A COMMUNITY ACTION PROGRAM IN CONSERVATION EDUCATION FOR PRESERVICE ELEMENTARY SCHOOL TEACHERS

Thesis for the Degree of Ph. D.

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MARY ANNE COOPER

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This is to certify that the

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MARY ANNE COOPER

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ABSTRACT

A COMMUNITY ACTION PROGRAM IN CONSERVATION EDUCATION FOR PRESERVICE ELEMENTARY SCHOOL TEACHERS

By

Mary Anne Cooper

Widespread environmental concerns have shown the urgent need for more effective conservation education programs at all levels of education and especially at the college level. The problem undertaken by this study is to design a course in conservation education for preservice elementary school teachers, based on a critical re-examination of conservation goals, analysis of means to reach them, a means of objective evaluation, and defining procedures, materials, and methods required for this course.

Goals examined indicated the greatest need lies in finding a methodology responsive to (1) individual needs for becoming effective, (2) immediate as well as generalized environmental information, and (3) the future job requirements for teaching children conservation concepts and principles leading to effective citizen action in environmental problem-solving.

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An analysis of current methods and procedures was made using these broad goals as guidelines and criteria. Results provided direction for an innovative methodology of course design utilizing an actual community and school as common experiential references for course content and method.

A pilot study was designed and conducted Spring Quarter, 1969, at Michigan State University, to test this methodology. Offered as a choice to students enrolled in the scheduled conservation education course, major activities of the course took place in the referrant community of Eaton Rapids, Michigan: laboratory, seminar sessions, and classroom application of student-designed lesson units in conservation. Evaluation of the results strongly support achievement of goals.

Results of the pilot course are incorporated into a course design having the following objectives. Means are provided through units structured by design criteria and performance goals. Objective evaluation is recommended as described in the pilot study.

Goals for this course seek to:

1. Acquaint the student with scientific knowledge, concepts, and principles specifically related to resources and problems of a selected community environment; employ procedures and techniques for investigating and interpreting these concepts in context; provide the opportunity for the student to design lesson plans applicable to a classroom situation in the community, identifying environmental concepts and principles, and using appropriate techniques; and put these into classroom operation.

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2. Design the course as a model for achieving these goals which will provide learning experiences based on individual differences in backgrounds, abilities, interests, and goals.

3. Make it possible to simplify the complexity of the environment for analysis by dividing the course into units, but maintain interrelationships through high level controls of the model.

4. Design the course unit contents and methods so that these are adaptable to recombinations and act as resources in situations beyond the immediate influence of the course. The suggested technique is the design of instructional modules.

5. Design and build into course design specific procedures for measurement which provide valid and objective means for evaluation.

The study concludes with recommendations for further study, applications of methodology and instructional modules, and research on comparative means for selecting the most effective course design to achieve conservation education objectives stated.

A COMMUNITY ACTION PROGRAM IN CONSERVATION EDUCATION FOR PRESERVICE ELEMENTARY SCHOOL TEACHERS

By

Mary Anne Cooper

A THESIS

Submitted to
Michigan State University
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Department of Fisheries and Wildlife

1971

I dedicate this volume

and all it represents,

To my partner and dear Husband, Bob, who says,

"I married a thesis"

ACKNOWLEDGEMENTS

I wish to express my appreciation for the guidance and assistance given me by Dr. Gilbert W. Mouser throughout this project which began in a musty old office in a brownstone building five years ago.

His consistant convictions and sincerity are the underlying guidelines of this study.

My sincere thanks also go to the members of my committee, Drs. Eugene Roelofs, William J. Fields, and Julian Smith, for their help and understanding throughout the study. Likewise to the delightful team spirit which exists among the Department of Fisheries and Wildlife which helped me unhesitatingly and cheerfully in ways too numerous to mention.

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INTRODUCTION

By the late 1960's wide-spread environmental concerns indicated that an effective conservation education program in the schools was needed more than ever. Legislation providing air and water pollution controls, bond authorization for parks and recreation, news media attention on environmental "quality" with dire predictions, public alarm over the population explosion--were stimulating an unprecedented public response and involvement in conservation goals.

A great conflict of values and attitudes confused the issues. Complexity of the problem-solving process required knowledge about man's world in relation to the natural world that was stimulating a search for answers and a demand for action. It was a time for professional soul-searching. Experts and educators found themselves in the spotlight.

It would appear that conservation education to meet contemporary needs had not permeated effectively into the domain of the classroom teacher.

This, in turn, suggested that teachers are not acquiring effective knowledge and skills in pre-service education which transfers to school and community environments.

There is an urgent need for a critical re-examination of conservation education goals, the means of reaching them, and objective evaluation of results. A program is needed that is scientifically valid, responsive to individual needs for becoming effective, provides a dynamic process for continuing self education within a rapidly changing environment, and transfers more predictably to future classroom situations.

As common practice, much of today's teaching and testing do not go beyond the skills needed for knowledge and awareness. Prevalent methods assume that curriculum content, presented abstractly, supplies the necessary information, attitudes, and values which may be transferred by the student to a job situation. Clearly, more is needed in one or more of these areas.

There is a need for a means of more closely integrating multiple disciplines to understand environmental interrelationships and ecological factors.

Conservation education must use new skills and educational technology to instill those values which manifest themselves in a love of land and attitudes which provide means of protecting it.

Finally, educators and environmental specialists need to communicate and cooperate for a more efficient and effective use of their efforts and expertise, producing knowledgeable and capable educators of our youth. Such a program must permeate downward through the university and into the community and school systems.

This study presents an innovative approach to conservation education for pre-service teachers designed to recognize these objectives, provide a means for reaching them, and a process for assessing the accomplishment.

In the Winter and Spring of 1969 a pilot program was conducted to test a course design specifically oriented through content and method to an actual community and its schools. Favorable results and new insights provide the basis for a second phase of course design, extensions of the course, and directions for research.

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CHAPTER I

GOALS AND GUIDELINES

Conservation began in conflicting values: the right defined by technological progress to exploit the resources for short term economic gain, and the right defined by man's trusteeship to manage these resources over time. Interpretation often equated conservation with preservation, and man's use with trespassing.

