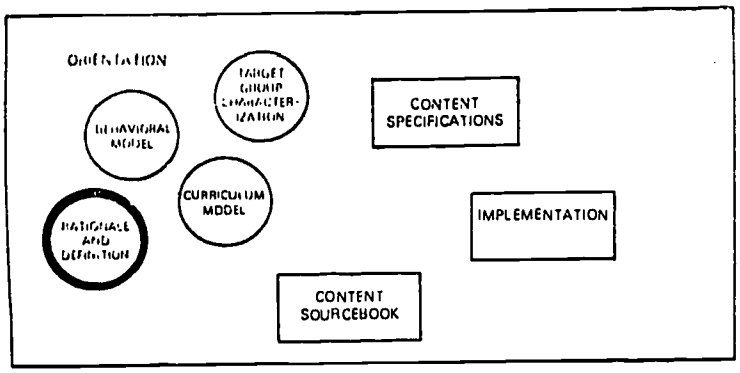
B. THE COMPONENTS OF THE COMMUNITY LEADERSHIP TRAINING MODEL

The components of the Community Leadership Training Model are designed to address the practitioner questions listed previously, thereby assuring the comprehensiveness of the model. The model component which specifically addresses each of the questions is listed below.

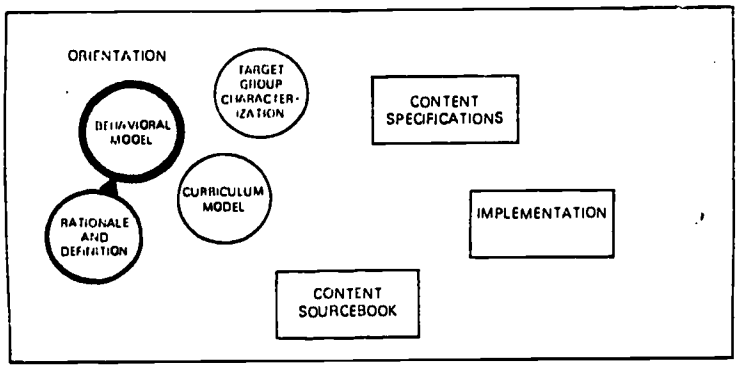
Practitioner Questions	Relevant Model Components
• What do I need to know?	CONTENT SPECIFICATIONS
• What materials/resources do I need?	CONTENT SOURCEBOOK
• What physical and logistical arrangements are needed?	IMPLEMENTATION
• What general guidelines can I use?	BEHAVIORAL AND CURRICULUM MODELS

The procedural framework for developing each of these components is described below, together with brief descriptions of the components.

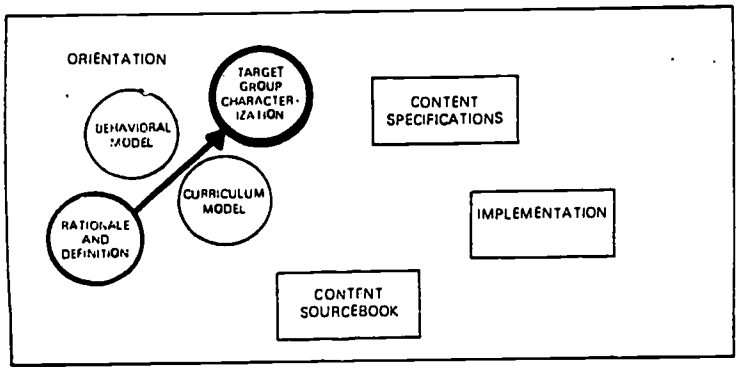
COMMUNITY LEADERSHIP
ENERGY/ENVIRONMENTAL EDUCATION MODEL



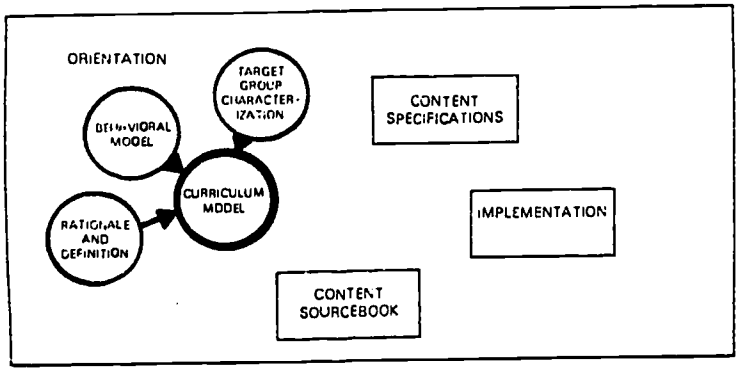
1. The Rationale for and Definition of Environmental Education presents an exposition of the Environmental Education Act as well as a definition of environmental education.



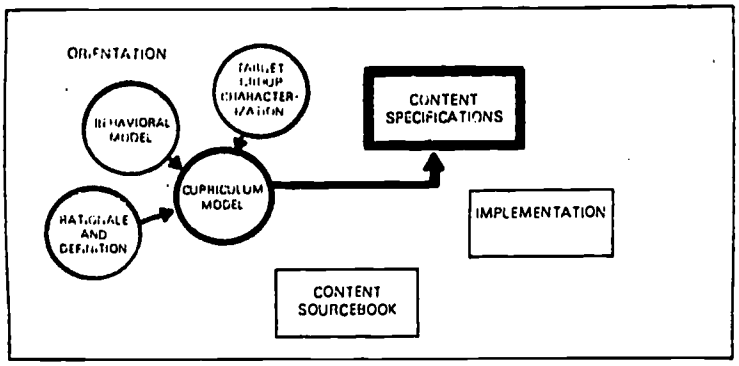
2. The Behavioral Model characterizes the general knowledge, skill and attitude requirements which define the literate, competent, and aware community educator. It is derived from the Rationale.



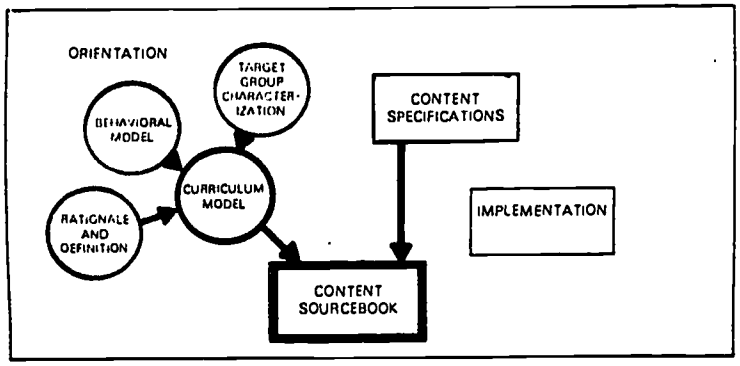
3. The Target Group Characterization defines three potential target groups for community EE and characterizes one: community organizations already taking a leadership role in EE.



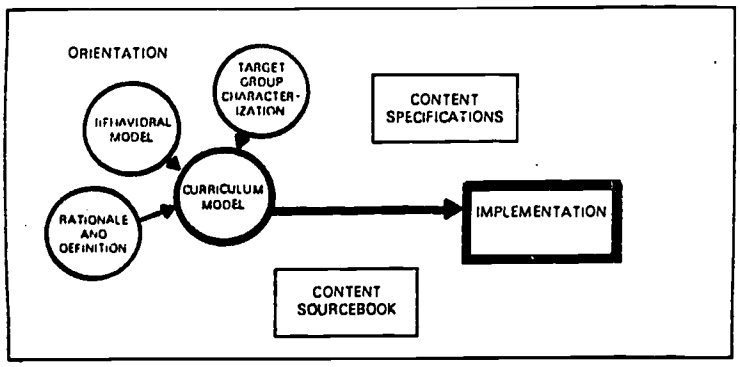
4. The Curriculum Model provides an organized description of the various content domains within which potential community educators need to attain competence. It is consistent with the Rationale and represents an elaboration of the Behavioral Model and the Target Group Characterization.



5. The Content Specifications present the knowledge components for energy/environmental education and a description of their instructional foci and purposes. These specifications were designed to satisfy the requirements of the knowledge component of the Curriculum Model.



6. The Content Sourcebook presents an elaborated discussion of the knowledge components of the content model, a subject matter/cultural process matrix, an annotated resource bibliography and glossary. The requirements for the Sourcebook are defined by the Curriculum Model and the Content Specifications.



7. The Implementation component describes an implementation design for three adult community target populations and provides a model for making instructional/learning arrangements for these populations. The design of this component was guided by the Curriculum Model.

PART THREE
SYSTEMIC CONTENT DESIGN

Systemic Content Design is a holistic approach to perceiving the environmental problem configuration[1] as the interactions between the total systems of humanity and nature. Since the Environmental Education Act was developed as a response to public opinion toward the undesirable effects of some of these interactions, the primary orientation of content design is toward a problem-solving approach. This approach is viewed, in turn, within the overall context of complex decision-making ranging in scale from individual decision-making to multi-national corporate and international governmental decision-making.

Systemic Content Design utilizes an anticipatory planning/design process and develops a content specification to be used within each Environmental Education Teacher Training Model. The anticipatory planning/design process is a synergetic procedure of including contingencies and alternatives in the feedforward mode, as opposed to reflecting on error signals as feedback, and making corrections. Neither mode by itself is ideal. Actually, an interaction between feedforward and feedback is the most desirable mode, as it stimulates evolution and the capability to switch between states of dynamic

[1]The "environmental problem configuration" is defined as the interactions of systems of humanity and nature in a values laden context.

equilibrium.[2] Personal experience with this anticipatory process develops the individual's intuitive awareness of the holistic "systemness" of human-environment interactions. This "systemness" of human-environment interactions will never be entirely concrete or completely understood. To have this as a goal is to misunderstand the utility of systems thinking.[3] An understanding of the systemic qualities of human-environment interactions is necessary so that their "signals" of dysfunction can be recognized in an anticipatory mode rather than in a reflective mode which is after the fact.

Most people view themselves as separate from the system they are interacting with. To be comprehensive and holistic, therefore, one must include him/hersefl as part of the "whole system" which is being manipulated or interacted with. To be anticipatory, one must take into account contingencies surrounding the "whole system" for their potentially useful or harmful effects.

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[2]Jantsch, Erich, Evolution and Consciousness, Reading, Mass.: Addison-Wesley Publ. Co., 1976.

[3]Gall, John, Systemantics, New York: Quadrangle/New York Times Book Co., Inc., 1977.

A. ORGANIZING INFORMATION FIELDS

The content specifications interpreted from the EE Act and the definition of EE are very complex and all encompassing. The whole range of humanity and natural system interactions includes every aspect of American culture and society. The task of organizing all the facts and data concerning every aspect of American culture and society according to EE is not a realistic one. As certain data are arranged into meaningful information to illuminate one domain of EE, another domain is surely diminished by this arrangement. To counteract this, data must not be regarded as "belonging" to any one field or discipline. In integrative, transdisciplinary EE, data must be flexible, and be arranged for specific purposes that are known or anticipated in advance of the arranging process.

The organizing element of the method of arranging data is a protocol or form of conduct which, as a process, has its own integrity. In organizing data into meaningful information for the specific purposes of EE, one of the main criteria for maintaining the integrity of this process is a comprehensive systems approach which functions as a guiding protocol for all EE activity.

This integral, comprehensive systems approach to EE content regards data as fields of information loosely connected in an elastic network of associations. The intrinsic qualities of these richly interconnected associations are illuminated or heightened by the specifications of the particular arrangements desired--the goal and

the purposive focus for organizing the information.[4] Content entities are manipulated as an elastic figure-ground network, where an entity can be featured (figure) in one particular arrangement and supporting (ground) in another. To further complicate the picture, a content entity can be regarded differently in several arrangements simultaneously.

Without a formal set of hierarchical classifications, a systemic approach to EE content must first generate its protocol or rules for making meaningful information arrangements. These arrangements must organize fields of information that illuminate specific EE problem configurations.

The following discussions of goal-oriented/process-oriented systems and integrative frameworks are oriented toward this task.

[4]For example, given a specific situation such as the fish are dying in San Francisco Bay, imagine the many ways the relevant facts and data could be organized to illustrate the many factors contributing to the situation. It could demonstrate the effects of landfilling, industrial waste outflow, urbanization, or the poor coordination of the various canal systems that feed the Bay. To compound the difficulty of the problem, the data organization can be designed to favor a certain point of view as representative of the "truth of the matter." In fact, every institution involved in the situation will design its own data organization that will reflect its own function--regulatory agencies, citizen's interest groups, or academic groups. Obviously, they all contribute to the "truth of the matter."

B. GOAL-ORIENTED AND PROCESS-ORIENTED SYSTEMS

Natural systems are process-oriented systems: an organism adapts its processes to achieve harmony with the processes of its environment. If its surrounding environment is complex and/or quickly changing, the organism must invest large quantities of time and energy in: (1) isolating itself from the changes in its environment by constructing buffers and accumulating storages, or in (2) developing structural mechanisms that can adapt and respond quickly to the new conditions. Either strategy is potentially "harmonious." Harmony, literally means "parts in syncopated rhythm." And survival in organism/environment relationships focuses more on coordinating the rate of changes than on a particular strategy. In natural systems, relationships are formed around mutually reinforcing processes.

The various components of the human system, on the other hand, are largely goal-oriented subsystems. Individuals, groups, and institutions of Western culture are all primarily goal-oriented. In the human system we rarely design processes except in terms of the product they are to produce or the goal they are to reach. The pre-eminence of rationality in Western thought has emphasized purpose, logical reasoning, and evaluation of the product generated, to the point where these steps in the process are specialized entities in themselves. All too frequently these steps compete with one another for overall controlling power of the process involved and thereby often jeopardize the holistic integrity of the entire process.

Attempts to generate an overall coordinating entity are met with resistance from threatened territorial domains, rather than embraced

as necessary overall navigational aids. The navigational aids, however, are not without their potential pitfalls. If the overall coordinating activity of navigation is perceived as just another specialized role, then the navigators are obliged to carefully plot the exact location as the ship sinks. To paraphrase Kenneth Watt in The Titanic Effect, we spend most of our time developing studies of how to arrange the deck chairs on the sinking Titanic.[5]

Although learning is a process very much akin to organic evolution, our educational systems are goal or product-oriented rather than process-oriented. Unfortunately, this focus upon goal accountability has shifted the emphasis from facilitating educational experiences to evaluating them, and in fact has curtailed the development of educational experiences that are difficult to evaluate. The EE effort emphasizes the necessary relationship between goal and process-oriented systems and cautions against emphasizing one over the other.

The acknowledgement of both the natural system, process-oriented, and the human system, goal-oriented, points to an important source of basic difference which contributes to the increasing adversary nature of the two systems. The "meshing" or successful coupling of the two systems depends on their being in the same temporal framework. This means literally being in time. Even the best conceptual strategy is useless if not operationalized in time and properly phased with the ongoing activity. When two systems are not tuned to the same temporal beat, there is interruption in the flows between the systems. In the

[5]Watt, Kenneth, The Titanic Effect, New York: E. P. Dutton & Co, Inc. 1974.

case of the natural and human systems, this interruption assumes the forms of resource shortages and/or excessive pollution.

An example of this kind of interruption is the well known practice of commercial agriculture in this country. Cash crops are planted year after year and eventually the yield diminishes due to depletion of soil nutrients. This prompts the application of commercial fertilizers which increases the yield and adds to the price. The continued addition of fertilizer year after year to maintain the higher yield eventually results in a loss of surrounding water quality as the runoff waters filter through the petro-chemical saturated soil. The long-term possibility of maintaining crop yield and soil health by other organic agricultural practices is sacrified by the short-term goal of ever-increasing crop yields.[6] The resulting unhealthy conditions are far more costly in energy and money to restore than to prevent. Proper agricultural practices that maintain long-term soil health have been known by many cultures for centuries. The basis for the present condition in America is lack of environmental awareness and a favoring of goal achievement rather than proper process practices.

[6]For a discussion of nurturing and exploiting the land, see Wendell Berry, The Unsettling of America, San Francisco: Sierra Club Books, 1977.

C. INTEGRATIVE FRAMEWORKS: STRUCTURE AND PROCESS

Both the Environmental Education Act and the Arizona Report stress the necessity for the construction of an integrative framework for the content of environmental education.[7,8] In the wording of the Arizona Report, the primary recommendation is "to develop core themes and a conceptual structure in environmental education that synthesizes and integrates pertinent subject matter across and between a variety of traditional disciplines."[9]

This report does not characterize an integrative framework, but it does identify the following certain key concepts or themes that are common to various disciplines and can serve as conceptual structures of integration:

- Environmental Unity
- General Systems Approach
- Energy Flow
- Economics
- Human Settlements or Ekistics

Synthesizing and integrating these structural themes and concepts in an application of the decision-making/problem-solving process requires process-oriented tools and strategies. Two such integrative techniques are:

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[7]EEA, P. L. 91-516, 1970.

[8]Arizona State University Center for Environmental Studies and Association of American Geographers, Environment-based Environmental Education: Inventory, Analysis, and Recommendations, June, 1975.

[9]Arizona Report, p. 1.6.

1. Information Organization Frameworks designed to collect, organize and store information.

2. Metalanguages which develop a language that can incorporate the elements of various disciplines

1. Information Organization Frameworks

Information organization frameworks may be considered as static or dynamic, outer or inner. Static integrative frameworks have the property that additional information inputs must be placed into the most suitable 'boxes' which exist for the incorporation of new material. Examples are libraries, expandable files and unifying schemata such as the periodic table of chemical elements.

Dynamic integrative frameworks, on the other hand, are anticipatory with respect to new information and include in their structure a reorganizing process for restructuring the file so that it not only has 'boxes' for new material, but all these 'boxes' reflect the most logical organization of all the material. "Sleuthing" or investigating obscure information is an example of an anticipatory reorganizing process in that new "facts" can completely change the organization of the file. Only dynamic files are integrative in the full meaning of the term.

Outer or external integrative frameworks are those that organize information of a tangible and practical sort: facts, data, processes, plans and activities. These systems may be either static or dynamic as defined above.

Inner integrative frameworks organize and process information of a non-physical nature. Typical materials include beliefs, values, worldviews and personal psychological materials such as images,

fantasies, and dreams. Inner integrative systems are necessarily dynamic since the processing of this sort of information, whether cultural or personal, invariably restructures or alters the system.

The flexible nature of EE data indicates that dynamic files of both inner and outer types be included in the comprehensive approach to EE content.

2. Metalanguages

The types of information to be processed in environmental education come in many separate "languages": economics, biology, ecology, chemistry, law, etc. In order to organize the vast and varied fields of information, a "metalanguage" is needed. Such a language would reflect the transdisciplinary nature of environmental education. This metalanguage would be capable of both organizing information and incorporating new information in an organized manner. Using a metalanguage, statements can be made of sufficient generality to unify and coordinate the propositions already validated within the original disciplinary domains.

Mathematics is a kind of metalanguage that is based on abstraction according to quantity. It is an attractive metalanguage because of the inferential and predictive capabilities of its numbers, measurements, and statistics.

There is also a metalanguage of systems which is based on abstraction of certain processes. These processes such as feedback, hierarchy, energy flow, are common to a large class of systems. The focus of this abstraction is to reveal deeper and more subtle essences

of a system's structure or process without losing the ability to make precise statements at every level.

Both mathematics and systems are abstract metalanguages that focus on micro-patterns common to all domains. A second type of metalanguages searches for macro-patterns in the universal domain. It is a more holistic language in that it is applicable to larger domains. But as the field of view is increased, the ability to see fine detail is reduced.

