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ABSTRACT

This publication reviews the literature pertaining to teacher education in, about, and for environmental education. The first section includes the definition, goals, and objective of environmental education. The second section summarizes the recent and current status of environmental education in elementary and secondary schools in the United States, with attention to implications for teacher education. Sections III and IV deal with foundation and content competencies for environmental educators. Section V addresses current teacher education activities in the field, and the sixth section summarizes trends and issues in preservice and inservice teacher education for environmental learning. A list of 52 references is provided. (KR)

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TRENDS AND ISSUES RELATED TO THE PREPARATION OF TEACHERS FOR ENVIRONMENTAL EDUCATION

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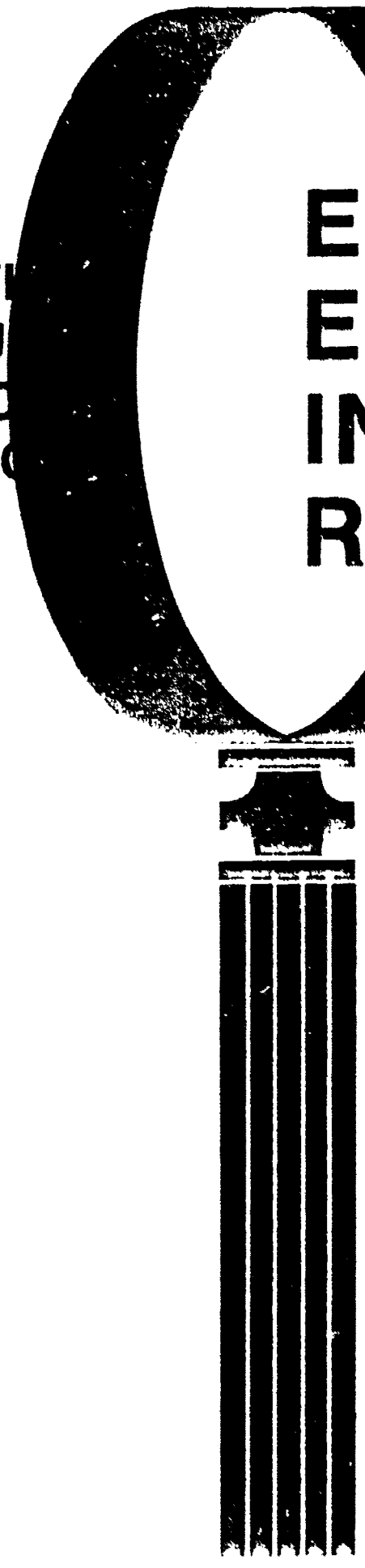

ENVIRONMENTAL EDUCATION INFORMATION REPORT

THE ERIC SCIENCE, MATHEMATICS AND
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in cooperation with
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SECTION I: INTRODUCTION

Definitions of "environment" are structured in either of two ways--by identifying humans as an integral part of the environment (i.e., humankind in environment, as one participating species), or by defining the environment as the surroundings of humans (i.e., humankind and environment, humans being considered separately from environment, with "environment" thus defined as "everything else"). In either case, the primary reason for interest in environment relates to the actual and potential interactive impacts between humans and everything else. Most (but not all) of the time, human interest in and concern for environment is based on species self-interest--the view that, if the environment is not properly regarded, treated, and managed, the human race will individually and collectively, sooner or later, suffer dire consequences.

In any case, the present-day concept of "environment" encompasses the man-made physical environment and the political, economic, cultural, technological, social and aesthetic environments, as well as the bio-physical natural environment. In all modern contexts, the environment is conceptualized as a dynamic system, its subsystems in continuous interaction with one another. Thus, it is essential for those concerned with environment to know about the subsystems, and to comprehend the dynamics of their interactions. The questions of depth of knowledge needed about each subsystem, and the necessary level of understanding of those interactions, make teaching and learning about the environment a particularly complex educational and pedagogical problem, just as they make identifying appropriate relationships with "everything else" a difficult concern.

Learning in and about the environment has been practiced since the times of the earliest civilizations. As scientific knowledge of the environment has broadened and deepened, educational responses have attempted to keep pace. Initiation of and progress in the science of ecology have led to increasingly more thorough understandings of the intricate interactions and interrelationships within the natural environment. As this has occurred, the meaning of the term "environment" has broadened from its original sense--limited to the biological study of plants and their environments, in an ecological sense--to more recent connotations of the totalities of complex environmental interdependencies, whether local or global. Today, the term "environment" has come to incorporate and focus on considerations of humankind as the primary disturbing agent in the environment.

Environmental Education: Definition, Goals, Objectives

The most significant trend in environmental education over the past two decades has been a pronounced shift from its historical antecedents--nature study, outdoor education, and conservation education--to what is now known as "environmental education." This change has not been a complete one, in that all three antecedents continue to exist in schools, and in teacher education programs, along with more modern approaches. The mixture is an uneven one, such that emphases in both school programs and teacher education institutions vary from institution to institution, program to program, course to course, school to school, and individual to individual.