As progress continued to be measured by increasing technology, a new dimension was added to "what" was being used, with questions of "how", again a conflict of values: the services considered essential to man for limitless progress and the complementary disservices of progress, considered destructive to the natural resources and, therefore, to dependent man.

The close association of conservation philosophy with historical development, in the growth of urbanization caused the conservationist to state that "as man becomes progressively urbanized his intimate association and interaction with natural resources diminish and with it his awareness of his dependency on them. It is imperative that man wherever he lives comprehend his welfare is dependent on 'proper' management and use of these resources".[1]

Thus, one goal of the "new conservation" must accomodate values of man-made systems with practical natural history. Conflict of values now come from polarization of fundamental principles and from interdisciplinary commitment. It has been stated that: "We are beginning to shift from a conviction that Yankee ingenuity will, somehow, solve every problem, to an understanding that science and technology can solve physical problems only. For conservation this means that the base is broadening from the technologies based on natural sciences to include a wide array of the social sciences, among them obviously political science, public administration, economics, and law, and, somewhat less obviously, social psychology and anthropology".[2] This is to be interpreted as providing a wider spectrum of applications for, rather than limiting, the natural sciences.

Although conservation leadership shifted its concerns to include human ecology, conservation education in the schools remained relatively unchanged. A leading conservationist noted, in 1968: "Most programs are oriented primarily to basic resources; they do not focus on community environments and associated problems. Few emphasize the role of the citizen. There is a vital need for an education approach that effectively educates man regarding his relationship to the total environment".[3]

Therefore, the second goal is a recognition that conservation concerns as "interdisciplinary" are studied most

effectively in connection with community environments, focused on resources in the context of their associated problems. The student becomes involved as a member of the community and develops an awareness and method for action appropriate to situations, meaningful to himself.[4]

When school courses place a major emphasis on content, or information, as the goal, it becomes an orderly coverage of categories, tested in the same manner. Achievement of higher levels of learning requiring synthesis and analysis of information is demonstrated by recall-skills. Guided throughout by the teacher, responses may reflect the student's ability to conform to teacher-objectives rather than indicate he can reject and accept concepts and make valid inferences.

Therefore, a third goal is to supply the information necessary for comprehension through methods which develop student-directed learning, structured within the experiences to which the information applies. Referring to Dr. Edgar Dale's Cone of Learning, this requires a systematic analysis of specific learnings in the selection of methods.

Conservation education for pre-service teachers implies a goal related to the future job situation. Therefore, in addition to information oriented to increasing student understanding, there needs to be a recognition of the progression of learning by children. In transferring college course learnings to classroom applications, for example, a teacher

encounters two common problems: (1) Putting abstractions into an experiential framework; and (2) identifying stages in the child's understanding of concepts, towards abstract, analytic thinking. A teacher may follow pre-conceived units which are either over or under the abilities of the children and, therefore, boring and unproductive; or a teacher may "borrow" units from source material which are attractive to the teacher and reminiscent of a college course, but more appropriate to other grade and subject levels. The popular recommendation, K-12 approach, infers there is an orderly progression of conceptual learning which reinforces and contributes to the highest possible degree of learning; analysis and evaluation are skills which make a more effective citizen and teacher.

A fourth goal, then, is to provide information and method in addition to those basic to the course, directed towards the job situation with a demonstrated potential for being transferable within the influence of the course.

The nature of community conservation concerns, themselves, make this possible. Legislation providing air and water pollution control, bond authorization for parks and recreation, news media attention on widespread environmental problems stimulate inquiry and involvement in conservation topics which make it quite natural to include these in the school curriculum. The teacher, firmly entrenched in a well-structured, demanding schedule, has limited time and background ability to research these topics, include them in unit plans, attend to their continuity in the K-12 program and, in general, integrate them

into the on-going curriculum. If conservation topics are presented as a "unit in the text", a static body of facts, it may do more to inhibit and finalize discussion on these topics than stimulate action.

With this in mind a fifth goal follows closely as a composite of all preceding goals. Definite attention is directed towards establishing a procedure for the course which becomes a model for continuing self-education of environmental, conservation education.

These goals which recognize current conservation philosophy are general and capable of broad interpretation. To be effective they must become specific, be accompanied with a plan for implementation, and produce results identifiable through objective, valid means. This makes it possible to look at course design as a dynamic process, sensitive to changing needs of students, environmental developments, educational technology, etc. It also provides for research methods in periodic course redesign.

Therefore, the sixth and final goal requires that course design includes implementation, objective means of evaluation, and opportunity for research.

These goals are summarized as follows:

1. The "new" conservation education accomodates values of human ecology with study of the natural sciences.
2. Conservation as interdisciplinary is studied most effectively in community environments, focused on resources in the context of their associated problems.

3. Basic background information is structured within the experiences to which the information applies, using methods which develop student-directed learning.
4. Information and method are related to the future job situation, demonstrated as potentially transferable within the influence of the course.
5. A procedure for the course is also a model for continuing self-education about environmental, conservation education.
6. The course is designed to include implementation, objective means for evaluation, and opportunity for research.

In order to incorporate these goals into a course design, the following definitions of terms used and guidelines to relevant concepts provide "frames of reference".

Definitions

1. Instructor: This term refers to the teacher or teachers of the course in conservation education at the college level.
2. Student: An enrolled member of the class in conservation education, this young adult is usually but not always a pre-service teacher.
3. Children: These are the youth or pupils in a public school classroom, usually elementary school.

4. Pre-service teacher: This refers to a student in the course who is working towards a degree in Education.
5. In-service teacher: This is a full-time teacher, employed by a public school system, having full responsibility for a classroom.

Guidelines

I. Course philosophy

A. Environmental education:

This term is used throughout the text as compatible with "conservation education" in contemporary thinking. The term grew out of the need felt to bring divergent interpretations of conservation under a unifying banner. It grew out of the urgencies of the times and called attention to expanded goals, such as "human ecology in addition to the natural sciences", and "interdisciplinary in scope". A widely accepted definition for environmental education has been formulated by Dr. William Stapp, University of Michigan, as follows:[5]

> Environmental education is aimed at producing a citizenry that is knowledgeable concerning the the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work towards their solution.