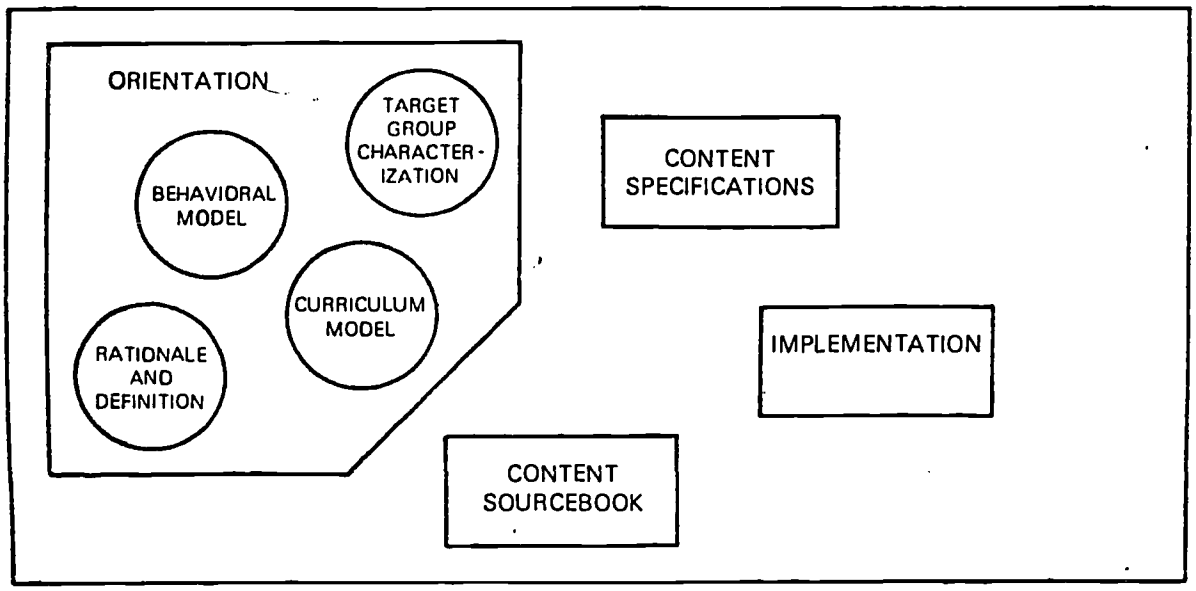
What will emerge however, as the result of viewing a larger field, are new patterns previously imperceptible either because the field was too small or there were too many details to see the overall pattern.

The oldest metalanguage of this type consists of the themes of folklore which are general statements through which many specifics are mapped onto a single expression or symbol: a line of verse or an archetypal folktale. Folklore, mythology and poetry are all metaphorical languages that communicate by analogies and indirect references. They are holistic in that they are de-focused from exact descriptions, but rather are applicable to larger domains.

These two kinds of metalanguages, the abstract and the metaphoric allow us to unify and integrate our descriptions of the world. This, in turn, makes it possible to transfer this knowledge from one situation to another. In environmental education both kinds of metalanguages are used.

PART FOUR
A DESCRIPTION OF COMMUNITY LEADERSHIP TRAINING DOCUMENTS AND INTENDED USERS

The components of the instructional design process displayed below have been translated into the documents comprising the community leadership energy/environmental education model



COMMUNITY LEADERSHIP
ENERGY/ENVIRONMENTAL EDUCATION MODEL

Each document addresses a particular component except for the one designated "Orientation."

A. DOCUMENTS

1. Orientation

In addition to introducing a systemic approach to the instructional and content domains of holistic, energy/environmental education, this guide contains:

- Rationale and General Definition of Environmental Education
- Behavioral Model
- Target Group Characterization
- Curriculum Model

2. Content Specifications

The Content Specifications describe the components of the energy/environmental education content model. These components represent a conceptualization of the basic set of indicators and processes for gauging or explaining the changing integration of all EE entities over time within a given energy/environmental context. These components are as follows:

- Systems Approach
- Problem-solving and Decision-making
- Holistic Lifestyle Assessment
- Ideal Environmental Worldviews
- Net Energy
- Energy Quality
- Forecasting for Planning and Policy Formation
- Futures Thinking

These content components emphasize three major aspects of any energy/environmental context:

Complexity:	any context is a complex system with many parts and processes
Integration:	all parts within a context system are interrelated and each part affects and is affected by the other parts
Dynamic nature:	the integration (nature and degree of interrelationship, interaction) of the parts within a context system change over time

When linked appropriately to other components of the Energy/Environmental Education Teacher Training Model (Implementation, Content Sourcebook), these content components constitute the major element in designing and developing holistic, energy/environmental education curricula.

3. Content Sourcebook

The Content Sourcebook provides an extensive resource base for developing instructional/learning materials. The Sourcebook presents:

- an elaborated description of each of the components depicted in the Content Specifications together with an annotated bibliography and glossary
- instructional/learning resource materials organized according to the following classifications:
  (1) Issues of National Priority (e.g., long-term utilization and conservation of coal resources)
  (2) Key Environmental Entities (e.g., pollution, conservation, technology)
  (3) Settings of Environmental Interest

4. Implementation

The Implementation component provides specifications for the development of programs/materials for the following target populations:

- key decision-makers in business, professional and governmental organizations
- community organizations already taking a leadership role in environmental education
- service-oriented non-profit community organizations

It also provides a training systems model for guiding and systematizing the development of instructional learning arrangements for these target populations.

B. INTENDED USERS

The documents described in the previous section address the components of the Environmental Education Teacher Training Model. They may be used in a variety of ways, depending on the purposive focus and goal of the intended user. The relationships between intended users and these documents is presented in the following pages and summarized in Table One.

1. Educational Research and Development Organizations

   Example: Far West Laboratory for Education Research and Development, Educational Development Center, American Institutes for Research, SRI (Stanford Research Institute)

   Application: Use all documents to produce EE training products at the modular, component or program level

2. International EE Organizations

   Example: World Education, International Union for the Conservation of Nature and Natural Resources

   Application: Use all documents to assist in:

   - developing new training products
   - developing criteria for evaluating existing programs
   - developing guidelines for future funding efforts

3. Professional Education Associations

   Example: National Science Teachers Association, National Council for the Social Studies, Conservation Education Association

   Application: Use behavioral, curriculum and content models as basis for assessing teachers' current knowledge, skill and attitudinal competences and making recommendations for changes in teacher preparation programs

   Use all documents to develop criteria/guidelines for recommending future research and development efforts

   Use Content Specifications and Content Source-book to develop series of introductory articles in professional magazines as to "what constitutes holistic energy/environmental education," etc.

4. Energy/Environmentally Concerned Federal, State and Local Governmental Agencies

   Example: Energy Research and Development Administration, California Conservation Corps, Natural Resource Department

   Application: Use Content Specifications and Content Source-book to generate criteria and guidelines for policy/decision-making regarding program and personnel development

5. State Environmental Directors and Training Personnel

   Example: Department Public Instruction

   Application: Use all documents to develop criteria for assessing existing state plans and making recommendations for future changes

   Use Content Specifications and Content Source-book (descriptions and annotated bibliography) as basis for presentations, structuring conferences, and making recommendations to the legislature regarding curricula changes

6. Universities

   Example: Teacher Education Departments

   Application: Use behavioral and curriculum model to assess their array of competences

   Use all documents to develop course(s) to provide opportunity for secondary teachers to become proficient in planning, developing and implementing energy/environmental education courses

   Example: Environmental Studies Institutes

   Application: Use Content Specifications and Content Source-book to develop criteria and guidelines for assessing comprehensiveness of existing curricula or establishing an interdisciplinary energy/environmental program at the B.S. or M.S. level

7. Curriculum Specialists/Developers at School District Level

   Application: Use behavioral and curriculum model to assess teachers' current level of competence

Use Content Specifications, Content Sourcebook and Curriculum Management to develop criteria to assess current programs and make recommendations for future training

Use Implementation Model to develop effective implementation plan

8. State and Federal Legislative Staff and Committees Concerned with Energy, Energy/Environmental Education

   Application: Use Content Specifications and Content Sourcebook to develop criteria for reviewing legislation

9. Energy/Environmentally Concerned Youth Groups

   Example: Boy Scouts, Girl Scouts, 4-H

   Application: Use all documents to develop guidelines for assessing current energy/environmental education projects/programs and/or developing new ones

10. Publishing Firms

    Example: Harcourt Brace Jovanovich, MIT Press, Scott, Foresman and Co.

    Application: Use Content Specifications, Content Sourcebook, Curriculum Management to develop criteria and guidelines to assess materials submitted and to commission development of new interdisciplinary series

11. Educational Television

    Example: Instructional Television Divisions of PBS at national and local level

    Application: Use Content Specifications and Content Sourcebook to develop guidelines for program development

12. Energy/Environmentally Concerned Community Groups

    Example: Sierra Club, Farallones Institute, Friends of the Earth, League of Women Voters

    Application: Use all documents to develop guidelines for assessing current energy/environmental education projects/programs and/or developing new ones

TABLE ONE

POTENTIAL USERS AND APPLICATIONS FOR THE EETTM

INTENDED USERS AND APPLICATIONS	DOCUMENTS ASSESSING MODEL COMPONENTS								
	Content Sourcebook			Orientation			Content Specifications	Curriculum Management	Implementation
	Subject Matter/ Process Matrix	Content Descriptions	Annotated Bibliography	Rationale[1]	Behavior Model	Curriculum Model			
1. Educational Research and Development Organizations									
• Producing training products	*	*	*		*	*	*	*	*
2. International EE Organizations									
• Developing training products • Developing program evaluation criteria • Developing future funding guidelines	*	*	*		*	*	*	*	*
3. Professional Education Associations									
• Assessing teacher competence					*	*	*		
• Recommending future R&D	*	*	*		*	*	*	*	*
• Developing publications	*	*	*				*		
4. Energy/Environmentally concerned Federal, State and Local Governmental Agencies									
• Generating criteria and guidelines for policy and decision-making	*		*				*		
5. State Environmental Directors and Training Personnel									
• Assessing state plans	*	*	*		*	*	*	*	*
• Making legislative recommendations	*	*	*				*		
6. Universities									
• Assessing teacher competence					*	*			
• Developing teacher training programs	*	*	*		*	*	*	*	*
• Assessing existing curricula/programs	*	*	*				*		

[1] Rationale in the Orientation Manual is essential for all intended users to address because it orients the reader to the domains of holistic energy/environmental education.

TABLE ONE (Continued)
POTENTIAL USERS AND APPLICATIONS FOR THE EETTM

INTENDED USERS AND APPLICATIONS	DOCUMENTS ASSESSING MODEL COMPONENTS								
	Content Sourcebook			Orientation			Content Specifications	Curriculum Management	Implementation
	Subject Matter/ Process Matrix	Content Descriptions	Annotated Bibliography	Rationale[1]	Behavior Model	Curriculum Model			
7. Curriculum Specialists/Developers at School District Level									
• Assessing teacher competence					*	*			
• Developing program assessment criteria	*	*	*				*	*	
• Developing program implementation plans									*
8. State and Federal Legislative Staff and Committees									
• Developing legislative review criteria	*	*	*				*		
9. Energy/Environmentally concerned Youth Groups									
• Assessing projects/programs or developing new ones	*	*	*		*	*	*	*	*
10. Publishing Firms									
• Assessing or commissioning publications	*	*	*				*	*	
11. Educational Television									
• Developing guidelines for program development	*	*	*				*		
12. Energy/Environmentally concerned community groups									
• Assessing projects/programs or developing new ones	*	*	*		*	*	*	*	*

PART FIVE
BEHAVIORAL MODEL

The purpose of the Behavioral Model for community energy/environmental education is to characterize the general knowledge, skill, and attitude requirements which define the energy literate, competent, and aware community educator or leader, and which are consistent with the mission of the Office of Environmental Education as defined by the Environmental Education Act of 1970.

A. GENERAL KNOWLEDGE REQUIREMENTS

The general knowledge requirements of the Behavioral Model characterize the energy/environmentally literate community educator as one who understands the basic concepts and principles of energy, and the processes and factors to be utilized or considered for effective identification and evaluation of alternative solutions to energy/environmental problems.

These general requirements include an understanding of:

1. The energy significant relationships within and between environmental entities, phenomena, systems, and subsystems.

2. The systems structure, energy requirements (needs), and impacts (degree of need satisfaction, problems, conflicts) of these relationships.

3. The reciprocal effects of human activities and their implications for energy production and comsumption, and energy/environmental policies and decision-making.

4. The holistic contexts (natural and man-made) within which energy, energy problems, and alternative energy problem solutions must be viewed for comprehensive, responsible, and future-oriented decision-making.

5. Strategies of inquiry and decision-making appropriate to analyzing and evaluating energy issues or problems and energy problem solutions.

B. GENERAL SKILL REQUIREMENTS

The management requirements of the Behavioral Model characterize the energy/environmentally competent community educator as one who is able to plan, develop, and implement educational arrangements which transmit to others an understanding of the knowledge, concepts, and principles of energy, and which enhance their capability of comprehending energy/environmental problems and issues from a holistic, transdisciplinary, perspective.

These general skill requirements include the abilities to:

1. Plan energy/environmental awareness educational activities which are appropriate to the needs, interests, goals, and commitments of persons within targeted community groups or organizations.

2. Develop informational materials and/or instructional programs which transmit energy/environmental awareness to persons using educational channels which are already available to and being utilized by community groups and organizations.

3. Implement educational arrangements which convey the planned energy/environmental content to persons within or affected by targeted community groups and organizations.

C. GENERAL ATTITUDE REQUIREMENTS

The general practices or attitude requirements of the Behavioral Model characterize the energy/environmentally aware community educator as one who demonstrates through writings, speeches, and other activities: (1) an appreciation of the holistic, transdisciplinary nature of energy, energy systems, and energy problems which are produced by and which affect the humanity-environment relationship, and (2) a willingness to develop the same appreciation in others by encouraging active interest and participation in energy relevant decision-making at both the individual and societal levels.

These general requirements include demonstrating:

1. A tendency to use both cognitive (analysis/synthesis/evaluation) and affective (valuing) processes or tools coupled with the knowledge bases of various disciplines in a highly integrative manner when studying, discussing, or presenting energy problems and issues.

2. A tendency to seek out and emphasize humanity-environment interrelationships which lead to "productive harmony" regarding energy production and use.

3. A tendency to search for and discuss energy policies which reflect long-range, as well as short-range, concern for the impact of energy programs and activities on environmental quality.

4. A willingness to consider physical, psycho-social, economic, cultural and other factors in addressing energy problems.

5. A tendency to encourage individual responsibility in making lifestyle decisions that are consistent with holistic, long-range strategies for energy production and consumption.

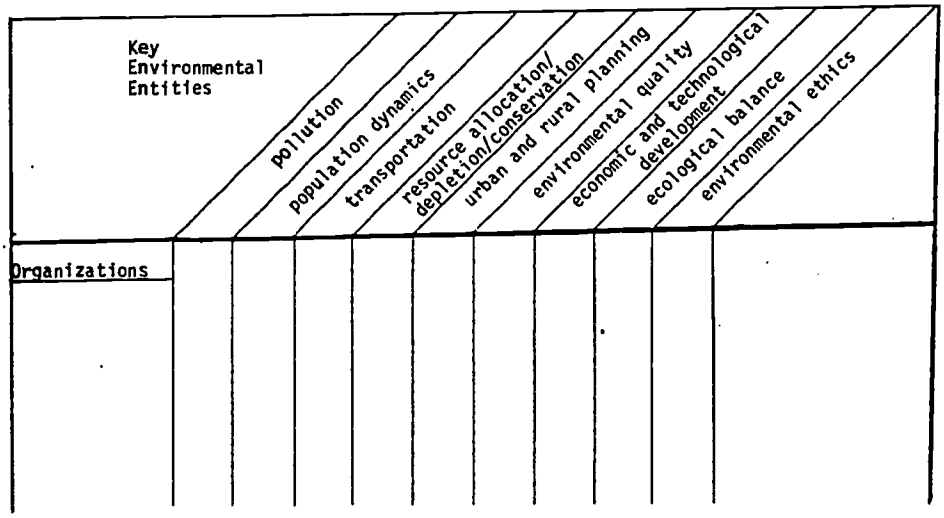
6. A tendency to encourage others to commit themselves to coping holistically, systemically, and scientifically with energy questions and issues.

PART SIX

TARGET GROUP CHARACTERIZATION

Designing, developing and implementing products to train community educators to provide instructional/learning opportunities for members of organizations to which they belong, presents several problems due to the vast number and types of adult community organizations which exist at the local, state, regional, national and international levels.

In order to characterize the vast number of adult community organizations that exist, a schema such as the one displayed below is helpful.



This schema correlates adult community organizations with the key environmental education entities to indicate their areas of interest and activity.* This schema can also be used to describe the manner

*Since the key environmental entities, as defined in the Environmental Education Act, establish the boundaries and topics of concern of environmental education, we are assured maximum coverage and consideration in the array displayed above.

in which their interests, activities and decisions affect these key EE entities, for example, whether it is direct or indirect.

This relationship provides the greatest potential for identifying relevant data describing how different types of organizations affect which entities and in what manner.

The following types of questions were helpful in compiling this relevant data:

- What governmental agencies at the local, state, regional and national level have direct jurisdiction over areas implicated in the entities?
- What business and labor organizations are involved in activities which affect elements of the entities?
- What non-profit, service-oriented community organizations have a potential for involvement in activities that influence these entities?
- What community organizations have already established a well-defined interest in relating to one or more of these environmental entities?

Compiling data in this manner has resulted in the identification of the following target groups as having high potential for community EE:

1. Decision makers in organizations whose activities and interests directly affect aspects of the key EE entities (e.g., legislators, businessmen)
2. Service-oriented, non-profit community organizations (e.g., Lion's Club, Chamber of Commerce)
3. Community organizations already taking a leadership role in energy/environmental education (e.g., Sierra Club, Audubon Society)

These three types of target populations represent a wide spectrum of community influence over the key EE entities. It is possible, and even probable that individuals could belong to all three types, e.g., a businessman who is a member of a church organization and on the Board of Directors of the local Audubon Society. The differing purposes and/or functions of the organizations dictate the necessity, however, of different programs and approaches. The section which follows provides a characterization of one of the three types of target populations: community organizations already taking a leadership role in energy/environmental education.

The characterization of this target group will offer.

- Four Selection Criteria which specify the desired characteristics of the target group organization and of the individuals within the organization
- The general and specific characteristics of this target group with respect to the four selection criteria

A. CRITERIA FOR SELECTING COMMUNITY ORGANIZATIONS

A set of criteria was developed in order to select from among the adult community organizations which appeared to be already involved with or interested in energy/environmental issues those groups which would be likely to benefit the most from the energy/environmental education training model.

In devising these criteria, our attention was constantly shifted between specifying the desired characteristics of existing organizations to specifying the desired characteristics of individuals within these organizations. The four criteria which evolved are those that were deemed most relevant and practical for selecting both organizations and individuals within these organizations as an initial target population for the energy/environmental education community leadership model.