During the 1970s, the term "environmental education" came into common usage. Early definitions by Stapp (1969) and R. Roth (1970) were echoed in a 1970s Unesco goal statement which is still generally accepted and frequently reprinted (for

example, Unesco Institute for Education, 1985, p. 3). The Unesco goal statement (Barry, 1976, p. 1) contains an implicit embedded definition:

> *...to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.*

This basic goal has been organized into three sub-goals (Muthoka and Rega, 1985, p. 9):

1. *To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas.*

2. *To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills to protect and improve the environment.*

3. *To create new patterns of behavior of individuals, groups and societies as a whole towards the environment.*

A useful expansion of this definition and goal set differentiates between education which focuses on acquiring cognitive knowledge about the environment and education which leads to the development of responsible environmental behavior among learners. Lucas (1972) made an analysis of education in, about, and for the environment, while Harvey (1977) referred to the "about" and "for" aspects as "people-environment relationship foundations" and "people- environment relationship education," respectively. The former, the informational or content component, is seen as perquisite to the latter, which has an explicit behavioral component. The caveat is that cognitive knowledge ("foundations") is not sufficient in itself to achieve the commitments identified and the behavioral results desired ("education") (Iozzi, 1989, p. 4).

The following objectives, in this instance as stated by the Unesco Institute for Education (1985, pp. 3-4), are typical of those identified for environmental education:

1. *Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.*

2. *Knowledge: to help individuals and social groups acquire basic knowledge of the total environment, its associated problems, and humanity's critically responsible presence and role in it.*

3. *Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment, and the motivation for actively participating in its protection and improvement.*

4. *Skills: to help individuals and social groups acquire the skills for solving environmental problems.*

5. *Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic, and educational factors.*

6. *Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.*

These objectives are best interpreted as a hierarchical set, such that they progress more or less sequentially from awareness to action--as do learners. They have been stated somewhat differently by Hines, et al. (1986, pp. 1-8), as attributes which must be possessed by individuals before they will exhibit responsible environmental behavior--and thus attributes which must be learned (and taught):

1. *Knowledge of relevant environmental concepts;*
2. *Knowledge of environmental problems and issues;*
3. *Concern for the quality of the environment;*
4. *Knowledge of action strategies that may be used for resolving an issue;*
5. *Belief that their action can make a difference;*
6. *Commitment to take action; and*
7. *Experience in action-based activities.*

Environmental Education: Evolution

Environmental education is evolving in response to a variety of stimuli ranging across the spectrum of academic disciplines of the biophysical and sociocultural sciences, and has proved to be difficult to incorporate within existing educational systems. In addition to the diversity of disciplines about which a good deal of cognitive information needs to be taught and learned, there are the additional problems of developing understandings of the myriad interrelationships involved and working toward changes in human behavior. As in all educational pursuits, depth and breadth of knowledge of the teacher must be carefully developed, as must pedagogical skills. But the complexity of expectations compounds the situation, with respect to environmental education--teaching and learning.

During the 1980s, a national focus on excellence in education was heavily promoted in the United States. One of the areas where excellence is necessary, if excellence in education is to be achieved, is teacher education:

> *...the key to success lies in creating a profession equal to the task--a profession of well-educated teachers prepared to assume new powers and responsibilities to redesign schools for the future. Without a profession possessed of high skills, capabilities and aspirations, any reforms will be short-lived.* (Task Force..., 1986)

In many ways, environmental education needs to mirror standard educational practice in teacher education, and needs to recognize its necessary and appropriate involvements in the total formal education enterprise. But there are differences:

> *Assume that conceptual development, coupled with environmental action skills, will lead to more effective environment-oriented behavior. If so, a logical conclusion is that teachers need those elements, plus teacher education basics.*

> *But environmental education curriculum development appears to have followed models not proved successful in changing school practice. We need to rethink some of the change processes that appear to impede, rather than promote, the conditions envisioned by much of the environmental education literature.* (Hart, 1990).

Teacher Education for Environmental Education

This publication reviews the literature pertaining to teacher education in, about, and for environmental education. The next section summarizes the recent and current status of environmental education in elementary and secondary schools in the United States, with attention to implications for teacher education. Sections Three and Four deal with foundation and content competencies for environmental educators. The following Section addresses current teacher education activities in the field, while the Sixth Section summarizes trends and issues in pre-service and inservice teacher education for environmental learning.

SECTION II: STATUS OF ENVIRONMENTAL EDUCATION IN PUBLIC SCHOOLS

Environmental education has established a presence in U. S. public schools, though it might be more accurately described as a toehold. Because its advocates stipulate that it should be included at all grade levels, and in most (if not all) subject matter curricula, it is difficult to get a reliable estimate of how much of it is actually accomplished. Surveys of commercial textbooks, state- and local-level mainstream curriculum documents, and (on occasion) classroom teachers suggest that it is not pervasive--but there is "some."

Information about the practice of environmental education in the schools may be secured from those professional staff members employed by the state education agencies who have assigned responsibility for it. During 1987, ERIC/SMEAC surveyed these individuals (Disinger,1987), asking respondents to summarize their perceptions of the extent of inclusion of environmental topics in school curricula in their states.

Responses were received from 40 of the 50 states. Results indicated that environment-related instruction was included in the curricula of 80 percent of the elementary schools in nearly 45 percent of the responding states, and in the curricula of 80 percent of the secondary schools of nearly a third of the responding states. In elementary schools, the most commonly reported forms of environmental education were nature study (listed as "commonly found" in 85% of the states reporting), energy education (in 69%), and outdoor education and conservation education (both at 67%). In secondary schools, energy education and science-society-technology-environment education (both listed as "commonly found" in 80% of the states reporting), conservation education and marine/aquatic education ("commonly found" in half of the states), and outdoor education and population education (both "common" in 44% of the states) were most frequently mentioned.

Rarely was a separate subject labeled "environment-" found. Five states reported the existence of occasional separate environmental courses at the elementary level, while eleven states reported the existence of occasional separate courses at the secondary level. Infusion of environmental topics was noted at the elementary level of 39 of the 40 states reporting, and at the secondary level in 36 states. In nearly all instances, in both elementary and secondary schools, science courses were reported as"hosts" for the infusion of environmental topics; social studies courses were listed iess frequently, and other subjects only occasionally.