Within this definition, three important concepts are examined for the purposes of this study:

Concept of becoming knowledgeable or informed:

The student must become knowledgeable regarding the bio-physical nature of the environment. Conservation education has a core of factual knowledge or concepts about the natural resources in the physical environment. However, by the definition, "resources are . . . those parts of the biophysical environment which are appraised by man as being immediately or potentially useful to him". Therefore, other ingredients of environmental conservation literacy include knowledge of man's uses, management, preferences, and abuses of these natural resources. A temporal-spatial consideration requires, further, a knowledge of the past, present, and future status of these resources with respect to their supply-demand function. And, categories which formerly encompassed only soils, water, wildlife, plants, and minerals now include human ecology, open space, recreation, and esthetics.

The complexity and comprehensiveness of the information outlined above points to the need for a selection process for making meaningful combinations. Emphasis on an environmental problem, on the resource category itself, or on a specific area of interest to the learner provide valid alternatives to becoming informed, in a relevant manner.

Teaching to achieve this goal involves the recognition of degrees and rates of comprehension. This may be contingent on the need for a given level of understanding, beyond the desire for achieving the highest level possible. These are complex variables but may be articulated when goals are well defined. Academic goals which require a competency based on single variables such as information-recall, produce equally narrow results and are not measures of course objectives which are broad in scope. When consideration is given to degree, rate, and need these goals may be specified in terms of behavior and may specify a continuum of learning beyond course influence.

A final consideration regarding the interpretation of this concept is time or spatial design. This relates to the various combinations of sequencing courses, prescribing prerequisites, and/or arranging units within the course. Conditioning factors may be external to the course, such as other course work; or, internal, such as flexible scheduling and instructional technology.

Concept of attitude:

Attitudes are complex internalities and should be measured in terms of action or behavior. Goals define this action which must be measurable by valid, objective means. However, there are certain built-in

limitations which must be considered as secondary, contributing factors: (1) Conditions of the course, in the presence of the subject matter, may produce positive or aversive (negative) responses;[6] (2) Consequences of course experiences may produce these responses also, which may be inseparable when interpreting the conservation attitude; (3) Performance may be imitative or conforming and not indicative of attitude.

Attitudes are measured currently by questionaire and may be expressions of group value systems. They do not reflect necessarily a subsequent action or involvement but may indicate a potential. Controlled responses of this kind may not represent the same attitude or value when transferred to a situation in another context.

Measuring attitudes is a hazardous undertaking since the observed behavior depends on complex factors including knowledge, skills, and personal response to environmental stimuli. Gilbert F. White attempts to simplify these deterministic factors by grouping them into four sets: the decision situation, the individual's experience with the environment, his perception of his role, and his competence in dealing with its complexity.[7]

Achievement of attitudes that lead to decision-making and action must be equated and defined in terms of (1) the University's ability to effectively

mobilize and direct its professional expertise towards empathy as well as accuracy in the design of an environmental course; and (2) the student's achievement in putting course concepts into real-life situations, in the community or classroom. Through recognition of these as separate yet interrelated, greater control of course content and methodology provides for evaluation and research.

The more distant environmental studies become from the complex, dynamic situations themselves, the easier it is for professionals to over-simplify or ignore phenomena that they consider irrelevant to their areas of competencies. In so doing they tend to shape policy without being challenged. When instruction is in context, students may accept or reject conclusions, make discoveries, and formulate action in a way that is more closely related to problem-solving situations encountered with classroom responsibilities.

Motivated to work for solutions:

Defining motivation as it applies to course design requires a recognition of individual differences in backgrounds, needs, and interests. A high proportion of matching between what is presented and the student's existing cognitive structure, creates the degree of dissonance necessary to make the student become a seeker of knowledge, motivated to search his environment for

clues and answers.[8] Not only does this provide motivation for inquiry, a means of assimilating learnings at the student's highest level, but it also provides a method for continuing self-education.

Innovations in instructional methods which place emphasis on curriculum content, materials, and attractive presentations to supply the required motivation for learning assume all students have sufficiently similar backgrounds, experiences, interests, and goals to use it.

B. Interdisciplinary

Although this term is not a new one, it has been applied in practice to wide variety of situations that seek support from it rather than contribute clarity of meaning to it. More precise meaning has been attempted by applying alternative terms, such as "multidisciplinary" and "multi-variant". In supporting programs of this kind, the White House Office of Science and Technology investigated the variety of programs claiming this problem-focused approach and found only a very few which they considered "genuinely effective multidisciplinary".

In their judgment, these programs had two things in common: "they had substantial influence or complete control over faculty hiring, promotions, and other rewards, and they enjoyed flexibility in introducing new course work and curricula and in devising degree

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programs. Also, in most cases the successful programs were found to have the direct support of one of the university's more senior administrators who could help provide resources and protect the program from 'traditionally minded faculty members'."[9]

II. Relationship of course to university function:

A. Responsibility to the community:

"The university sees itself in the functional role (1) to provide students with optimum opportunity for learning from the heritage of the past, for gaining experience in use of their intellectual and creative capacities, and for developing themselves as concerned, responsible, humane citizens; (2) to extend the frontiers of knowledge through research; (3) to provide society with objective information and with imaginative approaches to the solutions to problems which can serve as a basis for sound decision-making in all areas." And, in order that this be interpreted in future as well as as present programs, a restatement of purpose adds, "The primary purpose of a University is to provide an environment in which faculty and students can discover, examine critically, preserve, and transmit the knowledge, wisdom, and values that will help ensure the survival of the present and future generations with improvement in the quality of life".[10]

These broad commitments permeate throughout basic functions of research and teaching but have special

meaning for conservation courses. Interpreting (3) above, the function is defined in terms of providing communication between course and community within the scheduled time of the course. An efficient method for teaching and learning, a recognition of the existing "state of the art", and an opportunity to evaluate on the basis of goals in a more realistic manner, are attractive benefits. With the community as the focus, a high-level control of interdisciplinary content is possible. Using a "cybernetics" approach, the community with its complexity becomes the "systems-analysis" and introduction of multi-variate inputs are interrelated through a "cascade" system of feedback which provides for an inner consistency and a building of concepts throughout.[11]

This is consistent with the other functions stated in the definition which specifies actions such as "discovery", "preserve", and "transmit".