These four criteria are as follows:

1.	COMMITTED INTEREST	The target population should have an interest in energy/environmental education as evidenced by completed, on-going, or planned organization activities, publications, etc. The objective of the adult training activities will not be to convince organizations or individuals within those organizations that the environment or energy is important, but to assist them in developing or enhancing their awareness of the holistic, systemic nature of energy/environmental processes.
2.	ALREADY ACTIVE	The target population should already be assuming (or planning to assume) an active, leadership role in acquiring and analyzing information relevant to energy/environmental problems and issues affecting the general public welfare and be using this information to raise the level of awareness and understanding of their employees, constituents, or the general public regarding such problems and issues. Focusing on community organizations already engaged (or planning to engage) in information dissemination/education activities should help to increase the potential impact of a community energy/environmental education training program.
3.	EXISTING COMMUNICATION POTENTIAL	The target population should possess or have access to an information transmission system which: (a) disseminates information through printed materials, T.V., radio, and/or (b) conducts formal training via workshops, seminars, lectures, etc. A training program based on the community leadership model would not be designed to create such educative channels, but to utilize already existing channels for the purpose of increasing the community's energy/ environmental awareness and understanding.
4.	MULTIPLIER POTENTIAL	The target population should embody a sphere of influence or contact which ranges from the membership or constituency of their own organizations at local, state, or national levels to other individuals, groups, and organizations in the community at large. This should help to ensure a relatively high multiplier potential for transmitting energy/environmental awareness to various segments of the adult community.

B. CHARACTERISTICS OF COMMUNITY ORGANIZATIONS WHICH SATISFY THE SELECTION CRITERIA

The community environmental/energy education target group selection criteria described above were applied in screening a large number of community organizations throughout the United States.[1] From this initial screening, a smaller number of community organizations were identified which satisfied the four selection criteria for inclusion in the target group characterization. In general, these organizations/groups have the following characteristics in common:

1. Except for a small number of paid staff, their membership tends to be exclusively voluntary. Hence, it is difficult to identify any specific set of membership characteristics other than that they represent a wide range of technical and vocational professions, formal education, income levels, and lifestyles. The one unifying characteristic of the membership, however, seems to be their shared interests in and compatibility with the general purposes and objectives of the organization and/or the specific activities in which the organization is engaged.

2. They range in size from "local-only" groups to groups with statewide, national, and international chapters. Although the specific focus of their interest tends to differ, they all share an active concern and interest in the environment and in maintaining or improving environmental quality. Their activities in energy and energy education tend to be either direct (committees or sub-committees devoted to energy studies, developing special energy reports, newsletters, and other publications, etc.) or indirect (committees devoted largely to studying and providing information on broad environmental issues related to but not specifically focused on energy).

[1] Local, state, and national community organizations which satisfy the target group selection criteria used for this characterization were located through the help of publications (such as Energy. Who's Doing What, National Recreation and Park Association, Arlington, VA, 1977; Encyclopedia of Associations, National Organizations of the United States, Vol. 1, Gale Research Co., Detroit, Mich., 1976, and local directories. Also making contact with a specific organization identified through the above resources usually elicited the names of two or three other organizations.

3. They tend to be provincial or territorial with regard to their special areas of knowledge, expertise, and interests; they tend to specialize in a few specific knowledge or problem areas, e.g., nuclear energy, wildlife protection, marine ecology, urban/environmental planning, etc. They will refer any inquiries regarding "non-specialty" interests to other organizations with more "expertise." This referral systems, though informal, seems to be particularly well developed--each community organization or group being more or less aware of other community organizations with similar or related goals, interests, and activities. The development of this referral system has probably been reinforced as a result of the many alliances and coalitions community groups tend to form with one another for the purposes of political lobbying at local, state, and national levels.

4. Most of them maintain a low management overhead, employing few full-time personnel, and depending mostly on membership fees, publication sales, and volunteers to finance and carry out their activities.

5. Their educative functions overwhelmingly emphasize information transmission via one or several of the following channels: regular publications (newsletters, bulletins, reports, magazines) available to their membership; special publications (magazines, books, reports) available to the general public for purchase; articles, reports or position papers sent to various requesting business, labor, civic, church groups, etc. concerned with environmental/energy problems and issues; and lobbying at local, state, or national levels. A considerably smaller number of these organizations carry out more formalized public education via workshops, lectures, seminars, demonstrations, tours, etc.

6. Their reputations for past and present activities has firmly established their credentials as energy/environmental experts in the minds of other community organizations and groups (volunteer, business, labor). As a result, the community organizations surveyed reported being continually bombarded with requests for information and guidance from "non-expert" community organizations and groups, particularly when the public's need to know is most critical (e.g., during regular or special elections over state, county, or city propositions related to energy or environmental matters).

Table One provides more detailed descriptions of six example community organizations located in the San Francisco Bay Area which satisfy the four selection criteria and which are considered typical of the variety of community groups located in the United States to which the model for adult community leadership in environmental/energy education can be initially targeted. As exemplified in the table, these groups represent different levels of organization, ranges of interests, types of education (information transmission) channels utilized, and multiplier potential for having an impact on the public awareness.

TABLE ONE

Example Community Organizations (San Francisco Bay Area) Which Satisfy the Four Selection Criteria

COMMUNITY ORGANIZATIONS	AFFILIATION LEVEL	PURPOSE/GOALS/CREDO	INTEREST IN ENERGY EDUCATION	RANGE OF INTERESTS	EDUCATIONAL CHANNELS UTILIZED	MULTIPLIER POTENTIAL
Farallones Institute	Local	To carry out research and education programs which demonstrate the possibilities for integrated living systems which utilize appropriate (energy efficient, non-waste) technology	Direct	Energy conservation; appropriate technology experimentation	Media: brochures, newsletters, annual and quarterly reports, other (free) publications Formal training: workshops, classes, seminars, lectures, demonstration house tours	Members; subscribers to publications; teachers and students who participate in formal training channels; general public and other community organizations which ask for information
Friends of the Earth	International	To generate among people an awareness of and responsibility toward the environment (in which we live); to create a public forum for various environmental issues that would normally receive scant attention; to attack specific projects which offend the environment with every legal means possible	Direct	Variety of national, state, and local environmental issues	Media: bi-weekly, monthly news magazine; books, articles, pamphlets Other: state and national government lobbying	Members; subscribers/ purchasers of publications; general public who ask for information
Institute for Local Self-Government	Local	To conduct and publish research on issues and problems of common concern to (Bay Area) city and county governments	Indirect	Variety of local, state, and national issues which affect local governments, e.g., sanitation, housing, urban development, water and resource conservation, affirmative action, etc.	Media: reports distributed to constituents, trade journals, newspapers Formal training: seminars, workshops, lectures	Bay Area city and county governments, including councilmen, supervisors, mayors, and other public officials
League of Women Voters	National	To promote political responsibility through informed and active participation of citizens in government (by distributing information on candidates and issues, conducting campaigns to encourage registration and voting, and offering courses in practical politics)	Direct	Wide variety of national, state, and local issues from energy, environmental quality, to land use, international relations, legislative action	Media: monthly and quarterly newsletters, magazines, books, pamphlets, reports, studies Other: public forums (if topic warrants it), state and national government lobbying	Members; general public who ask for information or purchase publications Members: 145,000 Regional Groups: 33 State Groups: 50 Local Groups: 1,300
National Audubon Society (Richardson Bay Wildlife Sanctuary)	National	To promote and develop conservation and restoration of natural resources, with emphasis on wildlife, wildlife habitats, soil, water, and forests	Indirect	Natural resources; wildlife conservation	Media: semi- and bi-monthly magazines, newsletters, irregular bulletins, mail-order publications to general public; films; posters Formal training: workshops (mostly summer), teaching materials for schools; tours Other: state and national government lobbying	Members; teachers; youth and community groups; technical people; general public who ask for information, purchase publications, attend workshops Members: 275,000 Local Groups: 300 Affiliated Groups: 275
Sierra Club	National	To protect and conserve the natural resources of the Sierra Nevada, the United States, and the World; to undertake and publish scientific and educational studies concerning all aspects of man's environment and the natural ecosystems of the world; and to educate the people of the United States and the world to the need to preserve and restore the quality of that environment and the integrity of those ecosystems	Direct	Variety of national, state, and local environmental, economic, energy, wildlife and resource conservation, land use, and population issues	Media: weekly, monthly, annual bulletins, reports, newsletters, books, films, posters, pamphlets, exhibits Other: state and national government lobbying	Members; general public and community organizations/ groups who ask for information, purchase publications, attend exhibits Members: 140,000 Regional Groups: 48

PART SEVEN

CURRICULUM MODEL

The purpose of the Curriculum Model is to describe the various curriculum content domains, consistent with the Behavioral Model, in which potential community energy/environmental educators need to attain competence. The concepts displayed in this model are those deemed necessary for community educators to:

- acquire a holistic, systemic awareness and understanding of energy
- utilize community organizations' existing educational channels to transmit this awareness and understanding to others

To accomplish these ends, three community education competence domains have been identified which are as follows:

- Mastery of holistic energy/environmental content
- Competence in utilizing available information transmission channels which communicate energy/environmental awareness to others
- Personal commitment to developing energy/environmental awareness in others

A. MASTERY OF HOLISTIC ENERGY/ENVIRONMENTAL CONTENT

This competence domain characterizes eight knowledge areas in which community educators need to acquire competence in order to develop a holistic understanding of energy/environmental problems. These knowledge areas, which emphasize individual and aggregate lifestyle assessment and decision-making related to energy production and use, problems, and issues, would, if sufficiently elaborated, provide a basis for community educators to select and develop information and materials which promote energy awareness and which are appropriate to specific groups and organizations in the community. The knowledge areas described here are presented in more detail in the Energy/Environmental Content Specifications. They include:

1. A systems approach for describing and understanding the components and interactions of complex man/energy/environment phenomena.

2. Problem-solving and decision-making processes which can be applied to energy/environmental problems or issues.

3. The process of holistic lifestyle assessment which describes the needs of the human system in real energy terms.

4. Ideal, environmental worldviews which are a holistic set of images integrating and characterizing people's core beliefs, attitudes, values, and behavior and which affect the nature of human/environmental interactions.

5. Net energy analysis which determines the amount of energy remaining for use after all the "costs" to make it available have been "paid" in energy equivalents. Net energy is a holistic accounting method related to the law of diminishing return.

6. The concept of energy quality which acts as a basis for the appropriate allocation and utilization (conservation) of energy resources.

7. Forecasting, planning and policy formation which describes the highest levels of aggregate planning levels (e.g., multi-national, corporate, government) and its influences on aggregate lifestyles and the environment.

8. Futures thinking which examines combinations of careers, lifestyles, energy production and consumption, and their implications for the future.

The degree of competence which a community educator eventually achieves within any given energy/environmental content component, however, will vary according to the person's:

- prior experience with energy/environmental topics
- preferences or interests
- the particular focus or point of view chosen for communicating the energy/environmental education curriculum to others
- the needs and interests of the community educator's constituents (organization members, general public, government officials, etc.)

B. COMPETENCE IN COMMUNICATING ENERGY/ENVIRONMENTAL AWARENESS TO OTHERS

This domain characterizes two skill areas in which community educators need to develop or exercise competence in order to communicate to their constituents energy/environmental awareness information which is compatible with the constituents' needs and interests. These skill areas are as follows:

1. Planning and developing energy awareness information.

    a. Assessing constituents' interests and needs relative to a holistic understanding of energy/environmental problems and issues.

    b. Selecting appropriate data and information which conveys a holistic, systemic understanding of energy/environmental problems and issues, and which facilitates an understanding of decision-making and problem-solving regarding such problems and issues.

    c. Organizing and preparing data and information for use in an available communication channel or medium.

2. Selecting and utilizing an available channel or channels of communication.

    a. Communicating energy/environmental awareness information via organization media (e.g., brochures; newsletters; bi-weekly, monthly, quarterly, or annual reports; magazines; articles; pamphlets; books; etc.).

    b. Communicating energy/environmental awareness information via formal training activities (e.g., workshops, classes, seminars, lectures, demonstrations, tours, etc.).

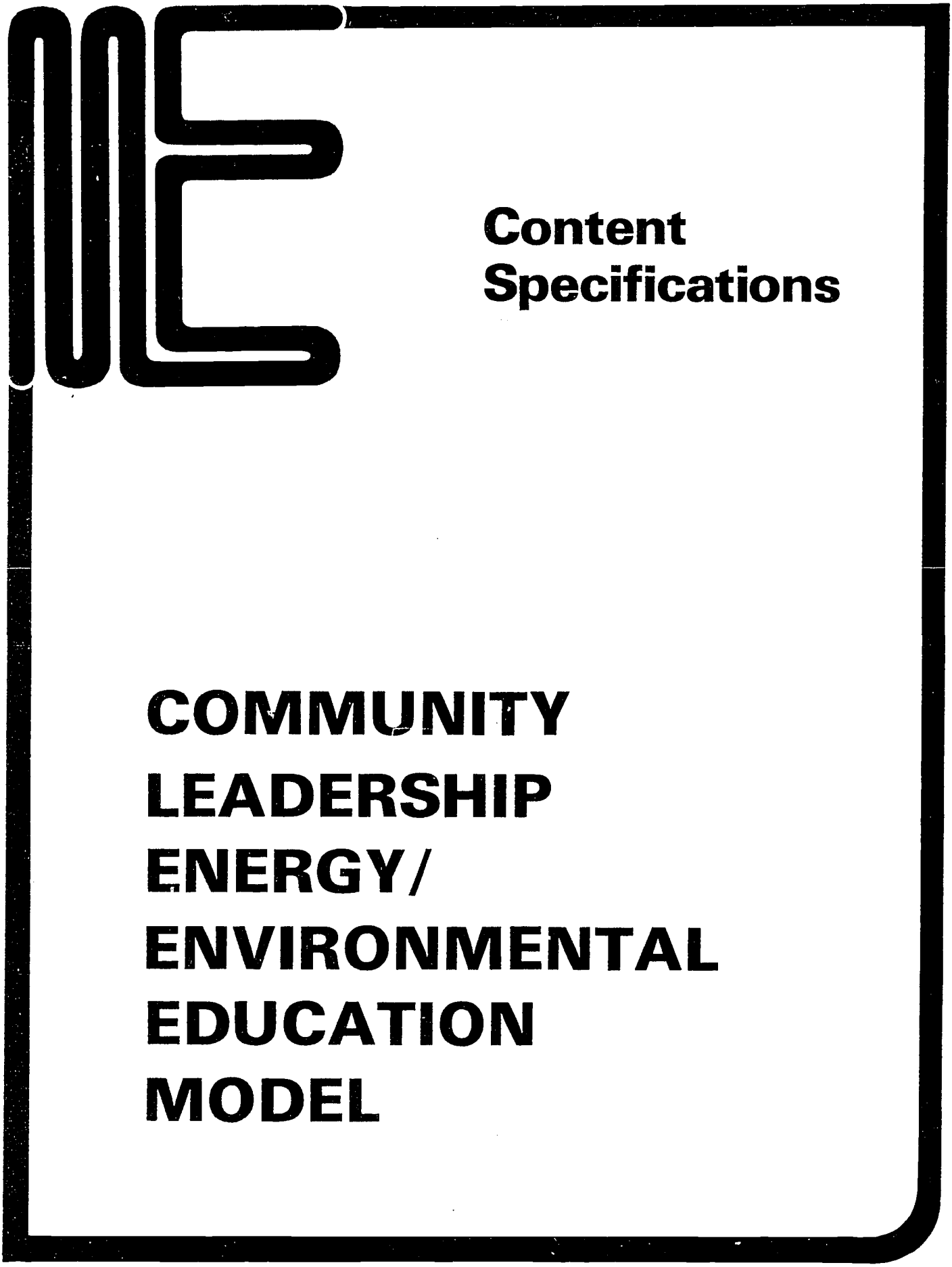
    c. Communicating energy/environmental awareness information via lobbying, advertising, propaganda activities.

The degree of community educator competence achieved within any given communication skill component is expected to vary according to the interest and prior degree of experience which the educator or leader has in carrying out the activities indicated for planning and developing energy/environmental information, and utilizing available communication channels.

C. PERSONAL COMMITMENT TO DEVELOPING ENERGY/ENVIRONMENTAL AWARENESS IN OTHERS

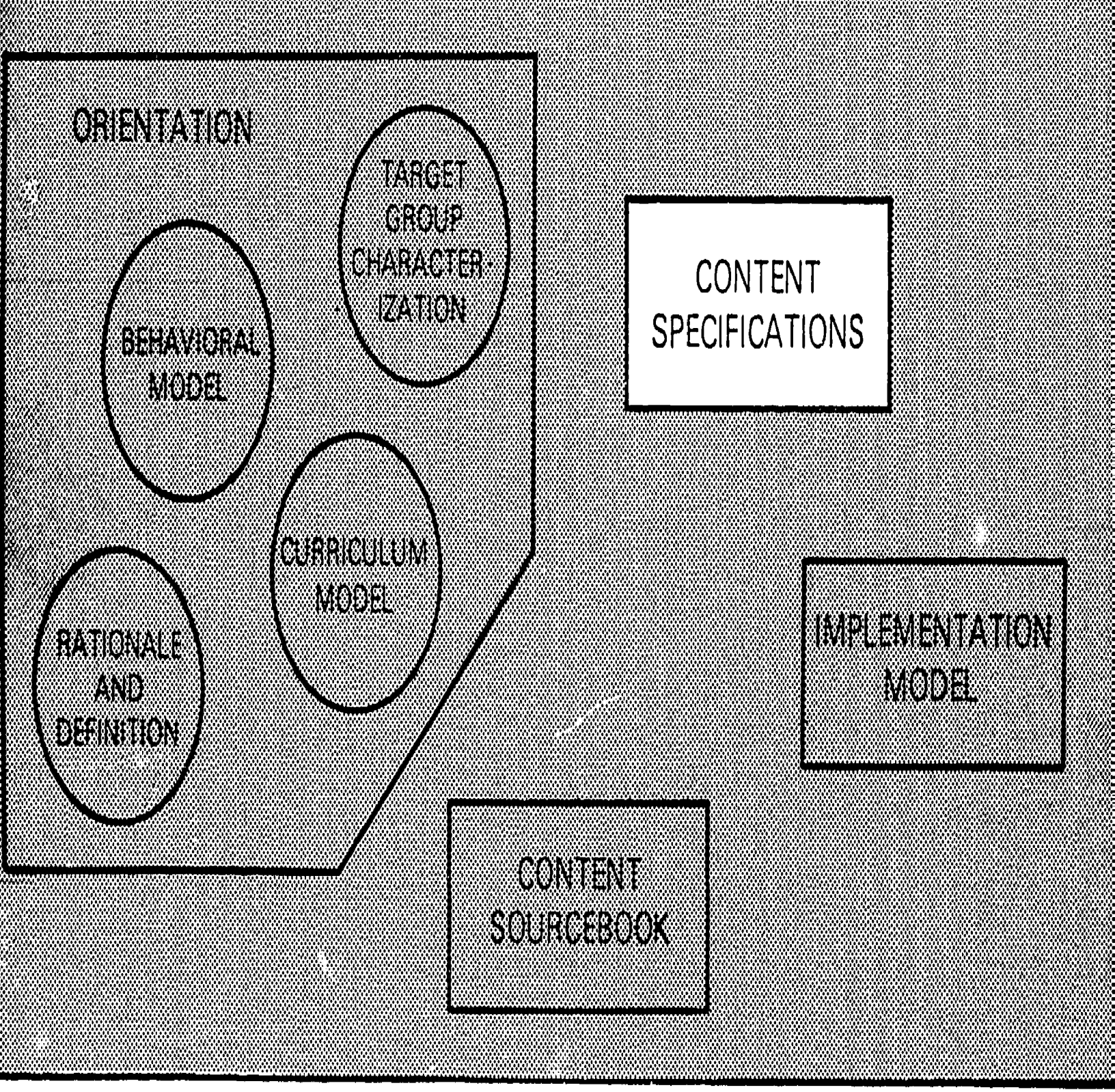
Commitment to developing energy/environmental awareness in others should begin to emerge as community educators gradually acquire an understanding of the holistic energy/environmental content and develop or exercise competence in communicating this understanding to others.