The implications for teacher education are obvious. It may be a chicken-egg conundrum, but with so few offerings of "environment" courses in schools, there is little demand for distinct environment-related courses for pre-service teachers. Because science is the typical host subject, the normal expectation is that environment-related content and methods might be included in content and methods courses in science, or the sciences. But rarely is there a mandate for inclusion of environment in such courses; typically their instructors are strongly oriented to the standard science disciplines--biology, chemistry, physics, and/or the earth sciences (Weis, 1990, p. 1116). College- level content courses carrying the "environment-" label (viz., environmental science), are becoming more prevalent, but they are by no means ubiquitous. Though they do in several states they do not typically qualify for certification credit for science teachers.

Environment: Multidisciplinary, Interdisciplinary

If "environment" were itself a discipline, the situation might be different, but by its nature "environment" is at least multidisciplinary, and optimally interdisciplinary. The fact that "environment" is concerned with disciplines beyond the natural sciences compounds the pedagogical problem in the same manner as it compounds the management problem; because environmental decisions are made in the socio-politico-economic milieu, they are realistically constrained by realities defined by the natural sciences.

There is a precise pedagogical parallel with respect to the social studies. In this case, the bottom line is that the scientific bases of environmental concerns are outside the specific domains of the social studies, and therefore not normally part of the subject matter backgrounds of those who teach in the social sciences.

With the exception of those preparing for secondary school science teaching, few pre-service teachers study the natural sciences beyond the basic minima required by their institutions of matriculation or their certifying agencies. Thus, it is unlikely that teachers who are not science teachers will possess the rudiments of scientific knowledge basic to any sufficient understanding of the realities of environmental problems.

Similar parallels pertain to the social studies. At the pre-service level, only those preparing to become social studies teachers receive sufficient training to develop understandings of anything beyond the rudiments of the social sciences. Thus, those trained as science teachers are likely to be deficient in their understanding of the social studies; those trained as social studies teachers are likely to be deficient in their understanding of the natural sciences. The multi- and interdisciplinary dimensions of environmental concerns are not typically addressed in the pre-service training of either science or social studies teachers.

Pre-service elementary school teachers rarely are obligated to study either the biological/physical sciences or the social sciences in depth, nor do they elect to do so. Even if they do, little conscious effort is made to develop understandings of multidisciplinary, much less interdisciplinary concerns. As Coon (1980, p. 3) has noted:

> *Teacher education in environmental education poses special problems. State legislatures and state boards of education mandate new standards which force colleges or departments of education to add more professional education courses to teacher training programs. This is done despite the demand by many critics that undergraduate teacher education institutions reduce professional education courses so as to permit students to take more work in the academic area(s) they are preparing to teach, and despite the interest of college students in environmental problems and solutions...*

A similar point was made more strongly in *A Nation at Risk*:

> *The teacher preparation curriculum is weighted heavily with courses in "educational methods" at the expense of courses in subjects to be taught. A survey of 1350 institutions training teachers indicated that 41 percent of the time of elementary school teacher candidates is spent in education courses, which reduces the amount of time available for subject matter courses.* (Gardner, 1983, p. 22)

Coon continues (1980, p. 3):

> *Additionally, the academic areas in colleges and universities have organized courses taught in their disciplines into tight, discrete packages with little opportunity for instructors to deviate from syllabi. It has been said that many undergraduate courses are taught with an emphasis on specific content which assumes that every student is interested in earning a Ph.D. in that department. Relatively few college courses are available which offer opportunity for multidisciplinary study of environmental problems.*

Wilke (1985, p. 1) has commented that "....teacher education programs in environmental education remain relatively scarce and poorly developed," also referencing a statement from Unesco's 1977 Trends in Environmental Education report:

> *Well-developed and strongly supported curricula in environmental education for students training to be teachers do not pervade tertiary level institutions at this time; such efforts seem to be limited to individual exemplary efforts dotted around the globe.* (Selim, 1977).

Few teacher education programs are designed or equipped to prepare effective teachers of environmental education, partly because they do not recognize environment as a unique curriculum area or as a significant component of existing (disciplinary) curriculum areas, partly because not enough time is available to study the academic content of environmental topics, and partly because the academic world (including, but not limited to, the subset involved in teacher education) has not yet come to grips with the somewhat unique demands of interdisciplinarity. In the next two sections, sets of necessary competencies for teachers of environmental education are proposed, detailed, and discussed. Section III deals with Foundation Competencies, and Section IV with Content Competencies. The discussions are initiated on work reported by Peyton, Hungerford, and Wilke (1980, pp. 189-196), with attention to amplifications and variations suggested by a number of investigators and practitioners over the past decade.

SECTION III: FOUNDATION COMPETENCIES FOR TEACHERS OF ENVIRONMENTAL EDUCATION

In 1980, Peyton, Hungerford, and Wilke described two sets of competencies for teachers of environmental education--an "environmentalized" professional education foundations set, and a content set to provide guidance in the selection of specifics to be studied and learned. The first set is presented and discussed in this Section, and the second set in Section IV.

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Foundation Competencies in Professional Education
(from Peyton, Hungerford, and Wilke, 1980, pp. 191-192)

The effective environmental education teacher should be able to...