B. Cooperation between education and science researchers:

Basically, the university functions in two broad areas, research and teaching. Professionals in biophysical, social, and education science occupy both spheres within departments, but when combining disciplines the teaching function is the one most commonly employed. For example, interdisciplinary courses in environmental education such as the one taught at the

University of Wisconsin consist of a series of lectures by departmental specialists who present basic conceptual material about their discipline, interrelated by sequencing.

However, putting these research professionals on a team with teaching professionals to design and construct a practical course would combine specific scientific knowledge, appropriate techniques and skills, instructional technologies, and dynamic sequencing. This focuses on method as the route towards achieving such goals as student involvement, individualized instruction, higher learning skills, and a more meaningful synthesis of the separate disciplines.

In a pioneering venture initiated by the U. S. Office of Education to study the application of research and development strategies for the improvement of education practices, Arthur Livermore, AAAS Commissioner for Science Education remarked: ". . . one of the important things that happened as the curriculum groups organized and developed their programs was that scientists and teachers collaborated, each learning from and educating the other. This cooperation has produced needed and significant changes in science curricula. Changes which could not have been effected by either scientists alone or teachers alone. This cooperation must . . . continue. Science curriculum research is a continuing activity and the best minds in science and

the best minds in education must be devoted to it."[12]

IV. Course Content: Minimum understandings

While it is difficult to obtain agreement on the validity of concepts which must stand on their own merits, it is simpler if these concepts are applied to specific situations for specific purposes. A criterion used for this purpose is: "The subjects shall be expected to be important twenty years from now."

This also points out the selection process necessary when confronted with the variety of fascinating environmental items: any subject area has the potential for a research project. By focusing on a particular aspect of the environment, it is possible to define the background material which applies to it and gives it both depth and breadth. This justifies the elimination of other concepts which are also basic but are relatively unimportant. This selection process allows the student to participate in the determination of relevancy of information and materials, a desirable skill of problem-solving.

Careful selection of environmental areas which illustrate basic principles, problems, and resources makes it possible to include understandings presented in the conventional course and to provide opportunity for research in which <u>method</u> is the independent variable.

V. Course Method

A. Community action program

Orienting the course to the environment is a determining factor for course content and methods: relating student involvement to the school and community requires further provisions for choice. Open-ended experiences may be pre-designed and applied to particular resources and generalized communities, but students determine the precise experiences through observations, explorations, and innovative applications.

B. Individualized instruction

Students enrolled in conservation education represent a cross section of the University's curricula. In a lecture series this may result in unavoidable redundancy and reduced learning to some extent for an undetermined number of students.

Improved course efficiency is possible through combinations of a variety of teaching methods which employ opportunity for student choices. This does not imply teaching on an individual basis but, rather, provides a means of matching course input with student backgrounds and desired outcomes.

> Individualized education is essentially the adaptation of instructional practices to individual requirements. Three major factors are involved, each of which defines a set of variables in the system: (1) Educational goals; (2) Individual capabilities; and (3) Instructional means. Goals are defined to suit the individual, as when individuals choose different courses of instruction for different desired vocations;

> The term individual capabilities refers to the capabilities that the individual brings to a particular instructional situation; these are influenced by prior background and schooling. Instructional means, which include what is taught, are dictated by both the nature of the individual's capabilities and the nature of his educational goals. These three factors may change in the course of one's education or one's life, but in any particular span of time, during a specific teaching act, it is assumed that a particular educational goal or level of competence is to be attained; that the individual has particular capabilities; and that there is available a set of instructional means and conditions relevant to assessed capabilities and to criteria of competence. [13]

It is difficult for the student to make choices which result in a good balance of inputs and outputs unless the concept of output is harmonious with the goals of the course. When these are content-oriented, the student is reluctant to explore any areas other those indicated by the instructor since course objectives are based on recall. Student choice is often made obediently and from boredom rather than from excursions into an enrichment which could also result in grade losses.

When goals of the course relate to behavior, the student may build on background information already acquired through discovery, inquiry, inference, and application related to a performance.

This study investigates techniques of methodology applied to common experiential reference of community and school, to provide individualized instruction defined by behavioral objectives.

C. Related to future job situations:

Definition of this feature of conservation education for the pre-service teacher is directed towards materials and information which the student may use or expect to find in classroom teaching. It refers also to providing opportunities for student-oriented projects related to school and community environments.

VI. Evaluation:

A. Feedback

Student performance as a goal is structured by means of a progression of experiences designed to match the student's levels of learning. As such, they provide a means for diagnosis of accomplishment and an opportunity to improve the on-going process, student achievement, and ultimate goals. Grading is based on this continuum rather than static, periodic testing. Objective evaluation, stating degree of quantity and quality, is obtained from defined performance requirements.

B. Behavioral objectives:

Performance equated in terms of behavioral objectives has certain limitations. It is by no means new, dating back to concerns in 1919 that results be observable in order to predict and direct human activity. In modern usage it was "discovered" by those designing systems and electronic analyzers, as appropriate for setting up objectives. However, other applications

of this technique could, through improper use, narrow the range of materials developed, particularly those seeking to promote higher levels of learning, or abstraction. The following identifies some of the functions served by behavioral objectives:

> A behavioral objective is a goal for, or a desired outcome of, learning which is expressed in terms of observable behavior or performance of the learner. The use of behavioral objectives may serve several functions:
>
> 1. To identify those student behaviors which correspond with a given set of content or process materials in a curriculum and to guide instructional planning to achieve those behaviors;
>
> 2. To provide criteria for the selection of learning experiences;
>
> 3. To provide a means of evaluating the outcomes of any instructional experience;
>
> 4. To provide criteria for analysis and revision of learning experiences in terms of the original or newly discovered objectives.
>
> Prior to and during the use of behavioral objectives, value-laden questions regarding what constitute worthwhile objectives must be considered along with the ever-present search for unanticipated, but worthwhile, outcomes.[14]

Recognizing these limitations prepares the way for an objective use of this technique in instructional design, subject content, teaching style, and student learning.