The process of developing committed personal behavior, therefore, is expected to occur as community educators immerse themselves in the holistic energy/environmental content and the communication strategies for conveying the content to others, and seek to integrate these two elements within the framework of their community leadership activities.



Content Specifications

COMMUNITY LEADERSHIP ENERGY/ ENVIRONMENTAL EDUCATION MODEL



COMMUNITY LEADERSHIP
ENERGY/ENVIRONMENTAL EDUCATION MODEL

TABLE OF CONTENTS

INTRODUCTION

The Content Specifications component of the community leadership energy/environmental education model is organized around the concept of problem-solving and complex decision-making within a holistic lifestyle assessment context.[1] The premise of this organization is based on a long-term view toward resolving the paradoxes inherent within our energy dilemma: the matching of the consumption habits accompanying our collective lifestyles with our reasonably stable means of energy production while maintaining a necessary ecological balance. The very complexity of this premise underscores the necessity for a comprehensive approach to the manner in which we think about and formulate the concerns contributing to all aspects of the energy issue.

The components of the Content Model are depicted in Figure 1. They are relatively autonomous and can be utilized in many different ways depending on the organizer's intended purposes. They can also play a range of roles, from general to specific, in any given model configuration.

Each "knowledge component" section encompasses principles, concepts and data crucial to a holistic understanding of energy/environmental problems. It is followed by a description of the instructional focus and "purpose" of the section. The first section addresses some aspects of a SYSTEMS APPROACH to describing and understanding both natural and man-made systems. The

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[1] Holistic lifestyle assessment is a method of looking at all the "costs of maintaining the needs of a person's lifestyle in energy terms; it identifies the trend of the changing energy requirements necessary to satisfy an unchanging need. Such an accounting system provides a sound base for the examination of the person's attitudes and values that are related to that need. For a list of the human needs upon which energy is spent see Section C, part 1.

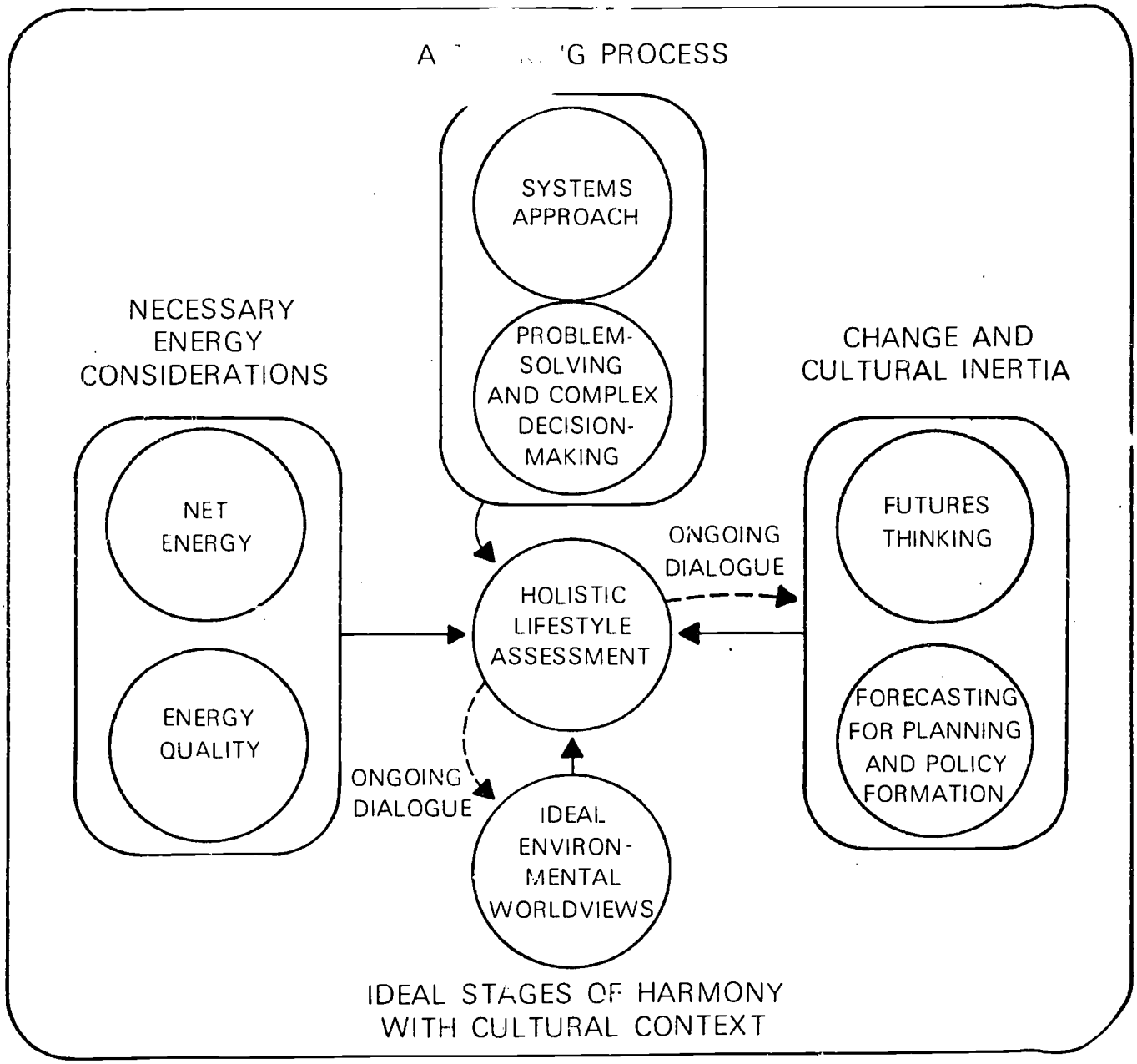
PROBLEM-SOLVING AND DECISION-MAKING section describes methods which are a part of a systemic approach to energy/environmental problems. HOLISTIC LIFESTYLE ASSESSMENT discusses the needs of the human system and the energies required to satisfy these needs, both at the individual and the aggregate (societal) levels.

IDEAL ENVIRONMENTAL WORLDVIEWS examines an individual's or an institution's worldview in terms of its relationship to the changing cultural context: how well does it "fit" in terms of the energy/ environmental issues? NET ENERGY ANALYSIS and ENERGY QUALITY are guides for formulating and making energy decisions and evaluating proposed alternatives to our energy dilemma.

The last two sections, FORECASTING and FUTURES THINKING, address the questions and decision points to be considered in planning for the future on both the individual and the aggregate levels. They present optional ways of imagining, defining and moving toward successful energy production and consumption futures.

FIGURE 1.

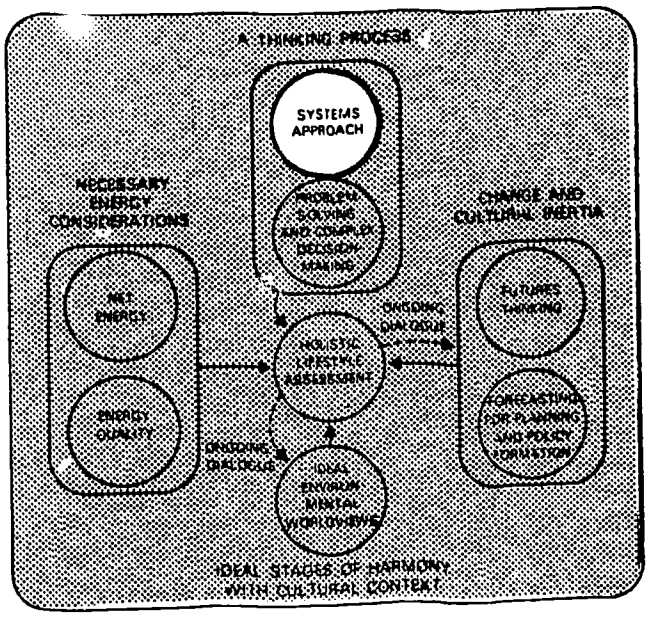
CONTENT MODEL FOR COMMUNITY LEADERSHIP
ENERGY/ENVIRONMENTAL EDUCATION



THE OVERALL GOAL IS PROPER CONSIDERATION OF EACH COMPONENT IN A COMPREHENSIVE PROCESS

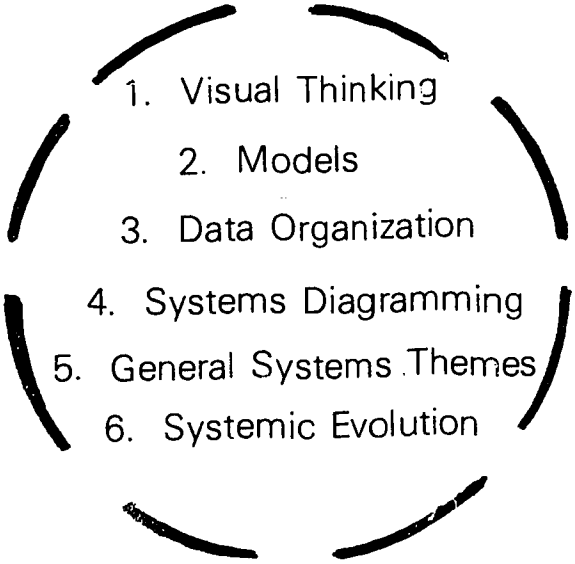
THE COMPONENTS OF THE COMMUNITY LEADERSHIP ENERGY/ENVIRONMENT CONTENT MODEL

SYSTEMS APPROACH



The Energy/Environmental Education Content Model

A SYSTEMS APPROACH implies developing a holistic understanding of the components and the interactions among the components by constructing "model" representations of real world systems.



Knowledge Components of SYSTEMS APPROACH

The following section will present descriptions of three systems orientation concepts: visual thinking, models, and data organization. It will also offer three tools for describing and understanding systems: diagramming, general systems themes and systemic evolution.

1. VISUAL THINKING

Visual thinking is an essential concept necessary for visualizing the arrangement of components and their interrelationships.

> "Visual thinking calls for the ability to see visual shapes as images of the patterns of faces that underlie our existence--the functioning of minds, of bodies or machines, the structure of societies or ideas."[1]

a. Consider the role of visual thinking in concept formation: using verbal and pictoral language, shapes and symbols to create images that constitute a statement.

> "By furnishing images of kinds of qualities, kinds of objects, kinds of events, visual perception lays the groundwork of concept formation."[2]

b. Consider the role of visual thinking in communicating the concept or perception: Visual renderings such as model diagrams or schematic designs are translations of thought products that bring order, clarity, correspondence of meaning and form, and dynamic expression of force to the consideration of energy/environmental issues.

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1 Arnheim, Rudolf, Visual Thinking, Berkeley, Ca.: University of California Press, 1969, p. 315.

2 Ibid, p. 294.

2. MODELS

A model is an abstraction of reality and/or a "map" of the territory. It aids in comprehending the performance of whole systems.

> "Unless an image is organized in forms so simple and so clearly related to each other that the mind can grasp them, it remains an incomprehensible, particular case."[3]

In energy/environmental education, it is useful to consider three kinds of models:

SYSTEMS-CONTEXT MODEL	Examines a system in the context of its environment
SPATIAL STRUCTURAL	Focuses on what the system is, what it looks like, or how it is organized
PROCESS MODEL	Examines the behavior of the system over a period of time, and indicates how the system operates

For the purposes of energy/environmental education these three kinds of models are considered in the following three areas of man-environment relationships:

- human systems
- natural systems
- the interaction of human and natural systems

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[3] Ibid, p. 274.

3. DATA ORGANIZATION

Integrative frameworks help organize thinking procedures and relevant data to define the systems in terms of models.

a. Information Organization Frameworks are schemes for organizing data or processes in a way that will optimize retrieval. The data or process information to be organized might be: facts, activities, values or beliefs.

   Examples of information organization frameworks are: libraries, expandable files or charts.

   (1) Fields of information are data that are organized into a loosely connected network of associations. This network provides a map of the influencing fields, and helps understand the system.

   (2) The Process of Arranging Data is a protocol of making meaningful arrangements of information for the specific purposes of energy/environmental education. This protocol, or set of rules, is determined by the purposive focus and goal for organizing the information.

b. Metalanguages are part of the interdisciplinary approach to energy/environmental education. They are a helpful tool in organizing information from many different disciplines into a common or standardized format that, while aiding the general understanding, does not lose precision.

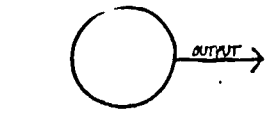
   Examples of such metalanguages are mathematics, general systems, or poetry, all of which map many specifics into a single expression or symbol.

4. SYSTEMS DIAGRAMMING

A set of simple diagrammatic symbols can be used as a means to visualize the behavior of whole energy systems. A diagram made up of such symbols can clearly map the interactions of resources and energy flows of a real system.

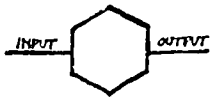
A set of symbols has been developed by H. T. Odum for diagramming the interactions of man and nature.[4] These symbols are based on the most common entities and activities found in all systems that process resources and utilize energy.

The symbols are representative of the following energy processes:



- sources of resources and/or energy

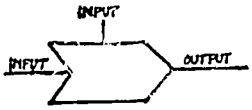
- production subsystem or photosynthesis activities



- consumer system using energy produced

- storages

- energy sinks



- interaction of energies flowing along pathways

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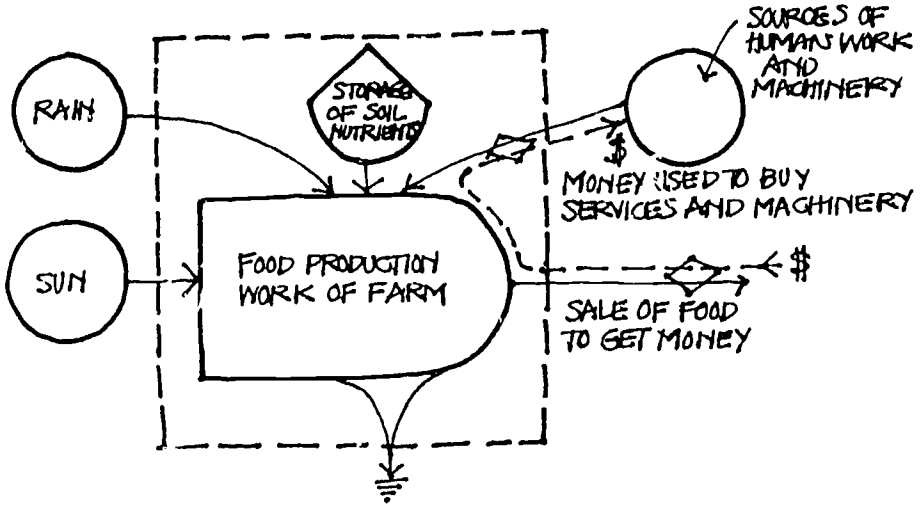
[4] Odum, Howard T., and Odum, Elisabeth C., Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976, pp. 269-70.

Using these symbols, some processes of a farm system can be shown as follows:



5. GENERAL SYSTEMS THEMES

Certain principles of systems and systems behavior are prevalent when "treating sets of related events collectively as systems manifesting functions and properties on the specific level of the whole."[5]

The following are some General Systems Themes which are described in more detail in the Content Sourcebook.

- Definition of System introduces various types of energy systems and examines three systems properties: boundaries, entities and input/output.
- Interactions describes three types of systems interactions: coupling, linkage and interrelationships.
- Cycles includes the dimension of time or periodicity in the consideration of both life cycles and periodic cycles.
- Feedback defines the role of feedback in terms of the growth or control of a system. It emphasizes the balance of negative and positive feedback.
- States of Equilibrium identifies durations and degrees of stability and instability in systems.
- Hierarchy provides parameters for identifying patterns of hierarchy in natural and man-made systems.
- Systemic Energy Flow discusses three types of energy flow: ordering, disordering and synergistic.

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[5] Engel, George L., "The Need for a New Medical Model: A Challenge for Biomedicine," Science, 196:4286, April 8, 1977, 129-135.

6. SYSTEMIC EVOLUTION

Systemic Evolution is the most fundamental of all systems processes. It unifies the structure of a system and its processes in the dynamic quest for self-renewal and self-expression.

> "Interactive processes spawn systems which in turn spawn new processes--in an evolutionary view, process and structure become complementary aspects of the same evolving totality."[6]

Systemic Evolution includes the biological and ecological theories of evolutionary succession and combines them with new hypotheses and principles of human or cultural evolution.

> "Evolution, or order of process, is more than just a paradigm for the biological domain; it is a view of how a totality that hangs together in all of its interactive processes moves."[7]

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6 Jantsch, Erich and Waddington, Conrad H., Evolution and Consciousness: Human Systems in Transition, Reading, Mass.: Addison-Wesley Publishing Co., 1976, p. 9.

7 Ibid.

The PURPOSE of the knowledge components of SYSTEMS APPROACH is:

1. To present visual methods of depicting systems as models.

2. To relate real world environmental phenomena to a simple diagrammatic language. These transdisciplinary symbols help in comprehending and analyzing energy/environmental systems interactions.

3. To demonstrate how general systems themes can be used as a tool for understanding energy in a holistic, systemic way.

4. To demonstrate how an understanding of systems can be used to describe and understand many types of energy/environmental phenomena.

5. To demonstrate that the environment, though complex, can be understood.

6. To counteract the attitude that in the face of complexity, simplistic views are acceptable.

REFERENCES

Arnheim, Rudolf, Visual Thinking, Berkeley, Ca.: University of California Press, 1969.

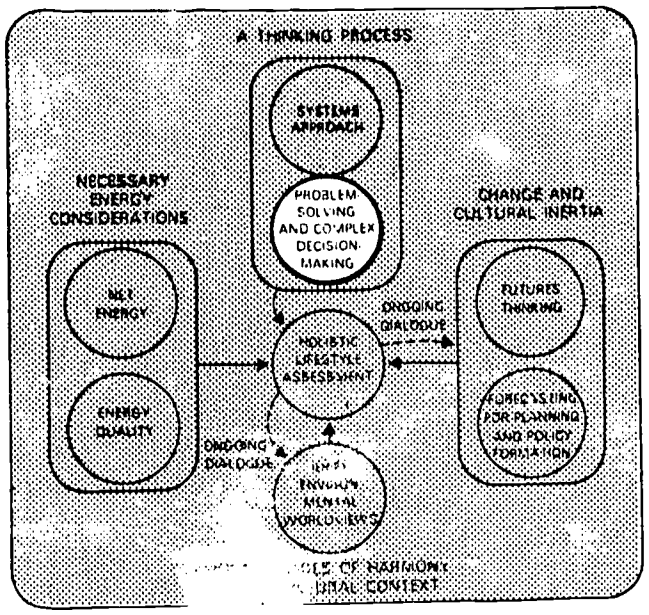
Banathy, Bela H., Developing a Systems View of Education, Belmont, Ca.: Fearon, 1973.

Engel, George L., "The Need for a New Medical Model: A Challenge for Biomedicine," Science, 196:4286, April 8, 1977, 129-135.

Jantsch, Erich and Waddington, Conrad H., Evolution and Consciousness: Human Systems in Transition, Reading, Mass.: Addison-Wesley Publishing Co., 1976.

Odum, Howard T. and Odum, Elisabeth C., Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976.