1. ...apply a knowledge of educational philosophy to the selection (and/or development) of curricular programs and strategies to achieve both general education and environmental education goals. It is important that all educators be aware of the philosophical basis for education in their own society. Environmental education goals and methods should be evaluated in light of such philosophies as Experimentalism or Reconstructionism. Many accepted goals of general education supported by such philosophies are entirely consistent with environmental education goals. General education materials and methods may sometimes need to be "environmentalized" to achieve the goals of each.

2. ...utilize current theories of moral reasoning in selecting, developing and/or implementing environmental education curricula in order to effectively achieve accepted goals of environmental education with selected receiver groups. Included in this category of "moral reasoning" are not only theories of moral development, but theories of valuing processes as well. Environmental education teachers should be competent to assess the developmental readiness of receivers when dealing with attitudes and processes in the affective domain. Teachers should be able to use strategies which allow receivers to recognize the role of values in environmental decision making, clarify value positions, and understand the valuing process.

3. ...utilize current theories of knowledge/attitude/behavior relationships in selecting, developing and/or implementing a balanced curriculum which maximizes the probability of desired behavior changes in receivers. Environmental educators often assume linear relationships among ecological knowledge, positive environmental attitudes, and environmentally ethical behavior. Current research indicates that such may not be the case. Many variables impinge on environmentally ethical behaviors, including various categories of knowledge (i.e., ecological knowledge vs. trade-off costs), experiences, and locus of control (internal or external). A balanced and syntactically sound curriculum is necessary to achieve environmental education goals.

4. ...utilize accepted learning theory (e.g., Piaget, Bruner, Gagne) in selecting, developing, and/or implementing curricular materials and teaching strategies to effectively achieve environmental education goals with selected receiver groups. The nature of many environmental education goals is problem

solving. Learning theory has much to offer in guiding the selection of materials and strategies to develop problem solving abilities. Selection of appropriate environmental education materials and strategies for specific receiver age levels may be effective when theories of learning development are considered. A pragmatic approach to this body of knowledge would do much to increase the effectiveness of environmental education teachers.

5. ...teach for the transfer of learning to insure that learned knowledge, attitudes, and cognitive skills will be transferred to lifestyle decision-making by receivers. The ultimate goal of environmental education is to produce environmentally literate citizens who are willing and capable of taking positive environmental action in their lives. Too often, educators fail to teach for the transfer of knowledge, attitudes, and cognitive processes learned in the classroom, to use in problem solving in students' lives.

6. ...select and implement effective instructional methodologies to achieve environmental education goals appropriate for desired cognitive and affective outcomes, receiver characteristics, and available facilities (e.g., time, money, personnel):

   a. outdoor education methods.

   b. affective education methods (e.g., values clarification, Bank's inquiry model, moral dilemma model).

   c. simulation games (including role playing).

   d. case study methods.

   e. community resource use (ecological, issue-related, human resources).

   f. methods of autonomous student and/or group investigation and evaluation of environmental issues.

   g. methods for effectively handling controversial environmental issues.

7. ...use effective means of planning for instruction.

8. ...effectively infuse environmental education curricula and methods into all appropriate disciplines.

9. ...effectively evaluate environmental education instructional outcomes in cognitive, affective, and behavioral domains.

****

The above provides a straightforward outline and rationale of foundational competencies which might be applied, with modest modifications, to any curricular area, or to the educational enterprise in general. Taken together, they represent idealized competencies which are desirable in, arguably necessary for, any educator, regardless of what he/she teaches. At the very least, the list can serve as a summary of the competencies needed by an educational system, in terms of what it should be equipped to do for its students and community.

For present purposes, the particular value of the list and accompanying discussion is that it is environmentalized. It clearly indicates that environmental education is closely aligned with general education, and that pedagogical competence in environmental education, and principles of sound teacher education practice for environmental education, do not differ radically from those associated with traditional curriculum areas. However, they do indicate concerns which make environmental teaching different from teaching about the discrete disciplines, in the sense that it must be broader. At the heart of the problem is the necessity of multidisciplinary content and interdisciplinary perspective.

SECTION IV: CONTENT COMPETENCIES FOR TEACHERS OF ENVIRONMENTAL EDUCATION

The question of what to teach presents a particular problem when the topic is environment. "Environment" is not itself an academic discipline; its content is drawn from several disciplines. Starting from the definitions, goals and objectives presented earlier, environmental educators have over the past two decades developed descriptions of necessary content which seem to be generally appropriate and accepted. These in place, the next questions emerge: how are these elements of content related to one another, how can they be taught, and...what do we expect learners to do with knowledge gained? These questions are addressed, but not resolved, in this section, starting from a list of "content competencies" published by Peyton, et. al, in 1980.

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Content Competencies in Environmental Education
(Peyton, Hungerford, and Wilke, 1980, pp. 192-194)

Level I: Ecological Foundations

The effective environmental education teacher should be able to...

1. ...apply a knowledge of ecological principles to the analysis of environmental issues and identify key ecological principles involved.

2. ...apply a knowledge of ecological principles to predict the ecological consequences of alternative solutions to environmental problems.

3. ...be sufficiently literate in ecology to identify, select, and interpret appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental problems.

4. ...communicate the major concepts in ecology and their implications for environmental quality. A partial listing of ecological concepts is presented below to provide examples of how this competency should be further operationalized. The criteria for further development and selection should include the usefulness of the ecological concept in understanding man's dependence on a stable, productive ecosystem for survival, and how man's activities impact on ecosystems.

   A. Individuals, populations, communities, and ecosystems represent legitimate organizational levels in nature which must use homeostatic mechanisms to cope with the laws of the universe (i.e., laws of thermodynamics) and the forces of change in the environment, in order to survive.