By examining the broad concepts contained in the definitions and guidelines, it is evident that a major consideration must be given to the processes or methods of conservation education as design criteria for an

effective course. Clay Schoenfeld, a pioneer in this philosophy, made the observation that "while we recognize the essential importance of strengthening existing disciplines, the essential nature of environmental quality looks toward . . . teaching. . . that transcends traditional lines of endeavor and is concerned with the wholeness of the relationship between man and his surroundings. So we address ourselves to laying a basis for action, to elucidating choices in land and water use and relating them to general values and social objectives, and to providing integrated approaches to environmental quality conservation."[15]

A beginning point for "laying a basis for action" lies in pre-service teacher education where the student is shaping a philosophy, gathering "ammunition", and can take "one more course" for the job ahead. In-service teachers, however more oriented to the precise needs of their jobs, are immersed in the demanding routine of fixed responsibilities, are psychologically past academic striving, and have only fractionated moments to contribute to the complex of environmental information, attitudes, and action.

A combination of pre-service and in-service conservation education to provide a continuum is, of course, attractive. If a methodology, initiated in pre-service education, does in fact provide experiences which relate to the job situation, focuses on community-school resources and problems, provides for individualized instruction and a continuum of learning, a combination should be possible and profitable.

The Study Focus

A research program is outlined which seeks to analyze conservation education concepts previously discussed. Particular emphasis is placed on the organization of these concepts into separate units, each defined and controlled to contribute to total objectives. These objectives are related to performance criteria in an environmental setting which corresponds to an ultimate classroom teaching situation. Evaluation of the performance provides a means of comparing behavioral objectives with job requirements. Controlled revision is through step-wise feedback mechanisms. The effective system then serves as a model for the teacher, as a process for teaching, and as a method for the student's own continued self-education.

Chapter II formalizes a decision-making process for selecting a course methodology through consideration of alternative ways to achieve these goals. Defining limiting factors, costs, and desirable outcomes as design criteria, an optimum, viable choice of alternatives is made.

Course objectives as guidelines recognize design criteria, time, and facilities. Behavioral objectives define the end point or desired outcomes hoped for as evidenced in student performance.

In Chapter III these are made operational in a model course through unit designing, content selection, sequencing, and feedback procedures. These are put into operation as a Pilot Study.

A discussion of the general methodology, information gathered, and results follow in Chapter IV. Evaluation of the system and units provide a comparison of performance with objectives, and of objectives with teaching requirements.

As a result of the analysis of alternatives, the formulation of design criteria, course objectives, and Pilot Study, and new insights, a revised course design emerges. Revision is also considered a function of dynamic course design, flexible to change as well as to a wide range of environments and teachers. Adjustment to the units, indicated by the feedback control mechanisms, are discussed in Chapter V. These constitute a "cascade type" control, whereby each unit is designed to contribute to the total system; recommendations for revision apply to these units without changes to the over-all course objectives.

A suggested course design is presented in this chapter, using design criteria and performance goals to define ten units based on generalized community resources, but specifically referring to the community of the Pilot Study as an example.

Suggestions for further study and research conclude the study. In Chapter VI the course continuum is also explored.

CHAPTER I REFERENCES

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2. Stanley A. Cain. "The New Conservation" Remarks at the Contemporary Club, Herron Museum of Art, Indianapolis, Ind., Nov. 19, 1968. (Mimeographed)

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4. In experimental program students and teachers became involved in environmental problems, developing a course in water pollution which encompassed nineteen high schools in Tilton, New Hampshire and secured the support of the Ford Foundation and Dept. of Interior. After the second year, the students themselves wrote the report: "The atmosphere at Tilton this summer was an important factor in the success of the program. The participants were excited and involved in the program. Involvement is the key to a course like this. Students must get interested enough so that they are actively curious about, for example, the effect that a rise in the nitrate level will have on all aspects of a body of water. This type of involvement cannot be obtained by lecturing to students. It has to be generated by the student who wants to find things out for himself."

   "Part of the Institute's purpose is to make science education have some bearing on the real world. What better way is there to get students involved in what they are doing than to have them study something that affects them in everyday life? While studying real problems, students realize that real problems are complex things. To solve these takes more than just following a procedure. The student must think about what is being done. This process sometimes breaks down the divisions between disciplines. The student comes to the realization that good intentions are not enough; that he must know something about chemistry, physics, biology, and even social science to understand the problems of the river." Benjamin Kohl, and students. "Barriers Fall", Environment, 18 (November 1970), Pp. 40-43.

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CHAPTER II

ANALYSIS OF COURSE DESIGN

The fundamental concepts of conservation education described in Chapter I provide guidelines to use in formulating and evaluating course designs. In consideration of these, course objectives are formulated with clearly defined goals that provide a basis for selecting methods and content. This chapter will use this process for analyzing and selecting alternatives to a methodology and content for a course in conservation education. Evaluation of the program is made through measurement and observation of behavior sought by goals and method.

Course Method

Selection of course methods is directly related to clear identification of goals. It has been noted that the most meaningfully stated object "is the one that excludes the greatest number of possible alternatives to the goal".[1] Therefore, basic objectives desired will be defined by identifying their basic concepts and purpose as follows: (1) Academic course scheduling and time span; (2) Individualized instruction; (3) Experiences related to the job situation; (4) Methods of teaching conservation

related to the job situation; (5) Community action program.

1. Academic course scheduling and time span:

The existing provision for conservation education is for two courses, scheduled over two ten-week quarters, for course credit of four hours each. These are sequential in numbering, but neither is a prerequisite of the other. Records show that only a relatively small percentage of students take both courses. Scheduled at the present time are three one-hour lectures and one two-hour laboratory each week, although other time blocks may be arranged within this course structure.