PROBLEM-SOLVING AND DECISION-MAKING

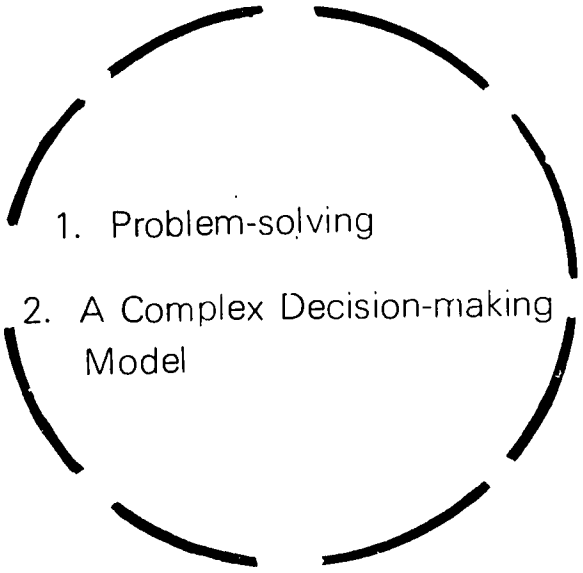


The Energy/Environmental Education Content Model

Energy/environmental problems and issues, whether on the individual or the aggregate level of society, require a systemic approach for appropriate and effective resolution of the problem.

A PROBLEM-SOLVING approach has a well-defined goal: a problem is identified and the process of solving it is linear and task-oriented.

A complex DECISION-MAKING process requires a comprehensive overview of the "problem components." The linear steps of problem-solving are incorporated into a complex model which depicts the input and output flow of the various "problem or decision components." A model of this complex decision-making process is presented in this section.



Knowledge Components of PROBLEM-SOLVING AND COMPLEX DECISION-MAKING

This section will describe the steps involved in problem identification and problem-solving It will also present a model for complex decision-making.

1. PROBLEM-SOLVING

The problem-solving quest is established by the interaction of two sets of variables:

- the constraints imposed by the nature of the solution sought
- the nature and/or posture of the problem-solver

The combination of these two aspects determines a routine for questing. Four major routines for problem-solving are:

a. artistic--search for form

b. craft--search for style/tradition

c. technological--search for methods and valid routines

d. paradigmatic--search for verities and constancy

These routines all have three limitations in common: media, tools and protocol. They may be utilized singularly or in combinations, depending upon the nature of the problem and the creativity of the problem solver.

2. A COMPLEX DECISION-MAKING MODEL

a. Requirements for a complex decision-making model

(1) Based on systemic, holistic methods for dealing with complex environmental issues

(2) Utilize data organizational tools which enhance human perception

(3) Provide the basis for the disciplined development of new knowledge and new, more comprehensive and integrative strategies

(4) Have the ability to adapt and change itself

(5) Enable the users to explore and mediate conflicting dimensions of public/private, individual/social, natural/man-made systems

(6) Recognize the utility of intuitive methods in addition to rational, scientific means

(7) Generate a variety of implementation strategies

(8) Generate appropriate decision criteria for evaluating alternative solutions

(9) Enable the users to explicate value components of the decision process

b. The components of a complex decision-making model are:

(1) A perception of a need for change

(2) Acquisition of relevant data or information

(3) Prediction of the behavior of the system under consideration

(4) Articulation of relevant individual/social value systems

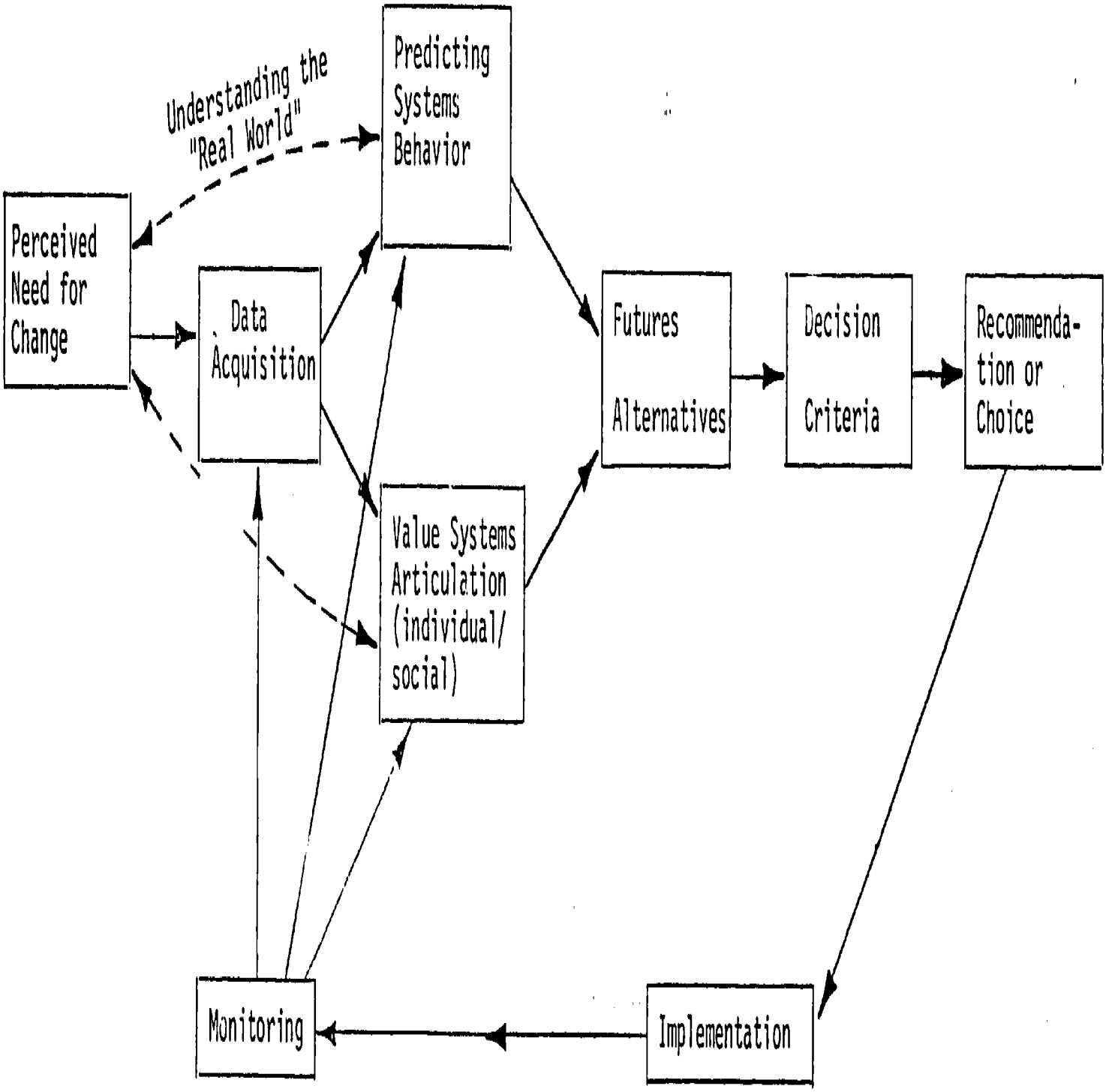
(5) Generation of futures-oriented alternatives

(6) Development of decision criteria

(7) Recommendation or choice of outcomes or actions; verification of hypotheses

(8) Implementation of recommended or chosen outcomes or actions; addition to or expansion of general state of knowledge

(9) Monitoring of effects, functions, or activities



A GENERIC COMPLEX DECISION-MAKING MODEL

The PURPOSE of the knowledge components of PROBLEM-SOLVING and DECISION-MAKING is:

1. To introduce some problem-solving routines.

2. To introduce a generic complex decision-making strategy.

REFERENCES

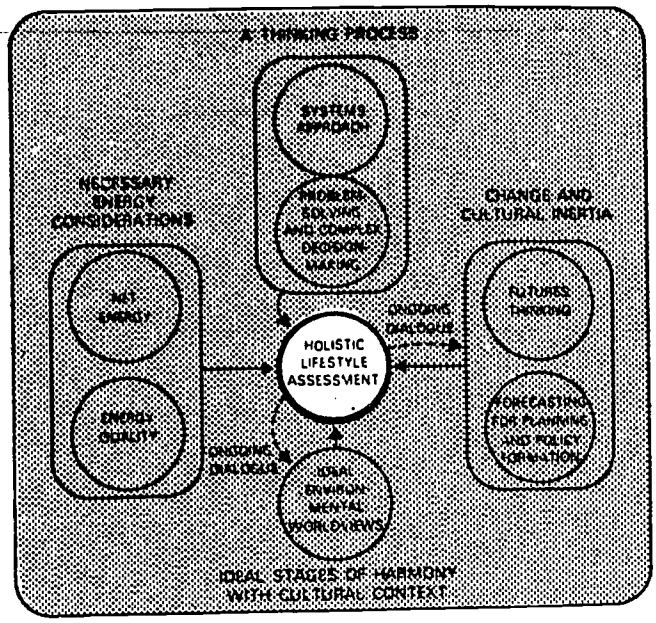
Easton, Allan, Complex Managerial Decisions Involving Multiple Objectives, New York: John Wiley & Sons, Inc., 1973.

Koberg, Don, and Bagnell, Jim, Universal Traveler: A Soft-systems Guide to Creativity, Problem-solving and the Process of Reaching Goals, Los Altos, Calif.: W. Kaufman, Inc., 1974.

Salk, Jonas, The Survival of the Wisest, New York: Harper and Row Publishers, Inc., 1973.

Zwicky, F., Discovery, Invention, Research, New York: Macmillan, 1969.

HOLISTIC LIFESTYLE ASSESSMENT

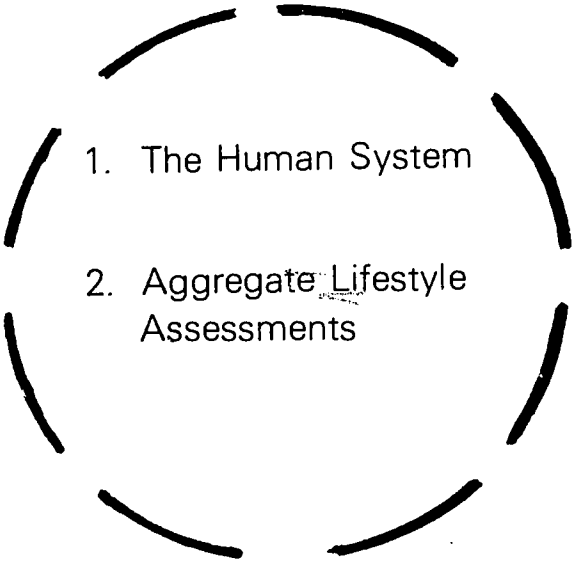


The Energy/Environmental Education Content Model

The process of HOLISTIC LIFESTYLE ASSESSMENT describes basic human needs in real energy terms. The assessment is a delineation of the inputs, throughputs and outputs[1] of energy and energy products that support an existing lifestyle.

It considers the energy relatedness of all actions and events broadly classified according to the individual's (or society's) production and consumption activities.

An application of holistic lifestyle assessment as a SYSTEMIC APPROACH using SYSTEMS DIAGRAMS, GENERAL SYSTEMS THEMES, the concepts of NET ENERGY and ENERGY QUALITY can function as a "lifestyle impact statement" or as a "societal or cultural impact statement."



Knowledge Components of HOLISTIC LIFESTYLE ASSESSMENT

This section will describe the needs of the human system and explore the impact of aggregate lifestyles on the environment.

[1]Inputs, throughputs, and outputs are the main classifications of a systems flow of energies, materials and information. Inputs are the necessary sources, or driving functions of the system; throughputs are the system's activities of processing, transforming, storing and converting; and outputs constitute the goods,services and information "exported" as products from the system.

1. THE HUMAN SYSTEM

a. Define the individual as an open system with:

(1) Inputs: fresh food, fresh air, fresh water, and also fuels, shelter and clothing

(2) Throughputs: system processing of food, air, water; use or depreciation of fuels, shelter, clothing

(3) Outputs

(a) Waste - trash, garbage, sewage, noise

(b) Meaningful work, maintenance work

(c) Creative activity

b. Human needs upon which energy is spent.[2]

NEED	MEANS OF SATISFACTION
Residential Shelter	Furniture, Lighting, Appliances, Heating, Cooling, Water Supply Landscaping
Organizations	Government, Political, Financial, Labor, Service, Special Interest Groups, Professional, Social, Legal
Creativity and Recreation	Sports, Entertainment, Toys, Pets, Arts and Crafts, Alcohol and Drugs
Food	Meats, Vegetables, Dairy, Fruits, Grains, Bakeries
Communications	Telephone, Radio, TV, Books, Talk, Magazines, Postal
Physical Protection	Police, Fire, Military, Health
Apparel and Grooming	Cosmetics, Clothing, Hair
Curiosity and Knowledge	Schools, Libraries, Museums
Spiritual	Churches
Birth and Death	Maternity, Babywear, Funeral Parlors
Mobility	Cars, Buses, Airplanes, Highways

[2]Adapted from Governor's Task Force on Energy, Oregon's Energy Perspective, State of Oregon, 1973.

(1) Certain of these human needs are "climate specific" or related to the individual's surrounding natural environment. Varying natural environmental contexts have different characteristics which generate and provide for some human needs. One important characteristic is climate.

- Macro-climates are associated with the major geographic regions such as mountains, deserts, major plains, and coastal areas.
- Micro-climates are smaller scale variations associated with special variations in the local area such as: river beds, forests, foothills and beaches.

These "climate specific" needs are closely linked to the physical environment and are usually satisfied sequentially.

(2) Other human needs are "cultural-environmental" specific, or related to the individual's understanding of his/her cultural environment. Two levels of cultural environments can be described:

- Macro-cultural environments include ethnic group stereotypes, sub-culture identification, religious affiliation, etc.
- Micro-cultural environments include urban or rural, old established family or tourist, socio-economic level, etc.

The interplay of these two levels generates very complex value systems in the individual. And when this interplay is combined with an individual's migration and exposure to all-pervasive media, it renders a distinct articulation of values very difficult.

(3) An individual's attitudes and values can be defined as a fuzzy set system or WORLDVIEW consisting of:

- Inputs in the form of cultural heritage, customs, and social norms through early childhood and family interaction.
- Current attitudes and values development reinforced through cultural peer interaction.
- Maintenance and continuance of accepted worldview through present decisions to satisfy future desires; these decisions establish the inertia of an individual's personal performance in career and lifestyle.

2. AGGREGATE LIFESTYLE ASSESSMENTS

The combined needs of different individual lifestyles have varying impacts upon both the surrounding natural environment and the cultural environment.

The impact of aggregate lifestyles upon our energy resources may:

- be within the environment's limits of tolerance
- exceed the environment's limits of tolerance

In the latter case, additional energies will be required to return the environment to its previous configuration. The additional energies can be provided by the individual or by society.

The PURPOSE of the knowledge components of HOLISTIC LIFESTYLE ASSESSMENT is:

1. To identify the inputs, throughputs and outputs of a human system in real energy terms.

2. To delineate the human needs which require energy expenditure.

3. To recognize the impact of aggregate lifestyle on the environment.

REFERENCES

Bateson, Gregory, Towards an Ecology of Mind, Westminster, Md.: Ballantine Books, Inc., 1972.

Bender, Tom, Environmental Design Primer, New York: Schocken Books, Inc., 1973.

Boulding, Kenneth E., The Economy of Love and Fear, Belmont, Ca.: Wadsworth Publishing Co., Inc., 1973.

Carpenter, Edmund, Oh, What a Blow that Plantom Gave Me, New York: Holt, Reinhart and Winston, Inc., 1973.

Florida Carrying Capacity Committee, Carrying Capacity Project for Florida and its Major Regions Involving Natural Systems Inventory and Comprehensive Planning, University of Florida, Gainesville, 1974.

Glasrud, Clarence A., The Age of Anxiety, New York: Houghton Mifflin Co., 1960.

McLuhan, Marshall, War and Peace in the Global Village, New York: Bantam Books, 1968.

Selye, Hans, The Stress of Life, New York: McGraw-Hill Book Co., 1976.

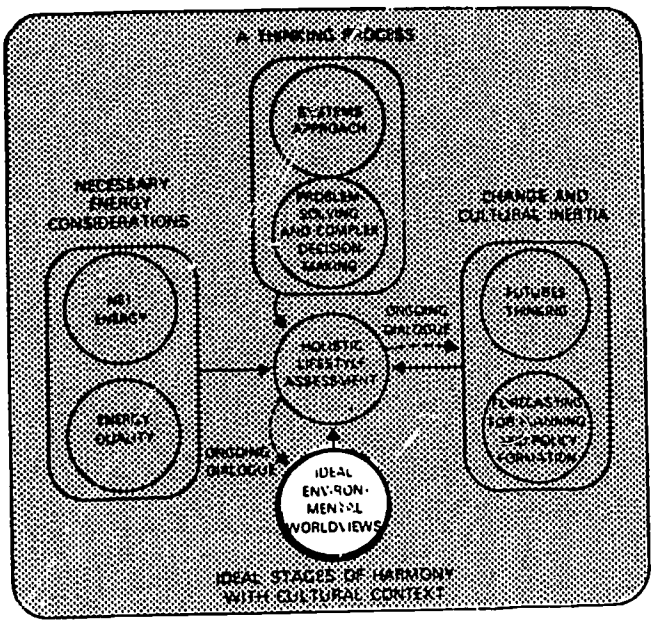
Skinner, B. F., Science and Human Behavior, New York: The Free Press, 1965.

Theobald, Robert, An Alternative Future for America Two, Chicago: Swallow Press, 1972.

Tuan, Yi-Fu, Topophilia: A Study of Environmental Perception, Attitudes and Values, Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1974.

Youngblood, G. Expanded Cinema, New York: E. P. Dutton & Co., Inc., 1970.

IDEAL ENVIRONMENTAL WORLDVIEWS



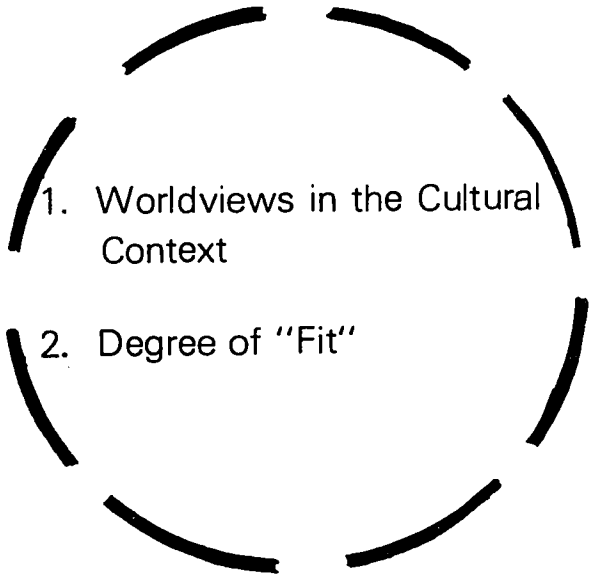
The Energy/Environmental Education Content Model

WORLDVIEWS are basic sets of beliefs concerning the nature and relationship of man and the universe.

A worldview is a representative set, or pattern, of thought connections that are organized from core beliefs, reflected in attitudes and values, and consequently manifested in human behavior.

A consistent strand of thought can be traced from many of our fundamental core beliefs which are at a very abstract level, to our experiences with other people and the events of everyday life. A process which delineates these traces and organizes them into patterns revealing their interactions generates an image called a worldview.

As the American culture recognizes the importance of energy resource utilization in conjunction with environmental concerns, an environmental awareness that lessens stress and anxiety may become a favorable attribute of the currently "ideal" worldview.



Knowledge Components of IDEAL ENVIRONMENTAL WORLDVIEWS

This section will describe two aspects of worldviews: their role in a changing cultural context and how readily they "fit" into the contemporary culture.