   B. Energy flows through and must recycle in ecosystems.

   C. Succession is the process of ecosystems changing with time, generally from a less complex stage to a more complex and mature stage.

   D. The population as an organizational level is the basic unit of the ecosystem. Each population occupies a specific functional niche which

"fits" into the organization of the ecosystem (e.g., as part of the energy flow and biogeochemical cycles).

Level II: Conceptual Awareness

The effective environmental education teacher should be able to select, develop and/or implement curricular materials which will make receivers aware of...

1. ...how man's cultural activities (e.g., religious, economic, political, social, etc.) influence the environment from an ecological perspective.
2. ...how individual behaviors impact on the environment from an ecological perspective.
3. ...a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.
4. ...the viable alternative solutions available for remediating discrete environmental issues and the ecological and cultural implications of these alternative solutions.
5. ...the need for environmental issues investigation and evaluation as a prerequisite to sound decision-making.
6. ...the roles played by differing human values in environmental issues and the need for personal values clarification as an integral part of environmental decision-making.
7. ...the need for responsible citizenship action (e.g., persuasion, consumerism, legal action, political action, ecomanagement) in the remediation of environmental issues.

Level III: Investigation and Evaluation

The effective environmental education teacher should be competent to investigate environmental issues and evaluate alternative solutions, and to develop, select and/or implement curricular materials and strategies which will develop similar competencies in receivers, including...

1. ...the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information and to synthesize the data gathered).
2. ...the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.
3. ...the ability to identify alternative solutions for discrete issues and the value perspectives associated with these solutions.
4. ...the ability to autonomously evaluate alternative solutions and associated value perspectives for discrete environmental issues with respect to their cultural and ecological implications.

5. ...the ability to identify their own value positions related to discrete environmental issues and their associated solutions.

6. ...the ability to evaluate, clarify, and change their own value positions in light of new information.

Level IV: Environmental Action Skills

The effective environmental education teacher should be competent to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of environment, and to prepare, select, and/or implement curricular materials and strategies which develop similar competencies in receivers to take individual or group action when appropriate (i.e., persuasion, consumerism, political action, legal action, ecomanagement, or combinations of these action categories).

****

A more detailed set of content parameters has recently been proposed by Ballard and Pandya (1990), as a product of a cooperative project between the State University of New York's College of Environmental Science and Forestry at Syracuse and the Centre for Environment Education of Ahmedabad, India, with the support of the Office of International Affairs of the U. S. Department of the Interior's Fish and Wildlife Service. Though this set was developed independently of the 1980 list and does not focus on teacher skills, it deals with the same general content areas as addressed by Peyton, et al., under "Ecological Foundations" and "Conceptual Awareness." In the 1990 set, no specific mention is made of direct teaching for the development of competencies in "Investigation and Evaluation" or "Environmental Action Skills," though the concerns themselves are addressed as topics to be considered--perhaps in a more academic sense. In any case, they also indicate the breadth of content areas--disciplines--which are typically considered necessary with respect to environmental learning.

The 1990 set (Ballard and Pandya, 1990) includes:

A. Natural Systems

1. General
   a. Environment
   b. Earth
   c. Biosphere

2. Abiotic Components
   a. Energy
   b. Atmosphere
   c. Land and Soil
   d. Water

3. Biotic Components
   a. Plant
   b. Animal

4. Processes
   a. Weather and Climate
   b. Biogeochemical Cycles
   c. Evolution and Extinction

5. Biological Systems
   a. Ecosystems
   b. Food Chains and Webs
   c. Community
   d. Population
   e. Habitat and Niche

B. Resources

1. Natural Resources
   a. General
   b. Distribution and Consumption
   c. Management and Conservation
   d. Sustainable Development

2. Abiotic Resources
   a. Energy and Minerals
   b. Water
   c. Land and Soil

3. Biotic Resources
   a. Forests
   b. Wildlife and Fisheries
   c. Biodiversity

4. Degradation of Resource Base
   a. Limits to Systems
   b. Pollution

C. Human Systems

1. Humans and Environment
   a. Humans as Part of Environment
   b. Human Adaptation to Environment
   c. Human Influence on Environment
   d. Population Factors

2. Technological Systems
   a. Agriculture
   b. Settlements
   c. Manufacturing and Technology

3. Social Systems
   a. Economic Systems
   b. Sociopolitical Systems
   c. Culture and Religion

4. Environmental Awareness and Protection
   a. Values and Ethics

b. Education and Communication
c. Participation/Voluntary Action
d. Legislation and Enforcement

The content dimensions of environmental education are generally accepted by its participants and researchers as similar to those advanced in the two sources cited above--strong emphasis on the natural and social sciences, with significant attention to the humanities in terms of values and ethics. There is generally implicit, and sometimes explicit, reference to interdisciplinarity, beyond multidisciplinarity.

Only recently has there been strong, explicit support for the emphasis on the "environmental action skills" advanced by Peyton, et al. The outspoken practitioners of instruction in this area have been prolific, persuasive, and rigorously scholarly in written publication, and well organized among themselves for some time, but teaching for environmental action is only now becoming a significant part of formal education curricula. Likewise, it is beginning to permeate teacher education programs. There seems to be an absense of consensus among those involved in teacher education as to whether or not it is appropriate for teachers in schools to teach explicitly for environmental action, so change in this respect has been difficult to come by. Frequently, explicit instruction in teacher education programs, including those involving environmental education, does not stress this aspect. But there is "more of it" now than in the past.