Selection of a one-quarter course, offering four credit hours, provides for flexible scheduling, facilitates student scheduling, and makes it possible to design a research project using concurrent classes and procedures as controls.

2. Individualized instruction:

Certain observations and principles define individualized instruction as a necessity and prepare the way for design criteria. In the first place, students enrolling in present courses in conservation education are in their junior and senior years and have varied environmental and academic backgrounds and goals. While the majority are pre-service elementary school teachers there is also representation from specialty fields of the natural resources and recreation. Backgrounds vary

from broad, basic survey courses in the sciences to a high degree of specialization. Personal interests and abilities have resulted in a wide range of environmental understandings and values and an across-the-curriculum range of subject specialties. Goals have the same broad range, including teaching in a variety of communities, at all levels, and resource management and recreation.

Secondly, it is the purpose of conservation education to build action-oriented attitudes and appreciation through comprehension and evaluation of principles governing man's environment. Structuring the course around broad comprehension and general application is not enough. This awareness must be internalized by the student to the extent it becomes a personal commitment to action, demanding further analysis, synthesis, and application. There is a direct relationship between degree of assimilation and extent of effective transfer to life situation which is a goal of conservation education.

A third point is a qualifying one. As mentioned above, there is a wide range of goals represented among students. These serve to condition <u>quantity</u> or <u>extent</u> of information and skill required to reach desired goals.

Matching student differences to goal requirements without providing methods for individualized instruction would be extremely difficult if not impossible, especially within the course scheduling time span. Provisions

for additional information, applications, skills, resources and references are made in anticipation of needs of the job and student. Establishing prerequisites for various jobs; analyzing student background, capability, and goals; setting objectives and criteria are means of preparing routes for individualized instruction.

This is fundamental to the learning process which seeks to match an individual's fund of knowledge with new learnings, arousing a conflict that stimulates inquiry. "The ability to ask questions is directly proportional to the individual's fund of knowledge and his ability to understand that expanding knowledge is gained only by asking questions."[2]

Progress is evaluated individually with variations in performance. These need not be tests, which are often negative stimulation, but goals in themselves based on performance. Through feedback procedures students may monitor their own progress.

With the objective of helping the student acquire the most effective conservation education, the course progresses towards increasing student-directed and instructor-resource orientation. Optimum achievement is a dynamic process of conceptualization and inquiry, a continuous self-education, and an assured transfer of conservation attitudes into the job situation.

Individualized instruction provides experiences meeting individual differences and need not be a function of class size. Procedures and methodologies are, therefore, an

important feature of course design.

In summary, design criteria for providing individualized instruction are:

a. Pre-test procedures will be given to identify each student's entering competencies, experience, and background and used to prescribe the student's program.
b. Students will make choices of desired experiences relevant to their individual interests and goals.
c. Students will achieve competency measured by performance criteria established for those experiences selected.
d. Procedures and methodologies provided for individualized instruction will not necessarily limit class enrollment.

3. Experiences related to the job situation:

One of the most common requests heard from teachers is for method: "how-to-do-it" techniques. This is so in spite of the fact that technologies, publishing houses, educational organizations, etc. have all contributed to an impressive array of "hardware" resources for science and conservation education.[3] And, closer to the problem, resource consultants and in-service courses have been making contributions to this need by localizing teaching concerns, pinpointing resources, and concentrating on a unit approach.

Teachers most successful with illustrative methodology seem to be those distributing it, documented through use in a successful program. A few of these soon reappear in an ever-widening assortment of modifications as, for example, programmed learning methodology in the past and systems analysis presently.[4]

In short, effective methodology originates as a product of a creative problem-solving process. This is a skill that can be taught. Needed are the target situation, problem in context, involvement in effecting solutions, evaluation, and experimentation. After the process is repeated and its flexibility recognized, the individual explores innovations among alternative solutions. A creative methodology is on its way.

Conservation education is ideally suited for the experiential approach, related to a target situation in the schools and/or community. It is an effective means of relating basic concepts to specific environmental applications, to synthesize the topic categories of conservation through contextual means, and to relate these understandings to problems and values. By adopting behavioral objectives in place of informational objectives, the effort spent on "cramming" for examinations is spent more profitably on the problem-solving process and on the acquisition of interpretative skills. This is stimulating and motivational.

In environmental context, conservation concepts provide insights into relationships external to the planned

experiences. These often create unexpected, illogical encounters which require flexible reactions on the part of the student. These not only focus on value systems but on depth of perception. These are learning situations unique to real experiences and, as such, contribute to the transition from academic to job situation.

A course designing conservation learnings around the specific environment of a community and its schools sacrifices the more comprehensive coverage of environmental education presented in the academic environment. However, a method which successfully promotes problem solving, value judgment, and motivation for action also promotes a continuous learning process.

Therefore, a summary of design criteria for experiences related to the job situation include:

a. Working cooperatively with the schools and community, students will apply conservation concepts to situations harmonious to on-going programs and resources.
b. Students will apply problem-solving and inquiry techniques to field projects in conservation.
c. Students will demonstrate that they can design and use effectively environmental experiences which teach a selected unit the best way.
d. Resources of the community will be used as a laboratory for teaching conservation concepts in context.
e. Students demonstrate procedures designed for producing appreciation, awareness, values, and attitudes.

f. Students will design experiences which explore conservation concepts in subjects other than science.

4. Methods of teaching conservation related to the teaching situation:

It has been pointed out that conservation education is ideally suited to a method of instruction utilizing environmental experiences. Carefully designed experiences serve two principal purposes: (a) a focus on understandings and interpretations to deepen the student's own abstract knowledge, and (b) skills, techniques, and information applicable to job situations. Ideally, both are included. However, the pursuit of information often dictates a methodology which is less than that desired of the teacher in a job situation. Methods involving problem-solving, student choice, inquiry, and creative involvement are minimally practiced.