1. WORLDVIEWS IN THE CULTURAL CONTEXT

- Determine what an individual's or institution's energy/environment worldview is by examining their interactions with a set of entities such as the following:[1]

SHELTERS:	housing community facilities city centers industrial plants
NETWORKS:	public utilities transportation communication
THE INDIVIDUAL:	psychological needs safety and security esteem, self-actualization knowledge, aesthetics
SOCIETY:	public administration and the law social relations population trends cultural patterns social hierarchies economic development health, education and welfare
NATURE:	humanity-managed resources land use environmental impact analysis

As a culture changes, the worldview, in order to remain in synchrony with its changing context, will change also.

- Determine if the worldview is "in tune with" changing cultural context by observing the anxiety, stress or harmony in the interactions of the individual or institution with the above set of entities.

[1] Doxiadis, Constantinos, Ekistics: An Introduction to the Science of Human Settlements, New York: Oxford University Press, 1968.

2. DEGREE OF "FIT"

If the worldview is in harmony with the chaning cultural context, the degree of "fit" will be less stress-producing.[2,3]

- Measure the degree of fit in terms of the desirable and undesirable relationships of the individual or institution to the above-listed entities.

  Note: This measurement of "fit" should include indications of both harmony and stress. Evidence of discord often attracts more notice than harmony so that much that is in tune with the cultural context goes unnoticed.

The worldview of an individual or institution is more than simply a reflection of its cultural context. The person or organization plays an active role in shaping its worldview, and further, in projecting the "quality of fit" of that worldview into the cultural context.

- Examine the function of public relations in large organizations and the "personality projection" of the individual.

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2 Alexander, Christopher W., Notes on the Synthesis of Form, Cambridge, Mass.: Harvard University Press, 1967.

3 Selye, Hans, The Stress of Life, New York: McGraw-Hill Book Co., 1976.

The PURPOSE of the knowledge components of IDEAL ENVIRONMENTAL WORLDVIEWS is:

1. To introduce the concept of a worldview as a holistic set of images which integrates a person's or an institution's core beliefs, attitudes and values, and behavior.

2. To explore the idea of an ideal energy/environment worldview: one in close harmony with its changing cultural context.

3. To provide a basis for examining and understanding part of the discrepancy between ideal and actual humanity/environment interactions which occur in changing cultural contexts.

REFERENCES

Alexander, Christopher W., Notes on the Synthesis of Form, Cambridge, Mass.: Harvard University Press, 1967.

Berry, Wendell,"Exploitation and Nurture," CoEvolution Quarterly, Spring 1977, pp. 57-71.

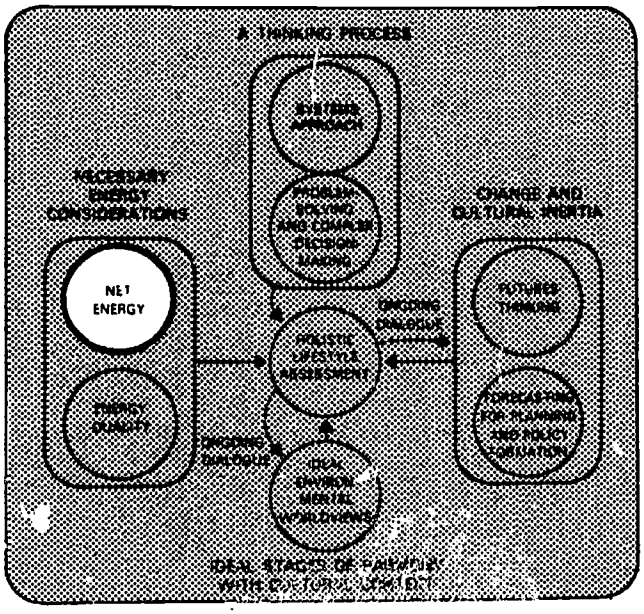
Doxiadis, Constantinos, Ekistics: An Introduction to the Science of Human Settlements, New York: Oxford University Press, 1968.

Engel, George L., "The Need for a New Medical Model: A Challenge for Biomedicine," Science, 196:4286, April 8, 1977, 129-135.

Selye, Hans. The Stress of Life, New York: McGraw-Hill Book Co., 1976.

Weil, Andrew, The Natural Mind: A New Way of Looking at Drugs and the Higher Consciousness, Boston: Houghton Mifflin Co., 1972.

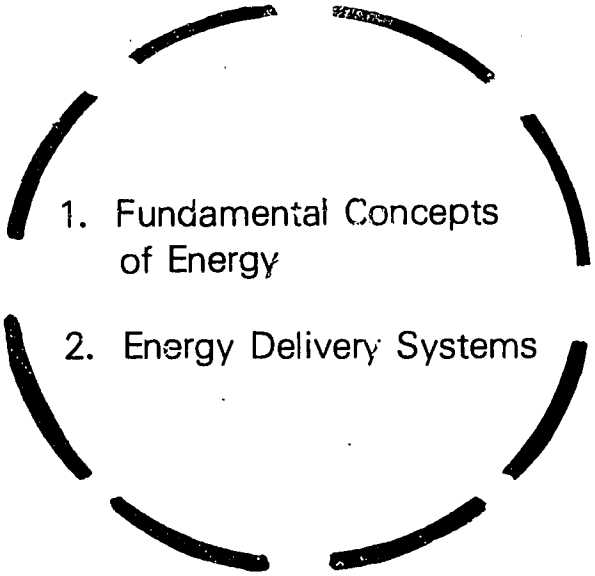
NET ENERGY ANALYSIS



The Energy/Environmental Education Content Model

NET ENERGY ANALYSIS is an accounting technique which determines the amount of energy remaining for use after all the "costs" to make it available have been "paid" in energy equivalents.[1]

NET ENERGY ANALYSIS is a holistic accounting method related to the law of diminishing return. It contributes to the lifestyle impact statement resulting from the process of HOLISTIC LIFESTYLE ASSESSMENT.



Knowledge Components of NET ENERGY ANALYSIS

This section will describe the fundamental concepts of energy as they relate to energy/environmental concerns and will examine the means to satisfy society's energy demands -- resources and delivery systems.

[1] Odum, Howard T. and Odum, Elisabeth, Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976.

1. FUNDAMENTAL CONCEPTS OF ENERGY

Examine the following as they relate to energy/environmental concerns:

a. The implications of new theories of physical science on contemporary thinking about energy and energy-related matters to include:

   (1) The interplay between absolute principles and situational (on relative) principles in our thinking patterns

   (2) Worldview definitions and their development in individuals, institutions, and corporations

b. Three principles of energetics:[2]

   (1) Law of conservation of energy: energy is either created nor destroyed.

   > "The energy entering a system must be accounted for either as being stored there or as flowing out."[3]

   (2) Law of degradation of energy: any process must degrade some of its energy.

   > "In all processes some of the energy loses its ability to do work and is degraded in quality."[4]

   Energy that has the ability to do work is called potential energy and is still useful. Energy that has done work is degraded and is no longer useful at its original potential.

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[2]The first and second principles of energetics are closely equivalent to the first and second laws of thermodynamics.

[3]Odum, Howard T. and Odum, Elisabeth C., Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976.

[4]Ibid, p. 38.

(3) The maximum power principle explains why certain systems survive.

> "That system survives which gets most energy and uses energy most effectively in competition with other systems."[5]

To "get more energy" or develop more power inflow, a system might:

- develop storages of high-quality energy
- use storages to increase energy flow (feedback)
- use storages as a control mechanism to keep the system stable: inflows balance outflows
- recycle materials as needed

The application of this principle to new systems developing in an environmental of abundant resources (early succession) generates competition. The application of this principle to mature systems that are in steady state with the resources of their environment (climax) generates cooperation.

[5] Ibid, p. 39.

2. ENERGY DELIVERY SYSTEMS

a. The primary energy resources available to humanity are of two main types:

(1) Non-renewable: a quantity of finite reserves that are made available to society as a function of available technology and capital investment.[6]

(2) Renewable: infinite reserves are available to humanity depending upon specific locale; their availability as an energy resource is also a function of available technology and capital investment.

NON-RENEWABLE PRIMARY ENERGY RESOURCES	RENEWABLE PRIMARY ENERGY RESOURCES	
Petroleum	Solar	Radiant Solar Heat Photovolatic Conversion
Natural Gas	Hydrological	Fresh Water Hydroelectric
Coal	Oceanographic	Tidal Temperature Gradient
Fissionable Materials	Geothermal	Steam Heat
	Life Forms	Human Photosynthesis Forests
	Recyclable Waste	

b. Secondary or tertiary sources of energy can be classified as recycled energies from processes that are driven by either type of primary energy resource. Re-using degraded steam from an electric turbine for heating or burning an industrial waste to make useable steam is an example of cogenerating systems.[7] There are many ways to couple cogenerating systems to increase overall efficiency of primary energy resource use.

[6] Lovins, Amory, "Energy Strategy: The Road Not Taken," Foreign Affairs, vol. 55, no. 1, October, 1976, 65-96.

[7] Business Week, "Saving Energy the Cogeneration Way," June 6, 1977, p. 99.

c. The general organization of energy delivery systems is in eight stages from primary resource site to end use:

STAGE	SAMPLE ENERGY DELIVERY SYSTEMS	
	OIL TO ELECTRICITY	WHEAT TO BREAD
1. EXPLORATION: siting of resource deposits, basic research and development of exploratory techniques, machinery	Geologic exploration for oil	Agricultural chemist's search for improved method of wheat production
2. EXTRACTION: removing the resource, machinery and site equipment, materials, operating agencies, maintenance over the life of the site	Tapping oil well	Harvesting wheat
3. TRANSPORT I: transportation mechanisms and operating energy necessary to carry the resource to the next facility	Shipment of crude oil	Trucking of grain
4. PROCESSING: energy to run machinery, construction of the facility, its maintenance and operating energies	Processing of crude oil	Grinding of grain
5. TRANSPORT II: transportation systems and the operating energies required to move the resource to the conversion plant	Shipment of partially refined oil to a regional refinery	Trucking of flour to baker
6. CONVERSION: plant construction, materials and maintenance	Transformation of oil into electricity	Transformation of dough into bread
7. DISTRIBUTION: energy costs, equipment, storage facilities and networks to move the converted product from final facility to point of consumption	Sale of electricity to a household	Sale of bread at grocery store
8. END USE: Input to the "basic human needs" system	Operate electric toaster	Eat the bread

d. Three types of energy losses during the delivery system procedures are:

(1) Degradation: the premature degradation of energy such as gasoline losing potency, batteries losing charge

(2) Physical: spillage during transport and processing such as an oil spill or discarding a resource that is inadequate and/or overly contaminated such as low grade ore or high-sulfur coal

(3) Internal Use: a fraction of the resource being supplied is diverted and fed back into the operation of the same system such as using generated electricity to light the generating site. This type of loss is a good candidate for recycling or cogeneration applications.

The PURPOSE of the knowledge components of NET ENERGY ANALYSIS is:

1. To define energy and explain the parameters of energy based upon the three principles of energetics.

2. To describe primary and secondary energy resources.

3. To indicate the methods and means by which products and materials are supplied to satisfy the aggregate lifestyles of society.

4. To describe a generic energy delivery system from exploration to end use.

5. To account for losses of energy as a result of the processes operating within the system.

REFERENCES

Bullard, Clark, Energy Costs, Benefits; Net Energy, Center for Advanced Computation, doc. 174, University of Illinois, Urbana, Ill., Aug., 1975.

Business Week, "Saving Energy the Cogeneration Way," June 6, 1977.

Clark, Wilson, Energy for Survival, New York: Anchor Press/Doubleday, 1974.

Cook, Earl, Man, Energy, Society, San Francisco: W. H. Freeman & Co., 1976.

Governor's Task Force on Energy, Oregon's Energy Perspect e, State of Oregon, 1973.

Loose, K. D., Six Energy System Concepts, Paper Presented at Eighth Annual Symposium on Systems and Education, Far West Laboratory for Educational Research and Development, San Francisco, 1976.

Lovins, Amory, "Energy Strategy: The Road Not Taken," Foreign Affairs, vol. 55, no. 1, October, 1976, 65-96.

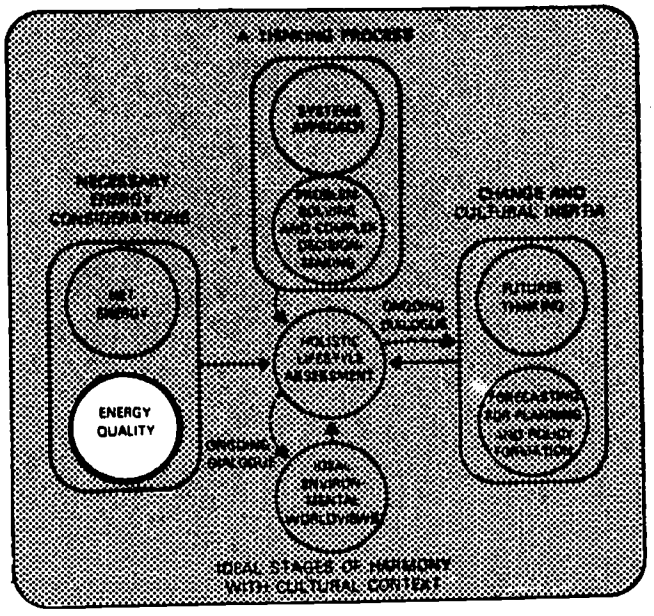
Odum, Howard T., Environment, Power and Society, New York: Wiley-Interscience, 1976.

Odum, Howard T. and Odum, Elisabeth, Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976.

Office of Energy Research and Planning, State of Oregon, Transition, Portland: Prometheus Unbound, Specialty Books, 1975.

Theobald, Robert, ed., The Guaranteed Income, Garden City, New York: Doubleday, 1967.

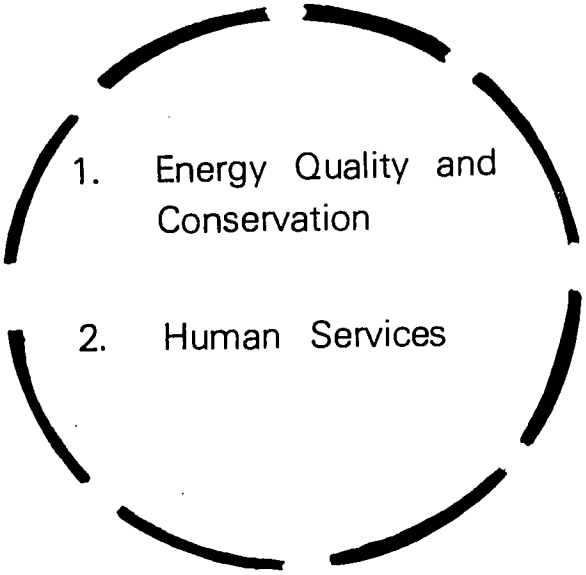
ENERGY QUALITY



The Energy/Environmental Education Content Model

ENERGY QUALITY is a measure of a substance's potential to do work. It is a basis for the appropriate allocation and utilization of energy resources.

Higher quality energies such as electricity have had a lot of "work" done to them to upgrade them and make them more flexible as in the geophysical action of vegetation to make coal or by society as in the extraction and purification of uranium from raw ore.



Knowledge Components of ENERGY QUALITY

This section will present two energy quality principles that pertain to both our natural and human resources.

1. ENERGY QUALITY AND CONSERVATION

- A principle of energy conservation: energy products should be used for tasks that require their specific energy quality

> High grade electricity is wasted on operations with low quality energy requirements such as opening cans or carving meat.

2. HUMAN SERVICES

- Human energy resources should be developed and used appropriately

> The energy quality equivalient of an individual's expenditure on education and training represents an investment society should not underutilize.[1]

[1] Odum: private correspondence, April 1977.

The PURPOSE of the knowledge components of ENERGY QUALITY is:

1. To introduce a guideline for assessing the appropriateness of energy products and use.

2. To introduce a general energy conservation concept that relates to all resources, including human resources.

REFERENCES

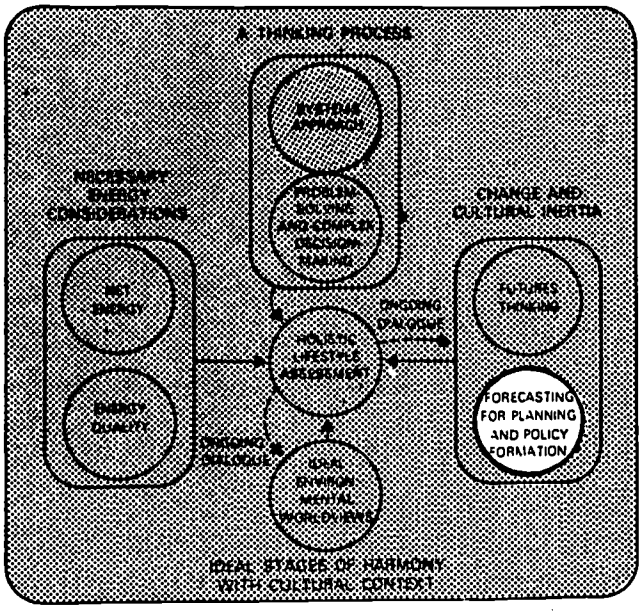
Hannon, Bruce, "An Energy Standard of Value," The Annals of the American Academy of Political and Social Science; Vol. 410, November, 1973, pp. 139-153.

Loose, K. D., Six Energy System Concepts, Paper presented at Eighth Annual Symposium on Systems and Education, Far West Laboratory for Educational Research and Development, San Francisco, 1976.

Odum, Howard T., private correspondence, April, 1977.

Odum, Howard T. and Odum, Elisabeth, Energy Basis for Man and Nature, New York: McGraw-Hill Book Co., 1976.

FORECASTING FOR PLANNING AND POLICY FORMATION



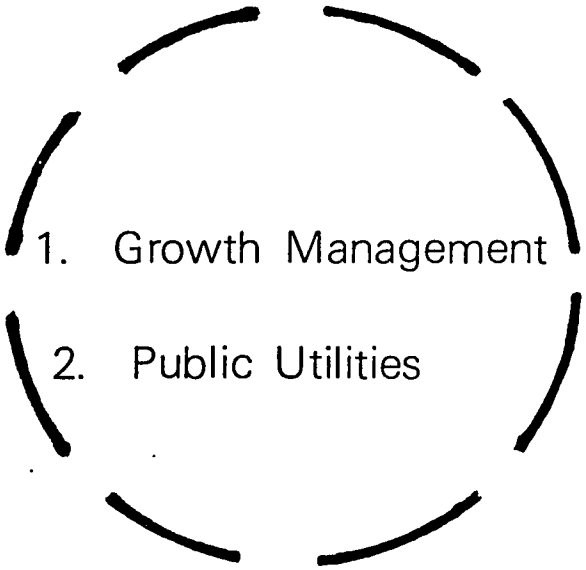
The Energy/Environmental Education Content Model

FORECASTS and trends play an important role in planning and policy formation/evaluation.

Forecasts are generated from available data and are based on certain assumptions regarding population, government, weather, etc. Trends are also mapped from available data, but are usually of a more general nature.

PLANNING AND POLICY FORMATION takes into consideration these forecasts and trends, but does not necessarily use them. The planners might challenge the assumptions on which they're based. Or they may use the forecast, but monitor it to verify its accuracy.

Forecasts which prove valid confirm plans or policies and act as reinforcements to continue in the same direction. Forecasts which result in contradictions serve as an error message to change the direction of the planning.



Knowledge Components of FORECASTING FOR PLANNING AND POLICY FORMATION

This section will briefly describe the idea of planned growth in business and government and will explore the role of public utilities as energy delivery systems.

1. GROWTH MANAGEMENT

Aggregate consumer decisions form part of the data base from which projected patterns, or forecasts, are extrapolated. These patterns establish the basis for growth management (kind, quality, amount of growth).