Environmental educators frequently appear to make implicit, sometimes naive, assumptions about the relationship between knowledge and propensity to take action. They do not generally spell out an objective related to the teaching of action skills, nor do they speak against it; they seem to assume that if students are taught what problems (including environmental problems) are, they will alter their personal behavior accordingly, and also will work effectively in a societal framework toward their solutions. The "action" component is often missing from environmental education curricula, including teacher preparation programs. There is, however, an element of "preaching" or "moralizing" that often appears in environment-related instruction (Steinhart, 1985, pp. 10-13) which suggests that many teacher preparation programs have not dealt effectively, if at all, with the behavioral dimension. Knapp (1990, pp. 301-304) has raised a particularly significant question--whose values will determine what environmental actions we will teach for--those of the curriculum planner, the teacher, or the student? He proposes that the development of action skills must start with values clarification procedures.

SECTION V: CURRENT ACTIVITIES IN TEACHER EDUCATION FOR ENVIRONMENTAL EDUCATION

With respect to the training of teachers in general, the *Report of a Panel on the Preparation of Beginning Teachers* (Boyer, 1984) suggested three areas of knowledge and skill that are essential for beginning teachers:

> *Knowledge of curriculum, which addresses knowledge of what to teach and how it is assessed,*
>
> *Knowledge of students, which addresses knowledge of characteristics of students as individuals and of how individuals learn, and*
>
> *Knowledge of setting, which deals with knowledge of the dynamics that make up the workplace and tasks of teaching*. (Duschl, 1989, p. 3).

From time to time, descriptive reports of teacher education programs for environmental education appear in the literature, though no comprehensive survey of the characteristics of such programs has been published. A decade-old collection of such reports (Bowman and Disinger, 1980) included examples in a number of areas falling under the environmental education umbrella--programs in areas such as outdoor education, resource-use education, conservation education, marine education, energy education, environmental studies, and environmental science. Many of the programs described in that volume are still extant, and still evolving.

Content Emphases

Inspection of more recent reports indicates that similar types of environment-related teacher education programs continue to exist, but that additional emphases have begun to emerge. Among these newer emphases are Science-Technology-Society (STS) Education, typically associated with science education efforts, and Global Education, generally associated with social studies education efforts. There is at least some direct crossover between environmental education and STS education (Rubba, 1987), while environmental aspects are a necessary consideration in global concerns. With respect to the relationship between environmental education and STS, Volk (1984) commented:

> *The new emphasis in the science education community on societal issues, their investigation/evaluation and resolution, could add considerably to the "respectability" of environmental education, especially if environmental educators continue to strengthen their posture of serious issue-oriented education.*

Using an environmental studies focus, Disinger and Schoenfeld (1987) published a collection of reports of environment-related instructional programs in colleges and universities; many of them included attention to teacher education, sometimes as one of several emphases. Among programs reported which had significant teacher education dimensions were:

--The University of Michigan's School of Natural Resources program in Environmental Education, Advocacy, and Communication, in which students develop expertise in the biophysical and technical aspects of natural resource and

environmental issues as well as in the areas of environmental education, advocacy, and communication (Bryant, et al., 1987);

--Ball State University's Department of Natural Resources curriculum, based in natural resource science and technology, focused in part on equipping teachers with an environmental literacy and featuring interrelated thrusts in resource conservation, environmental protection, and environmental education (Hibbs, 1987);

--Montclair State's New Jersey School of Conservation, which focuses on providing elementary and secondary school students, college undergraduates and in-service teachers with field experiences intended to increase their knowledge and awareness of environmental problems and their possible solutions (Kirk, 1987);

--Western Washington University's Huxley College of Environmental Studies, which stresses interdisciplinary interactions in a curriculum featuring environmental pollution, environmental ethics, and environmental decisionmaking (Miles, 1987);

--The University of Vermont's Environmental Program, which offers a coordinate environmental studies major in secondary education with the University's College of Education and Social Service (Reidel, 1987); and

--Murray State University's Center for Environmental Education, which offers preservice environmental education training for undergraduate students integrated into their student teaching experience, as well as an extensive in-service program (Wilson and Judy, 1987).

A survey by Weis (1990) provided an overview of environmental science programs in undergraduate education; though her study was not directed at teacher education, it does provide clues for course and programmatic opportunities currently available for pre-service teachers. In particular, this report addresses both semantic and practical difficulties in establishing environmental science programs in college and university settings.

Pedagogic Emphases

Butts (1989, pp. 123-130) asserts that the skilled science teacher is developed, rather than trained, as "the product of combining the essential elements of four research areas--the content of science, problem solving, environmental essentials, and personal involvement." (His reference to "environment" is in the sense of the classroom, or educational, environment). From this starting point, he identifies four phases of development as a teacher, beginning with the prospective teacher's matriculation in a teacher education program:

--Exploration of what being a teacher means;

--Practice in the organization of ideas for instruction;

--Student teaching; and

--The first two years of professional teaching.

This conceptualization is also appropriate for environmental education, and for teaching areas in general. However, it does not address the specifics of either science education or environmental education.

With respect to the training of science teachers, Duschl (1989, p. 7) has pointed out that "the design of instruction and the preparation of teachers should be consistent with the goals set for science education." His remarks are appropriate with respect to education dealing with the environment, particularly with respect to his assertion that "the dilemma which faces our colleges of education is how to design instruction and prepare teachers to deliver instruction that can bridge this chasm" (i.e., "the widening gap between scientists' conceptualization of science's concepts and processes, and the average citizen's conceptualization of the same concepts and processes"). He points out that many science teachers are intellectually tied to the science areas represented in the standard school curriculum (biology, chemistry, physics, earth sciences) and "see their primary goal as one of passing on the substance of such disciplines to as many students as possible." (Yager, 1984, p. 52). Thus, the general education objective is obviated.