An effective conservation education program seeks higher levels of understanding than that achieved by applying comprehended material abstractly in the form of generalizations or single solutions. Critical thought develops in an environment about which isolated facts need analysis, synthesis, and qualifying solutions. The teacher is a very important part of this process requiring skill in inquiry.

At any level of understanding, the search for evidence which confirms abstract thinking, produces higher levels of comprehension, and, in the experience of the pre-service teacher, it serves as a more effective means of transfer. These environmental experiences make effective use of simple tools for measuring, testing, and comparing as a means of inquiry.

Conservation, basically related to the natural sciences, has always carried an association with science teaching. Consequently, teachers whose science backgrounds and preferences for this subject are minimal avoid conservation education as "outside their capabilities". It is extremely valuable, therefore, if during pre-service education conservation applications are provided through other units in social studies, art, math, and English.

Most encounters utilizing the natural environment in the schools are a type of enrichment which are structured independently of the on-going unit plan: school camping, recreational skills, field trips. These utilize "experts" as resource people in the specified conservation categories. A less-structured utilization involves the school site and neighboring community resources with the teacher as resource expert. These encounters represent informally structured lessons, teaching segments of on-going units in this way in a most effective manner. The real-life situation is a laboratory for the classroom.

Another advantage for a greater concentration on the method of teaching conservation lies in the possibility of providing a dynamic continuum. Not only does this provide a way to "teach as taught" and a method for continued self-education, but also indicates a consistent and efficient approach to in-service training and extension of university program.

Criteria for methods of teaching conservation, related to the teaching situation and to the teacher's need for information, understandings, and interpretation are:

a. The student will interpret environmental observations to demonstrate understandings of such basic conservation concepts as are presented within the topical content of the course.
b. Course content shall include those topics and related ones which are most relevant to school, community, and environmental problem areas of concern to the students.
c. Course content and sequence will provide methods and materials for the learnings required by the scope of the course and projects of the students.
d. Students will construct simple demonstrations which require investigation of basic concepts of the course. Chosen by individual students, these are open-ended.

e. Students will use various tools for investigating environmental phenomena either in a learning or teaching situation.

f. Students will select and design lessons in subjects other than science.

5. Conservation education within a community action program:

It is difficult to find agreement on what are considered the basic concepts of conservation.

Dr. Clarence Messner approached the problem by assembling "a series of key statements which identify good conservation education in the school. These statements have been evaluated for importance by a select jury of conservation educators. Following each criterion or key statement, is a series of specific statements of practice. This objective form points to specific measures an elementary school may use in setting up a satisfactory conservation program".[5] Because it is so comprehensive, it has a wide application suggested. Categories are philosophy, personnel, program, organization, principles, subject topics of conservation, all related to the school system.

Representing another approach, Dr. Robert Roth seeks to broaden the base by including more disciplines and broader coverage. He asks: "What should a person know about environmental management education in order to function as an effective citizen?" [6] His study

resolves 111 concepts that were found acceptable by 90% of 350 scholars from 40 professional areas and a number of ecological regions. His categories are: environmental management, management techniques, economic environmental problems, environmental ecology, adaptation and evolution, natural resources, sociocultural environment, culture, politics, the family, the individual, and psychological aspects.

He states that the investigation "is an attempt to provide a structure of important ideas which may be helpful to educators at all school levels in developing meaningful programs of environmental management education. A focus on environmental management that is different from the traditional agrarian approach is needed; one which will bring man, physical and cultural environments, and their interrelationships into a different structural organization for instruction and understanding.

Both studies represent approaches which have multiple uses and no specific applications or focal points in real life. Dr. Roth says about his study, "It will provide an organized structure of the important environmental management concepts as a suggested base for instructional purposes. This and other follow-up studies may help answer such questions as: 'How, in what environment(s), and at what grade level(s) should the various environmental management concepts be taught?'".

In recognition of the need for specificity, Dr. William Stapp identifies grade themes with concepts.[7] His program includes an orientation, field trip, and teacher training for each unit. Categories include grade themes oriented to the physical environment in the elementary school, expanding into the social sciences in the upper grades. Conducted by resource people, these experiences are provided for all students and occur once or twice a year for any one class.

Dean Bennett expands grade themes to segments of the environment: the school, neighborhood, community, region. Concepts are based on environmental problems. The teacher is prepared and assisted by an environmental education specialist who uses community and school resources upon which to build the program and concepts.[8]

Although the basic disciplines of conservation have become more complex, defining of concepts need simplifying clarification in order to comprehend the problems and work towards solutions. Application to specific areas of the environment provides a conceptual framework in which this process takes on a personal meaning to the one involved, causes comprehension and motivation for inquiry.

There is a frequently heard criticism about the amount of information a student or teacher should know

in order to teach conservation or become effective in handling environmental problems.

If it is considered that "goals for conservation educators must be to provide the student with a set of experiences in and out of the classroom that will guarantee he really does have the concepts he needs to make effective decisions",[9] this defines a lifetime process if well done, and unsatisfactory if the student is not effective. If, however, more precise goals relate this information to experiential references, segments of the environment, then selection is made through a rational process which is a learning experience with goal-testing action. This could become a way of life.

Therefore, selection of concepts is an important part of the design process, both for the course and for a process which is a skill for the student and teacher.

The method used for selecting concepts for the course are based on the needs of the student for becoming a well-informed citizen through dynamic inquiry and a teacher alert to these needs in his own students.