The goals of our institutions have historically been short-term (less than 10 years) and as situations worsen and available data become more unreliable, they become shorter (less than 1 year). The time horizon of goals greatly affects growth management strategies.

The following institutions are engaged in growth management:

- private business: financial planning, capital formation
- government: legislation and regulations affecting business and affecting the public interest

Consider: anti-trust laws, tariffs, subsidies, public utilities commissions, recreation and wildlife areas management

2. PUBLIC UTILITIES

Public utilities provide for a large share of an individual's (or society's) basic needs: fresh water, natural gas, electricity, transportation and communications. In terms of the individual as a system, these utilities are inputs and depend upon energy delivery systems for their continual operation and availability.

The relationships among policy regulations, financing capital investment and physical construction of energy delivery systems can be examined by looking at:

- How energy-based forecasting is a basis for utilities planning and construction
- The function of the State Public Utility Commissions
- Types of rate structures

Consider: Current practices

Lifeline allowances where a basic allowance for the household is calculated based on size of household unit, number of occupants, etc., and an allowance is fixed. If consumption exceeds the allowance, another higher rate is charged for the excess.

Exponential where the more energy you use, the more you are charged.

Inverted where the more energy you use, the less you are charged.

Incremental where the rate increases by steps (0-100 at Rate 1, 100-1000 at Rate 2, etc.)

Credit Accruing where you may be generating more energy than you are using, thereby accumulating credit.

Time dependent where the cost per unit varies with the time of use (day or night, peak or off hours).

The PURPOSE of the knowledge components of FORECASTING FOR PLANNING AND POLICY FORMATION is:

1. To recognize that individual consumer decisions are a basis for government and corporate planning.

2. To demonstrate the relationship between constructing energy delivery systems and corporate/utility planning and policy formation.

3. To examine the impact of this forecasting/planning on individual lifestyle choices.

REFERENCES

Brezina, Dennis W. and Overmyer, Allen, Congress in Action, New York: The Free Press, 1974.

Galbraith, John K., Economics and the Public Purpose, New York: New American Library, 1975.

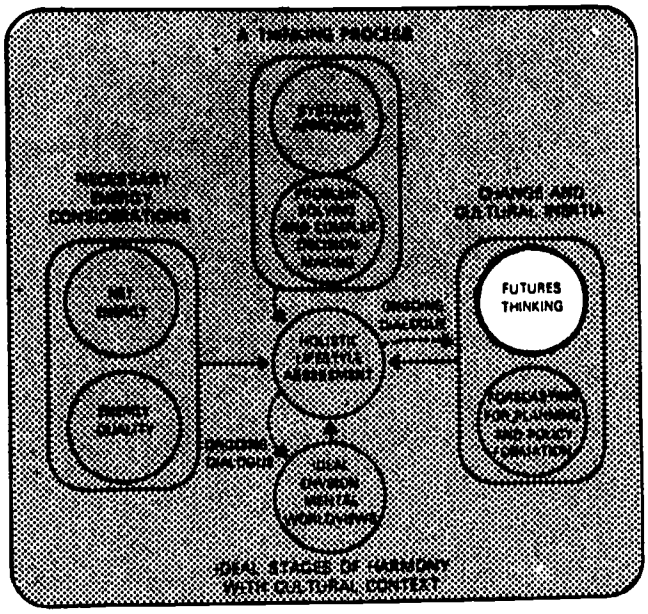
Hammond, Allen; Metz, William; Maugh, Thomas III, Energy and the Future, Washington, D. C., American Association for Advancement of Science, 1973.

Kahn, Herman; Martel, Leon; Brown, William, The Next Two Hundred Years, West Caldwell, N. J.: William Morrow & Co., 1976.

Meadows, Donella; Meadows, Dennis; Randers, Jorgen; Behrens, William III, The Limits to Growth, New York: Signet Books, 1972.

Mesarovic, Mihajlo, and Pestel, Eduard, Mankind at the Turning Point, New York: E. P. Dutton & Co., Inc., 1974.

FUTURES THINKING

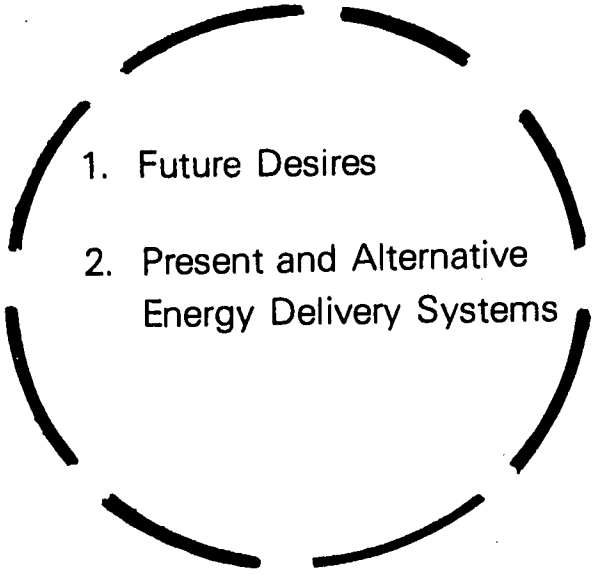


The Energy/Environmental Education Content Model

FUTURES THINKING examines the limitations placed on imagination by people and institutions. The nature of these limitations separate possible futures from probable futures.

Values and LIFESTYLES play a definite role in futures thinking as resources (human, material and currency) are examined and estimated in terms of their implications for the future.

FUTURES THINKING involves DECISION-MAKING on both the individual and societal levels.



Knowledge Components of FUTURES THINKING

This section will address the individual consumer's questions about his/her future desires and the ability of the present energy delivery systems to satisfy these desires.

1. FUTURE DESIRES

WHERE DO I WANT TO BE IN THE FUTURE?

Examine individual future desires in terms of basic and perceived needs to include consideration of:

- alternative lifestyles
- size of family unit
- career options
- concept of success and happiness

WHAT DOES IT TAKES TO GET THERE?

Examine the means of satisfying these future desires in terms of:

- the kind of technology required

Consider:

Appropriate Technology means using a technology "more appropriate to the transition period we are in than that which now is conventionally used by our society in its continued pursuit of quantitative economic growth... to cure ourselves from our cheap energy addiction."[1]

Intermediate Technology means a return to a simpler decentralized technology. It does not mean abandoning sophisticated technology, but rather shaping it to our needs and humanizing it.

> "Intermediate techology is here to help both those who choose alternatives to the present society, and those who are trying to adapt present society to more humane ways of living and working."[2]

[1] Yudelson, Jerry and Van Der Ryn, Sim, "What is Appropriate Technology?", Office of Appropriate Technology, Sacramento, Ca., June, 1976.

[2] Burchard, Preston, "What Do We Mean by Intermediate Technology?", Intermediate Technology, Report No. 1, Winter/Spring, 1976, p. 7.

- the resources available

Consider:	Immediate access to natural, human and currency resources required for the goal. Access to primary means of production for the fulfillment of the goal; most desires require a variety of technologies and producers.

- growth management strategies

Consider:	There will be limited access to certain resources, some will be in short supply.

2. PRESENT AND ALTERNATIVE ENERGY DELIVERY SYSTEMS

HOW POSSIBLE IS THIS FUTURE IN TERMS OF PRESENT ENERGY DELIVERY SYSTEMS?

Examine the consequences of continued development of present energy delivery systems and relate this to individual future desires:

- Determine present energy consumption rates and patterns

WHAT ARE THE ALTERNATIVES TO THE PRESENT ENERGY DELIVERY SYSTEMS?

Within the context of a particular worldview a new approach can be made to investigate and evaluate alternatives:

- The traditional approach asks "What can the future be?" in terms of merely extending available processes, making minimal changes. — PROCESS EVALUATION APPROACH

- A more optimistic, visionary approach asks "What should the future be?" and organizes whatever processes are necessary to achieve the stated goal. — STRUCTURE EVALUATION APPROACH

- A more holistic approach asks "How can we <u>begin</u> to define a desirable future?" and moves from a differentiated to a more integrated condition by focusing on long-term goals that are representative of a broad range of society.

STRUCTURPROCESS EVALUATION APPROACH

The PURPOSE of the knowledge components of FUTURES THINKING is:

1. To express future desires in terms of careers, lifestyles, energy production and consumption.

2. To examine in terms of energy expenditure the means of satisfying these desires.

3. To encourage voluntary decision-making that synchronizes energy consumption/lifestyle with available means of energy production.

4. To relate numbers 1 and 2 above to the aggregate level of social decision-making.

5. To introduce different approaches for evaluating future alternative energy delivery systems.

REFERENCES

Burchard, Preston, "What Do We Mean by 'Intermediate Technology'?" Intermediate Technology, Report No. 1, Winter/Spring, 1976.

Fuller, R. Buckminster, Operations Manual for Spaceship Earth, Carbondale, Illinois: Southern Illinois University Press, 1969.

Harman, Willis, An Incomplete Guide to the Future, San Francisco: San Francisco Book Company, 1976.

Illich, Ivan, Tools for Conviviality, New York: Harper & Row Publ., Inc., 1973.

Jantsch, Erich, Design for Evolution, New York: George Braziller, 1975.

Laszlo, Ervin, A Strategy for the Future, New York: George Braziller, 1974.

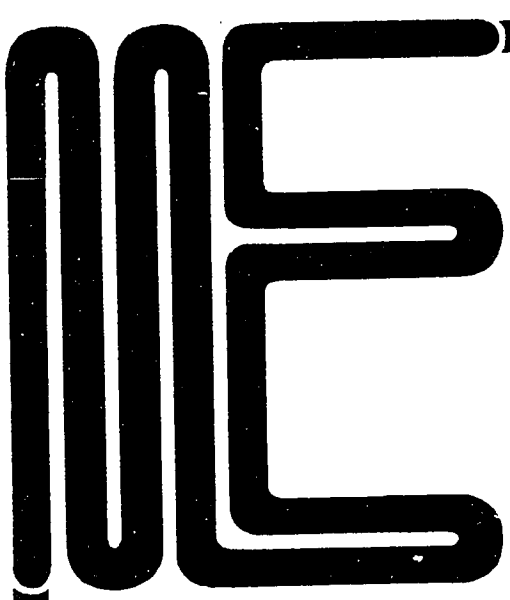
Meadows, Donella; Meadows, Dennis; Randers, Jorgen; Behrens, William III, The Limits to Growth, New York: Signet Books, 1972.

Schumacher, E. F., Small is Beautiful, New York: Harper & Row Publ., Inc., 1975.

Skinner, B. F., Beyond Freedom and Dignity, New York: Bantam, 1971.

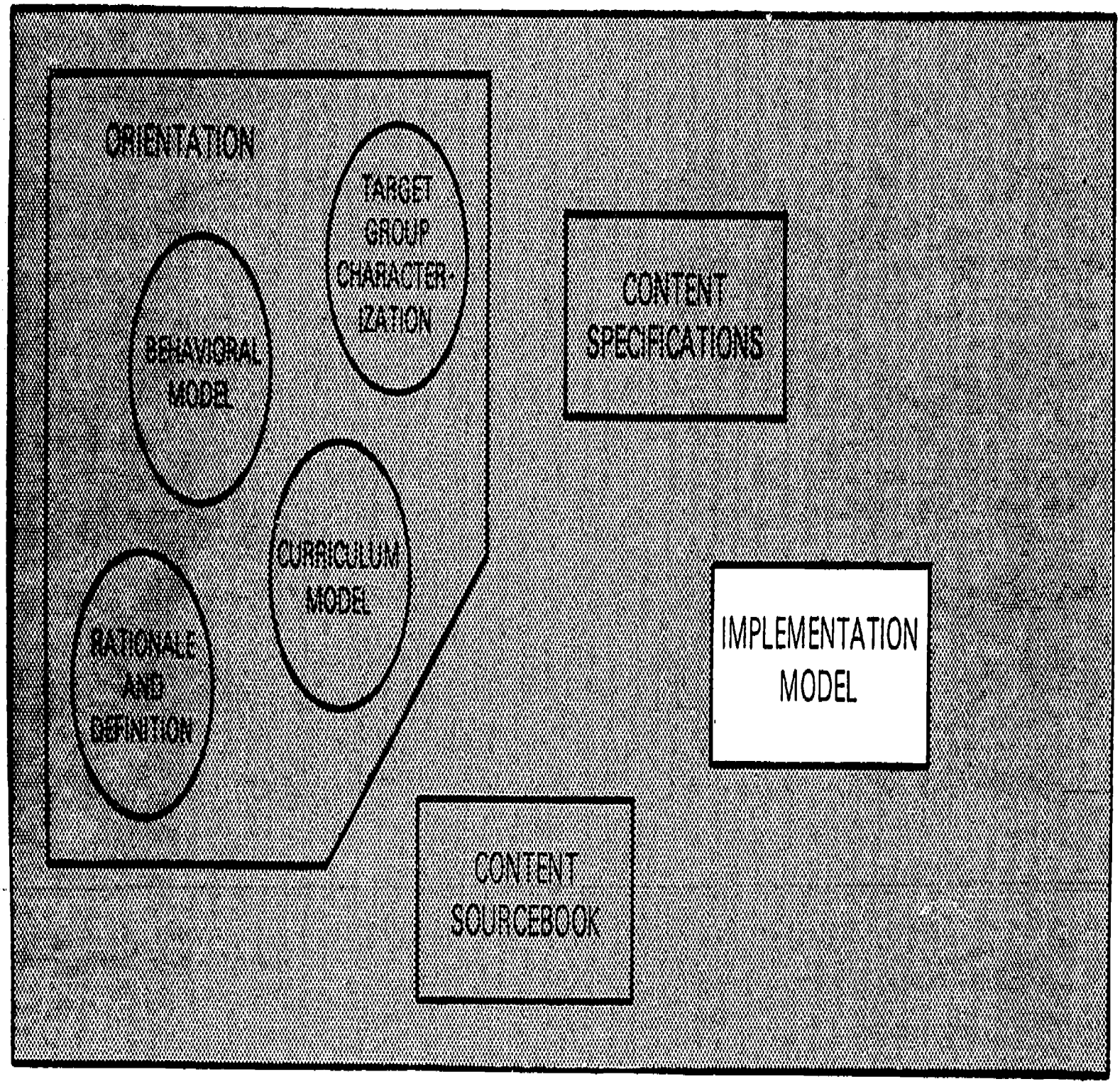
Watt, Kenneth, The Titanic Effect: Planning for the Unthinkable, Stamford, Connecticut: Sinauer, 1974.

Yudelson, Jerry and Van der Ryn, Sim, "What is Appropriate Technology?" Office of Appropriate Technology, Sacramento, Ca., June, 1976.



Implementation Model

COMMUNITY LEADERSHIP ENERGY/ ENVIRONMENTAL EDUCATION MODEL



COMMUNITY LEADERSHIP

ENERGY/ENVIRONMENTAL EDUCATION MODEL

INTRODUCTION

The Implementation component of the community leadership energy/ environmental education model describes an implementation design for three target populations and provides a model for making instructional/ learning arrangements for these populations.

Part One provides program and implementation specifications for three community group target populations.

Part Two presents a training systems model for systematizing and designing instructional/learning arrangements.

TABLE OF CONTENTS

PART ONE
AN IMPLEMENTATION DESIGN

This implementation design provides specifications for the development of energy/environmental education programs and materials for the following types of target populations which represent a wide spectrum of community influence.

- Decision makers in business, professional and governmental organizations
- Community organizations already taking a leadership role in environmental education activities (e.g., Sierra Club, Audubon Society, Friends of the Earth)
- Service-oriented non-profit community organizations (e.g., church groups, Lions Club, Junior Chamber of Commerce)

The sections which follow provide brief descriptions of successful attempts to implement EE programs, specifications for program/materials design and implementation guidelines associated with each program.

A. KEY DECISION MAKERS

Previous attempts to work with key decision-makers in business, professional and governmental organizations provide insight into some of the critical elements which need be addressed in materials development and implementation specifications. In Italy, for instance, information seminars or short courses on environmental matters were conducted to bring Senators up to date on: (1) scientists' conclusions about

current environmental problems, remedies and preventive measures, (2) current action being taken to cope with these problems, and (3) procedures likely to facilitate creation and utilization of policy guidelines for future legislative decisions.[1] Six environmental experts were selected to prepare papers and lectures which they, in turn, presented in the Senate Chambers. Following these "information seminars," which adhered to "...a particularly tight timeline, with maximum time saving," a special commission for ecological problems was established to address information needs of concerned senators, maintain the link, and hence continue the dialogue between the scientific and academic circles.

Another program in Italy, described as a training course on environmental policy, highlights different elements in working with decision makers.[2] A Centre of Environmental Studies was established at the Pro Deo University in Rome for "...present and future decision makers--for professionals holding responsible positions in administrative bodies, in particular government departments." Day and evening classes were held at the Centre to make available to these decision makers documentation, information and research instruments related to economic, political and social problems of the environment. The main purpose, beyond providing information, was to arouse participants' awareness of environmental issues and to facilitate the habit

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[1] Giacomini, V., "Information Seminars for Senators of the Republic," in Environmental Education at Post Secondary Level: Courses for Educators, Decision-Makers and Members of Professions Concerned with the Environment, Center for Educational Research and Innovation, Organization for Economic Co-operation and Development, Paris, 1974.

[2] Giacomini, V., "Training Course on Environmental Policy," in Environmental Education at Post Secondary Level, 1974.

of exchanging ideas and experience among those whose cooperation was essential. The teaching methods, media and materials that were used avoided all academic formalism and reflected an emphasis upon a multi-disciplinary approach toward looking at concrete practical problems.

Incorporating elements from these and other related attempts to work with key decision makers has resulted in the following implementation specifications for EE programs and materials:

1. Professionalism, effectiveness and efficiency are key terms which characterize the concerns of decision makers. EE materials and program activities designed for them must exhibit these same characteristics, i.e., they must be well-planned and effectively executed. Without attention to "the medium is the message," well-intended efforts may be unsuccessful.

2. The most effective program format will most likely be a conference with direct or indirect involvement of experts.

3. The Community Leadership Energy/Environment Content Specifications will provide guidelines for the identification and development of conference themes, topics and materials. Since decisions of the majority of business, professional and governmental organizations reflect short-term reactions to accommodate change, it is important to introduce decision makers to the systemic nature of environmental problems, to corresponding systemic problem-solving/decision-making strategies and to forecasting as a tool for planning and policy formation.

   These topics, however, may not be of interest or concern to most decision makers since they deal in terms of efficiency and effectiveness. It will be important, therefore, to develop an awareness of potential dangers to environmental quality and ecological balance which current decision-making patterns manifest. One way to elucidate these dangers is to extrapolate individual decisions to the aggregate level, moving from the micro to the macro level, and from the local, to the regional, national, and international levels.

4. A problem-solving approach will afford the most effective organizational structure for the instructional/learning arrangements with the following teaching methods being utilized: panels followed by open discussion, problem-solving groups, follow-up activities.

5. There is a need for a well-trained staff of professionals to work with key decision makers, to revise and update training materials, to coordinate and conduct workshops, etc. This may require the development of some types of resource center.

   A university facility such as the Environmental Studies Centre in Italy or Florida Resources Analysis Center Programme could be established.[3] Decision makers' reliance on experts, up-to-date information and research instruments makes it necessary that access to these services be made available.

[3]Fernald, E. A., "The Florida Resources Analysis Center Programme," in Environmental Education at Post Secondary Level, 1974.