In terms of instruction in science for students and for prospective teachers, Connelly, et al. (1977, p. 18) have suggested four goals:

> *To develop an understanding of the most important content;*
>
> *To develop an understanding of the parts of a pattern of enquiry;*
>
> *To develop the reading skills and habits of mind so as to be able to identify and understand knowledge claims;*
>
> *To develop the evaluative skills and habits of mind so as to be able to assess the status of knowledge claims.*

These goals are generally consistent with those stated earlier as foundational competencies for environmental education by Peyton, et al. They clearly support an emphasis on the development of creative skills, which C. Roth (1988) has pointed out are embedded in and achievable through environmental education.

At its 1989 annual conference, the North American Association for Environmental Education hosted a symposium entitled "Preparing Classroom Teachers to be Environmental Educators" (Engelson and Disinger, 1990). Many of the papers described in the remainder of this section were presented at the symposium; use was made of a summary paper by Hart and Robottom (1990, pp. 97-105).

In terms of applied aspects of preservice teacher education in environmental education, Lubbers (1990, pp. 19-23) has described the use of cooperative learning as a pedagogical strategy for environmental education and as environmental education content in teacher education courses. His purpose in emphasizing cooperative learning was the development of conflict resolution skills applicable for students. In Lubbers' view, cooperative learning represents the ultimate teaching method for developing in students the management skills associated with the resolution of societal/environmental issues. Lubbers' interest is in reinforcing behaviors identified as linked with developing "productive and effective members" of conflict management groups.

Champeau (1990, pp. 25-36) has reported a research study which examined perspectives of pre-service education students on course work in environmental education. In Wisconsin, nearly all pre-service teachers are required to have training in environmental education, which is mandated across the curriculum in the schools of the state. Students were surveyed after a course to determine their perspectives on effectiveness of the course in preparing students for this mandate. After reviewing the state's environmental education goals and the objectives used in the development of the assessment instrument, the paper demonstrates the perceived match between course activities and outcomes on the one hand, and the state's mandated goals on the other. The paper indicated that students perceive a need for mandated preservice training in environmental education. They also perceive their environmental education coursework as being instrumental in motivating them to include environmental concerns in their teaching. After presenting data relating to students' perceptions of the value of mandated environmental education, the conclusion reached by Champeau was that "mandates or requirements are effective in putting bodies in desirable places."

In-service Teacher Education for Environmental Education

The primary thrust of this document has been preservice teacher education for environmental learning. However, much of the effort in the field has targeted in-service teachers because, historically, very few on-the-job teachers received environment-focused instruction, either pedagogical or content- specific, during their preservice training. There are two reasons for this-- the newness of environmental education as such, and the historical and present paucity of preservice opportunities in environmental education.

Two large-scale in-service efforts operate outside the college/university educational structure, in association with the development and dissemination of supplementary environment-related curriculum materials by the Western Regional Environmental Education Council. Project Learning Tree, now administered by the American Forest Foundation, employs professional educators to train in-service teachers in the use of these materials in 49 states, 6 Canadian provinces, Sweden, Finland, and Mexico (McGlauflin, 1990). Project WILD, originally supported by the Western Association of Fish and Wildlife Agencies and sponsored at state levels by resource management agencies, also operates in 49 states and all but one Canadian province, and has trained more than 200,000 in-service teachers since 1983 (Charles, 1990). For both of these projects, training is hands-on, short-term, and project-specific, and rarely carries college credit.

The literature of environmental education is replete with "how to do it" descriptions of in-service training efforts. For example, Wright (1990, pp. 49-63) has described a cooperative model for teacher in-service in environmental education, outlining a strategy for a two-day workshop. Strategies are presented for conceiving, organizing, publicizing, presenting, and evaluating an annual in-service program. The paper also includes suggestions for workshop planning, publicity, budgeting, and providing college credit, and a sample agenda. Also presented is a list of hints for conducting workshop activities. Among the reference materials recommended for such workshops are such well-known centrally produced curriculum materials as Project WILD, Project Learning Tree, and the CLASS Project

In a related paper, Sanchez (1990, pp. 91-96) has provided a list of ten suggestions for workshop leaders designed to increase effectiveness of workshops aimed at

preparing classroom teachers to become environmental educators. Some of the justifying principles advanced by Sanchez in support of his ten suggestions are:

> *the targeting of workshops to specific grades correlates well with educational research on child development;*
>
> *there are manifold realities in the classroom;*
>
> *abstract concepts are not appropriate for younger grade levels;*
>
> *environmental education can be infused into all subject areas;*
>
> *workshop materials should be inexpensive;*
>
> *teachers like activities that can be taken back immediately to the classroom;*
>
> *teachers love handouts;*
>
> *follow-up is important.*

An attempt to connect student dropout prevention to teacher in-service in environmental education was described by Stoner (1990, pp. 65-82). Her paper focused on a preliminary study of the effectiveness of "Environmental Education as Dropout Prevention" as the basis for in-service programs targeted at fourth through twelfth grade teachers. Stoner presented eight lesson plans from well- known environmental curriculum guides; she also noted personal comments of teachers in an attempt to provide an insight into the effectiveness of the lessons. She made the observation that "teachers who used environmental themes across the curriculum were ecstatic about the results and future possibilities," claiming that teachers were hampered only by their lack of time and lack of familiarity with the materials. On the basis of her experiences with teachers involved in a two-day in-service program, Stoner concluded that connection of academic, emotional, and social needs of at-risk students with the benefits of environmental education contributes to the solution of two pervasive problems- -environmental literacy and student dropout.