B. ENVIRONMENTAL EDUCATION LEADERSHIP ORGANIZATIONS

Community organizations such as the Sierra Club, Friends of the Earth and Institute of Appropriate Technology which belong to this target population display the following characteristics:[4]

1. They have a direct interest in the environment and energy or in energy/environmental education as evidenced by completed, ongoing, or planned activities, programs.

2. They assume an active leadership role in acquiring and analyzing information relevant to energy/environmental problems and issues and developing programs to disseminate this information and hence raise the public's level of awareness and ability to understand and make decisions with regard to such problems or issues.

3. They have established an information transmission network capable of disseminating information through a variety of media, and/or conducting formal community training.

4. They embody a sphere of influence or contact which ranges from the membership of their organizations at local, state or national levels to individuals, groups and organizations in the community at large.

Working with representatives or "community educators" from these organizations who will, after participating in some form of training experience, plan and implement environmental education activities for members of their respective organizations, requires a different focus from that presented for key decision makers.

Some program and implementation specifications for these groups have been derived from the successful experiences of a project in Tallahassee, Florida which provided all types of community leaders with training in environmental studies.[5] The essential elements

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[4]The Sierra Club and the Friends of the Earth are based in San Francisco, Ca.; the Institute of Appropriate Technology is in Sacramento, Ca.

[5]Allen, Rodney, Community Leader's Training in Environmental Studies: An Action-Oriented Educational Program, Florida State University, Tallahassee, Final Report, June 30, 1976.

in this program were: (a) a workshop experience for leaders to increase their environmental awareness, (b) the development by the leaders of their own environmentally focused learning materials and projects for their respective members, and (c) the establishment of an environmental center at a local museum which the leaders were encouraged to use in planning and conducting educative experiences with their members.

The workshop experience, then, focused on training community leaders to be environmentally aware and sensitive, and to become skillful in working with their own community groups in environmental studies at the museum.

The following implementation specifications for this target group reflect an approach similar to that of the Tallahassee program:

1. The most effective program format for community educators/leaders from the energy/environmental leadership organizations will be a team learning, workshop experience. A team learning approach will require individuals representing different organizations to work together and hence facilitate and strengthen inter-institutional cooperation in dealing with environmental problems and issues.

2. An effective training sequence will include:

   a. introducing participants to the holistic energy/environmental education as specified in the Community Leadership Content Specifications,

   b. generating criteria and guidelines to assess the comprehensiveness of their current EE activities, projects or programs,

   c. assisting participants in adapting current efforts so their materials satisfy the criteria and, in turn, provide members with effective energy/environmental education activities.

3. The designation of an environmental center, such as the one established at the junior museum in Florida, will facilitate a cooperative working relationship between staff members and leaders from environmentally active organizations, thus ensuring that future EE activities and projects are the product of a long-term collaborative effort.

C. SERVICE-ORIENTED COMMUNITY ORGANIZATIONS

Working with community educators/leaders from service-oriented organizations such as church groups, the Lion's Club, the Junior Chamber of Commerce, and youth groups such as 4H or Boy/Girl Scouts, requires a third program focus. The implementation strategy described above, however, of coordinating efforts through some designated environmental center remains appropriate.

The most important element in working with individuals associated with these types of organizations will be either to stimulate their interest in energy/environmental education activities or to channel their interests into an appropriate avenue. A program designed to meet these needs will:

1. Provide an overview as to what constitutes holistic environmental education and how it relates to individual and community concerns and interests.
2. Present this content in an array of concepts, topics and competences.
3. Assist participants in selecting a holistic configuration of concepts, etc. that are of particular interest to their members.
4. Design and develop holistic, energy/environmental materials, activities, and programs for the organizations.

In addition to this type of program which places responsibility for developing materials on staff members at a particular center, it is important to make these organizations aware of alternative sources of information about energy/environmental education activities. This, in fact, would consist of learning about biases embodied in the great

variety of materials and how to assure that all perspectives are examined. "What to know" and "where or how to get the information" would be the central foci for this type of program.

The different approaches associated with each particular target group are summarized and displayed below. Even though the designated target populations require different training materials and resource assistance, all three programs can most effectively be implemented and coordinated through some type of environmental resource center.

IMPLEMENTATION APPROACHES FOR
THREE TYPES OF COMMUNITY LEADERSHIP GROUPS

	Top/Down	Bottom/Up	Through-The-Middle
Goal	Give decision makers a better understanding of systemic nature of energy/environmental problems and familiarity with complex decision-making/problem-solving models and forecasting as a tool for planning and policy formation	Provide organizations with an understanding of holistic energy/environmental education and criteria and guidelines for developing their own holistic materials, activities and programs	Provide these organizations with an introduction to holistic EE education and familiaring with services and materials provided by other organizations.
Instructional/ Learning Format	Conference	Workshop	Workshop
Role of Staff Members	• identify and contact participants and speakers/ experts • plan conference • adjust training materials and activities to needs of target group • coordinate data collection, resource exploration and research activities	• identify and contact organizations already involved in EE educative activities • conduct workshop • assist in development of holistic EE educative projects, materials • compile these projects into reference guides for use by other organizations • coordinate use of resource center's facilities by these organizations	• identify and contact organizations to make them aware of services available • conduct intro workshops • develop materials, projects, programs they can use with their membership • develop resource book of services and materials available from other organizations

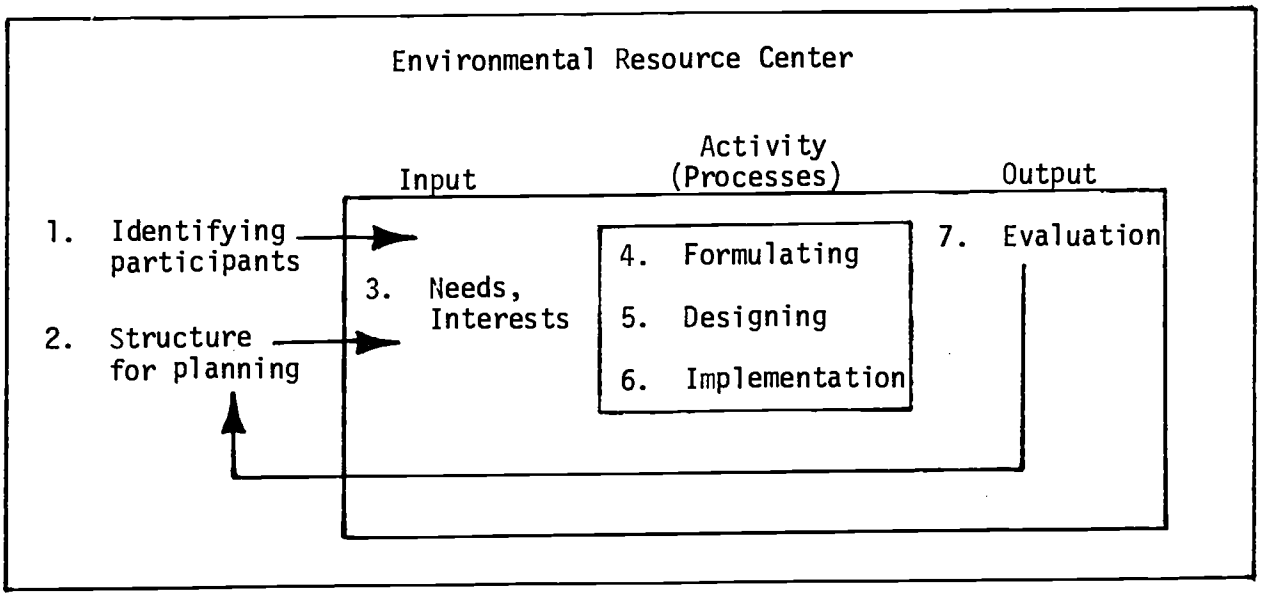
PART TWO
A TRAINING SYSTEMS MODEL

A. AN ADULT LEARNING SYSTEM MODEL

This section presents a learning system model or framework which systematizes the program/material specifications previously described. The model, which provides the framework, is adapted from the Andragogical Process designed by Malcolm S. Knowles specifically for adult learning experiences.[6] It involves the continuous circular application of the following seven steps:

1. Identifying and contacting participants
2. Establishing a structure for mutual planning
3. Assessing needs, interests
4. Formulating objectives of training experience
5. Designing instructional/learning arrangements
6. Implementing instructional/learning arrangements
7. Evaluating effectiveness of training experience

This process also may be displayed graphically in a simple model format indicating input, output and feedback entities which would be contained within the larger framework or context of an environmental resource center.



THE ANDRAGOGICAL PROCESS

[6] Ingalls, John D., A Trainer's Guide to Andragogy, revised edition, U. S. Department of Health, Education and Welfare, Social Rehabilitation Service, Washington, D. C., 1973.

B. DEVELOPMENT OF RESOURCES

Within each of these seven steps, guidelines and resources need to be compiled so Trainer's Guides can be developed for the staff personnel at centers who will be working with decision makers and community leaders from the designated target populations. The following discussion identifies some guidelines and resources to be developed.

1. Identifying and contacting key decision makers and community educators/leaders

   a. Establish criteria for identifying and selecting key decision makers and community educators/ leaders from community organizations. Factors which might be considered include:[7]

      (1) Are potential participants leaders of their organizations?

      (2) Do they have the connections necessary for effective follow-up?

      (3) Are they already interested or involved in environmental problems and issues?

      (4) Will their organizations co-operate?

      (5) If they are experts, should they be considered as a speaker or panel members?

   b. Generate guidelines for contacting potential participants and making them aware of services available through the resource center. Brochures and pamphlets may be designed to inform some audiences but personal contact will have to be made with decision makers and possibly with those

[7] These guidelines were generated by a Planning Committee of the League of Women Voters in their attempts to conduct environmental seminars for decision makers. See J. Bahnick, "Decision Makers Environmental Seminars," in Environmental Education at Post Secondary Level, 1974.

service-oriented organizations not currently engaged in environmental education activities. Guidelines for contacting decision makers need to focus on making these individuals aware of the relevance of the services provided at the center. A possible model for generating such guidelines is presented in Community Decision Making for Education Associations where 10 basic steps are outlined for identifying power and recommendations are made for communicating with these individuals.[8]

2. Establishing a structure for mutual planning

   Generate guidelines for establishing a mutual planning structure. This structure, established for each of the three target populations, is a critical element because it will supply a continuous source of data regarding the changing needs and interests of the organizations. This information will enable programs/materials/objectives, etc., to be revised and adapted. The planning structure, in maintaining a link with individuals who have participated in the workshops and conferences, also provides the potential for a communication network to be established.

   Guidelines for designing this planning structure and specifying its function more clearly may be derived from sources such as:

   Emery, F. E., and Trist, E. L., Towards a Social Ecology: Contextual Appreciation of the Future in the Present, London: Plenum Press, 1973.

   Michael, Donald N., On Learning to Plan--and Planning to Learn, San Francisco: Jossey-Bass Publishers, 1976.

   Warfield, John N., Societal Systems: Planning, Policy, and Complexity, New York: John Wiley & Sons, 1976.

3. Assessing needs and interests of participants and organizations which they represent

   a. Needs assessment instruments and other self diagnostic tools need to be designed more for awareness than for measuring. They need to be more concerned with setting broad program goals than defining terminal behaviors. These instruments must incorporate different procedures for assessing the areas of knowledge, skill and attitudes.

[8] National Education Association Division of Press, Radio, and Television Relations, Community Decision Making for Education Associations, Washington, D. C., 1972.

Assessment in the area of attitudes and values is the most difficult to tap and will require the design of some sensitive indicators, Pertinent discussions of elements to address in designing assessment instruments are found in Modern Practice of Adult Education and Self-Directed Learning.[9,10] A sample needs assessment instrument is presented in Educational Development Dissemination and Evaluation Training Resources, Series I, Planning developed by Far West Laboratory.[11]

b. Generate guidelines for utilizing such instruments, interpreting results and adapting program materials.

4. Formulating Objectives

a. Develop guidelines for translating needs and interests into program materials, and learning objectives. A model for organizing and displaying these guidelines is presented in Determining Instructional Purposes produced by Far West Laboratory.[12]

b. Generate criteria for assessing objectives. Sample criteria might be:

(1) Do they provide a balanced emphasis among the knowlege, skill and attitude categories?

(2) Are they future oriented?

(3) Are they holistic?

(4) Are they attainable within such constraints as the availability of time and other instructional/ learning resources.

Further criteria can be generated from guidelines presented in Preparing Instructional Objectives.[13]

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[9]Knowles, Malcolm S., The Modern Practice of Adult Education: Andragogy versus Pedagogy, New York: Association Press, 1970.

[10]Knowles, Malcolm S., Self-Directed Learning: A Guide for Learners and Teachers, New York: Association Press, 1975.

[11]Far West Laboratory for Educational Research and Development, Series I: Planning in Educational Development Dissemination and Evaluation Training Resources, San Francisco, 1975.

[12]Far West Laboratory for Educational Research and Development, Determining Instructional Purposes, San Francisco, 1975.

[13]Mager, Robert F., Preparing Instructional Objectives, Palo Alto: Fearon Publishers, 1962.

5. Designing instructional/learning arrangements

   a. Guidelines need to be generated for combining the following types of elements in designing an effective program format:

      (1) Format for group learning

         (a) clinic, institute, workshop

         (b) conference

         (c) course

      (2) Organizing framework

         (a) learning team approach where participants work together in small (4-6) task or problem oriented teams.

         (b) learning triad approach where each participant is considered the key focus of his/her own instructional system. A trainer assists each participant to purpose, plan and implement a training program responsive to his/her individual needs and interests. A third individual from the trainee's organization is identified and participates in the training experience in order to provide support and assistance when the trainee is involved in implementing environmental education activities in the host organization.

         (c) lecture approach where the trainer presents a pre-determined curricula to participants.

   b. Generate guidelines for designing and utilizing a problem-solving learning team approach. The one recommended for community educators may be derived from:

      Knowles, Malcolm S., "An Experiment With Group Self-Directed Learning: The Learning-Teaching Team," in The Changing College Classroom, Philip Runkel, Roger Harrison and Margaret Runkel (eds), San Francisco: Jossey-Bass, 1969.

      Koberg, Don and Bagnall, Jim, The Universal Traveler: A Companion for Those on Problem-solving Journeys, Los Altos, Ca: William Kaufmann, Inc., 1972.

6. Implementing instructional/learning arrangements

Develop guidelines for utilizing an instructional strategy such as the steps displayed below to present instructional/learning arrangements. This approach is based on an adaptation of the Life Skills Approach.[14]

(1) Concept presentation which includes orientation, problem introduction, overview, etc.

(2) Evocation which enables participants to assess what has been presented in the preceeding stage against their own interests, skills and needs and serves to permit feedback, clarification and goal-setting.

(3) Inquiry which involves interpretation, comparison, review, in-depth study, preliminary application and case study materials.

(4) Application in which participants practice, experiment and demonstrate the integration of newly acquired knowledge, skills and attitudes.

(5) Evaluation in which points are devised at each of the above steps and consist of group-based discussions "think points" and procedural reviews.

7. Evaluating training experience

a. Establish criteria for evaluating short and long-term effectiveness of training experience. Questions such as the following may provide indications as to the type of data to be gathered.

(1) Has there been greater individual and community involvement in environmental problems?

(2) Do the activities/projects/materials designed by community educators meet criteria for holistic environmental education derived from the Content Specifications?

(3) Have decision makers been able to utilize a systemic problem-solving/decision-making strategy?

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[14] For a more complete description of this strategy see "Life Skills, Power Plans," Instructional Simulations, Inc., St. Paul, Minnesota, 1972.

b. Develop systemic evaluation instruments

Guidelines for developing holistic evaluation instruments may be derived from sources such as:

Edwards, Ward; Guttentag, Marcia and Snapper, Kurt, "A Decision-Theoretic Approach to Evaluation Research," in Handbook of Evaluation Research, Elmer L. Struening and Marcia Guttentag, eds., Sage Publications, Inc., Beverly Hills, Ca, 1975.

Guttentag, Marcia, The Evaluation of Training in Mental Health, New York: Behavioral Publications, Inc., 1974.

SELECTED BIBLIOGRAPHY

Allen, Rodney, Community Leader's Training in Environmental Studies: An Action-Oriented Educational Program," Final Report, Florida State University, Tallahassee, Florida, 1976.

Bahnick, J., "Decision Makers Environmental Seminars," in Environmental Education at Post Secondary Level, Center for Educational Research and Innovation, Organization for Economic Co-operation and Development, Paris, 1974.

Center for Educational Research and Innovation, Environmental Education at Post Secondary Level, The Training of Generalists and Specialists, Organization for Economic Co-operation and Development, Paris, France, 1974.

Center for Educational Research and Innovation, Environmental Education at Post Secondary Level, Courses for Educators, Decision-Makers and Members of Professions Concerned with the Environment, Organization for Economic Co-operation and Development, Paris, France, 1974.

Edwards, Ward; Guttentag, Marcia and Snapper, Kurt, "A Decision-Theoretic Approach to Evaluation Research," in Handbook of Evaluation Research, Elmer L. Struening and Marcia Guttentag, eds., Beverly Hills: Sage Publications, Inc., 1975.

Emery, F. E., and Trist, E. L., Towards A Social Ecology: Contextual Appreciation of the Future in the Present, London: Plenum Press, 1973.

Far West Laboratory for Educational Research and Development, Series I: Planning in Educational Development Dissemination and Evaluation Training Resources, San Francisco, 1975.

Far West Laboratory for Educational Research and Development, Determining Instructional Purposes, San Francisco, 1975.

Fernald, E. A., "The Florida Resources Analysis Center Programme," in Environmental Education at Post Secondary Level, Center for Educational Research and Innovation, Organization for Economic Co-operation and Development, Paris, 1974.

Giacomini, V., "Information Seminars for Senators of the Republic," in Environmental Education at Post Secondary Level, Center for Educational Research and Innovation, Organization for Economic Co-operation and Development, Paris, 1974.

Giacomini, V., "Training Course on Environmental Policy," in Environmental Education at Post Secondary Level, Center for Educational Research and Innovation, Organization for Economic Co-operation and Development, Paris, 1974.

Guttentag, Marcia, The Evaluation of Training in Mental Health, New York: Behavioral Publications, Inc., 1974.

Ingalls, John D., A Tr iners Guide to Andragogy; Its Concepts, Experience and Application, Revised Edition, U. S. Department of Health, Education and Welfare, Social Rehabilitation Service, Washington, D. C., 1973.

Knowles, Malcolm S., "An Experiment with Group Self-Directed Learning: The Learning-Teaching Team," in The Changing Classroom, Philip Runkel, Roger Harrison, Margaret Runkel, eds., San Francisco: Jossey-Bass, 1969.

Knowles, Malcolm S., The Modern Practice of Adult Education: Andragogy versus Pedagogy, New York: Association Press, 1970.

Knowles, Malcolm S., Self-Directed Learning: A Guide for Learners and Teachers, New York: Association Press, 1975.

Koberg, Don and Bagnall, Jim, The Universal Traveler: A Companion for Those on Problem-solving Journeys, Los Altos, Ca.: William Kaufman, Inc., 1972.

Lawrence, Paul R. and Lorsch, Jay W., Developing Organizations: Diagnosis and Action, Reading, Massachusetts: Addison-Wesley Publishing Company, 1969.

Mager, Robert F., Preparing Instructional Objectives, Palo Alto: Fearon Publishers, 1962.

Michael, Donald N., On Learning to Plan - and Planning to Learn, San Francisco: Jossey-Bass Publishers, 1976.

National Education Association Division of Press, Radio and Television, Community Decision Making for Education Associations, Washington, D. C., 1972.

Warfield, John N., Societal Systems: Planning, Policy, and Complexity, New York: John Wiley & Sons, 1976.