In discussing the problem of professional development in environmental education at a distance, Robottom (1990, pp. 37-47) identified the need for programs that are community-based, in recognition of the fact that environmental education (especially at a distance) is doubly idiosyncratic. In one sense, environmental issues that form the substance of environmental education work are specific in terms of time and space. In another sense, educational problems are rarely susceptible to universal solutions. One of the lessons to be gained from distance education is that in environmental education professional development, there is a great opportunity for grounding the substantive tasks for participating teachers in environmental and educational issues existing in the teachers' own communities. An important research question concerns the tendency for non-community-based professional development programs to structurally pre-figure curriculum content for environmental education for teacher-participants in a way that diminishes the perceived environmental and educational relevance of the program.

Cowan (1990, pp. 83-90) has also addressed staff development and teacher training taking place in a distance education context. A list of features characterizing staff development in Alaska, including a common focus and sense of

direction, a research base, and quality control, is presented in her paper. She illustrates how consortia in other subject areas have operated in Alaska. In discussing the local school district's responsibility and the state department of education's role in these consortia, she described the context within which environmental education must be approached, in her view. She acknowledged the low status ascribed to environmental education in Alaska, which led her to prescribe an infusion of environmental education into a "hands-on science consortium as the most effective approach to gaining statewide support for environmental education."

Potentially the most widespread approach to teacher education for environmental learning has been initiated by the Alliance for Environmental Education, an umbrella group whose membership includes more than 50 non-governmental organizations having interest in the field. The Alliance has initiated and is now operationalizing a National Network for Environmental Education (Paulk, 1988). The Network is modelled on a regional environmental education network established and managed by the Tennessee Valley Authority (Wilson and Judy, 1987), and consists primarily of university "centers" involved in teacher education, curriculum development, and related activities. Its purpose is to encourage cooperation among the centers, with exchange of materials, ideas, etc. A key element is interactive computer linkages through EcoNet, an existing international telecommunications network. At this writing, 72 network centers have been established. It remains to be seen how effectively the network will operate, but its potential is high in many areas, including teacher education.

SECTION VI: TRENDS AND ISSUES IN TEACHER EDUCATION FOR ENVIRONMENTAL LEARNING

During the 1980s, two significant environment-related foci emerged in elementary and secondary schools, colleges and universities--science/technology/society education and global education. These have been developed primarily outside of the community which identifies itself as environmental educators--the former primarily by science educators (with some input from social studies educators), the latter primarily by social studies educators (with some input from science educators). There is some cross-representation among science, social studies, and environmental educators in these groups, primarily because many environmental educators are primarily science educators, and a significant (though smaller) number are primarily social studies educators.

However, many environmental educators have continued to pursue traditional priorities and interests in nature study, outdoor education, and conservation education, and have not acknowledged the broader scope which is both implicit and explicit in definitions of environmental education advanced since the late 1960s. All of these call in some form for rigorous consideration of biophysical and sociocultural interactions in the context of human decision-making in a milieu of change. To the extent that this has happened (that is, that practitioners of environmental education have not kept abreast of developments in science/society/technology/environment concerns, or of the pervasive environmental considerations inherent in global education) advances in education in these two areas may pass the environmental education community by.

The real danger is in potential loss of the unique input of environmental educators into education in these areas; for example, environmental education already deals with much of the content, and appropriate educational methodologies, for S/T/S education. It is clear--and necessary--that both S/T/S and global education will continue and develop, with or without the input of those who already hold the advantage of a substantial commitment to, and knowledge of, their environmental underpinnings--and how to teach in an interdisciplinary manner. Among other things, this suggests that teacher education for environmental education should incorporate S/T/S and global education concerns, and that environmental educators need to influence science and social studies educators to incorporate environmental concerns in all their efforts, including their teacher education efforts.

Hart (1990, pp. 7-18) has argued that environmental education professional development should be critical, in the sense of encouraging critique of current environmental education practices. His paper provides a framework for critical appraisal of professional development programs in environmental education. His distinction between approaches based on assumptions about "defective," "effective," and "reflective" teachers focuses attention on different views of the professional status of teachers embodied in teacher education programs. In arguing for programs supporting professional development as critical self- reflection, Hart contends that reflective teaching is more closely aligned with environmental than scientific world views--that is, that it is more coherent in environmental education for our enquiries to be informed by a holistic environmental paradigm than by a reductionist, scientific one.

In this statement, Hart has summarized the underlying dilemma of environmental education: finding its appropriate place in the educational

enterprise. This is manifest in all aspects, particularly the K-12 curriculum and the teacher education enterprise.

Several general principles seem to be supported by the information base available concerning teacher education for environmental learning. As summarized by Hart and Robottom (1990, p. 104), "these general principles are that professional development in environmental education should be: participatory and practice-based; enquiry-based; critical; community-based; and collaborative."

They continue:

> *For environmental education to survive and to be distinctive, there is a need to ensure that critical educational debate about environmental education professional development continues, so that our practices are informed by educational paradigms and imperatives, rather than being coopted by the scientific paradigms and imperatives currently dominating our environmental education thinking.*

It is clear that the educational and scientific paradigms both have contributed, and will continue to contribute, to the development of thought and practice with respect to teacher education and program development in environmental education. It appears counterproductive, perhaps futile, to approach this as an "either-or" situation. Rather, it makes sense to approach the situation in an eclectic fashion - by selecting "the best" from both paradigms. In this fashion, it is possible that a unique model will emerge. Even if not "unique," it may be <u>appropriate</u> and <u>useful</u>.

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