A summary of the objectives and desired outcomes as described are outlined below. These will be used for selecting among alternatives, the course method best able to put these into operation:

1. Individualized instruction
    a. Analyze student differences
    b. Provide instructional techniques
    c. Provide for student choices within:
        1. Subject content
        2. Experiences offered
        3. Progression towards student-directed course
2. Experiences related to job situation:
    a. Select concepts related to school curriculum
    b. Select concepts related to community resources
    c. Students design teaching units
    d. Students teach and evaluate units in schools
    e. Apply concepts and units to different curriculum subjects
3. Methods related to job situation
    a. Design course as a model for students
    b. Present experiences as open-ended inquiries
    c. Relate concepts to:
        1. Everyday phenomena
        2. Broad scientific dimensions of the problem
    d. Teach each unit as a complete experience
4. Community action program
    a. Divide course into practical environmental units
    b. Relate concepts to an immediate environment, close at hand
    c. Relate concepts to basic scientific knowledge
    d. Demonstrate course content as a continuum:
        1. School grades
        2. Community resources
        3. Interrelated physio-socio-politico-economic structures

Selection of Course Content

Having discussed the philosophy for selecting concepts within a community action program, the following categories are illustrations of application:

Background information on conservation:

Following the selection of the target community, general topical information about conservation is developed through an introduction to the community's physical, social, and economic resources. This is an exercise in reconnaissance. Important resources and socio-economic structures are identified, illustrating broad concepts such as the land-man ethic, preparing the way for a more precise analysis of the environment. Local resources are related to regional, state, and national resources in terms of historical development and importance.

Historical and philosophical orientation:

Evolving from the survey and reference materials is an awareness of the dynamic growth and changes, viewed in spatial relationships. Causal relationships analyzed by students culminate in hypotheses for later investigation.

Natural resources of the community:

Identification of the natural resources important to the life of this community focuses on ecological principles. Categories of natural sciences are interrelated with those of the human community. Central and basic ecological themes are selected, such as those stating interdependence, change,

diversity, and adaptation, and structured into experiences throughout the course.

Problem areas of the community:

Students select a problem area in the community to develop as a class throughout the duration of the course. This is done in consultation with community leaders. From this, concepts will be developed which illustrate the interdisciplinary complexity, management, and decision-making process. This is open-ended.

School curricula:

Students designing unit experiences for the schools relate these to interests and grade level of the children in consultation with in-service teachers, and to the on-going curriculum, using curriculum materials available to the children. Students may use school site development, resource areas, community problems, or whatever emphasis matches their individual criteria.

Selecting the Course Method

The summary of objectives and desired outcomes developed earlier is used in the following chart, together with a comprehensive selection of course methods and procedures, presently being followed[9] or proposed, for the purpose of determining the best possible method for a course designed with these objectives and goals.

Although it is recognized that the present process for selecting course method is far from being precise and largely intuitive, the process points to this as a possible method for purposeful and objective course design, given additional information. There is a need for clear and precise statements of course objectives, stated in terms of desired outcomes which are testable and observable. This would provide an objective means of evaluation, better use of a wide range of course materials, methods, and procedures.

Within the limits of this study, this method is being used for analysis and evaluation, together with other conditioning factors, such as cost, which contribute favorable and unfavorable factors for implementation. These will be the "building blocks" for calculated change and work towards increasing efficiency in course design and performance.

Procedures and Methods	Feasible Alternatives: Field Trips	Case Study	Outdoor Education	Indoor Laboratory	Programmed Instruction	Real Experiences	Lecture-Discussion
Individualized Instruction							
Measure student diff.							
Instr. Techn., multi-media							
Student choices: Content							
Experiences							
Projects							
Experiences = Job situation							
School site dev.							
Community Resource areas							
Student-Designed Tea. Units							
Student classroom exper.							
Units for Soc.St.,Math, Etc.							
Methods = Job situation							
Course design, a model							
Open-ended inquiry exper.							
Invest. everyday phenomena							
Scientific invest. techn.							
Community-School related info.							
Cons. units compl.,modular							
Selected, scientific, valid							
Continuum, experiential ref.							
Through school prog. K-12							
Community ecology							
Phys-soc-econ-pol. concept							

Fig. 1.--Selecting the course method among feasible alternatives and desired goal-seeking methods

Costs

Defining and ordering new methodology for desired outcomes must be followed by implementation in order to determine if chosen alternatives are viable ones for course design. The following is a consideration of favorable and unfavorable factors for implementation:

A. Factors favoring implementation:

1. Individualized instruction

Educational techniques and technology for learning are available to supplement other course methods and provide for individual rates and levels of learning. Techniques, such as programmed instruction and simulation offer an opportunity to increase depth and breadth of information and permit student choice so that this does not serve to intensify requirements. Involvement by the student is provided by integrated materials and activities. These are the same kind as have been used for teaching skills, and the "state of the art" is such that these have exciting developmental possibilities for the academic subjects as well. These have a potential for increasing efficiency in learning for the individual student.

2. Integration of subject categories:

"Interdisciplinary" achievement through the use of real community situations utilizes the

common experiential reference, and focuses information, skills, activities, and student projects on specific problems of the environment. Problem-solving techniques of research are utilized. The emphasis shifts from a sequence of disciplines to units composed of disciplines. It is a "natural" approach. Learnings relevant to specific situations are reinforced by repetition and amplification in other situations having related foundational information. In addition to integrating subject fields, the student becomes a part of the environmental situation, stimulating learning, attitudes, and action.

3. Teach-as-taught consistency of method:

The technologies of education, methods of research, and use of the environment are all applicable to in-service teaching skills and citizen participation in environmental problems. Interpretation of concepts to apply to the learning levels of children and to specific job situations are provided within the scope of the course.

4. Relevancy of a university course to community:

Including cooperation with a community as a part of the course introduces dimensions, disturbances, and enrichment to the course which are seldom included in courses designed for efficiency in structuring learning of concepts. Yet these make

the course relevant to the community problems for which learning of concepts is desired. As the student becomes involved personally, he may make discoveries beyond the precise learnings designed, often modifying them. This provides direction for the student and course design as well. It is a healthy, reciprocal inter action between University and community.

5. Motivation for learning:

Motivation is directly related to effective structure and sequencing. Instructional technologies are well structured, and student-directed experiences are controlled through feedback procedures; environmental disturbances outside course content are anticipated in course design. Unitized structure of the course provides sub-system analysis and evaluation for close contact with student achievement.

6. Use of university resources:

These may be used either as a team approach or as reference resources. It is possible, also, for the professional staff and departments of the University to train teachers for interpreting all disciplines and to prepare teacher-manuals for assistants, on environmental units.

7. Supplementary resources

So-called "hardware" of conservation education has been produced in great variety because of demand and current interest in environmental education. The course designed to use the environment would find many more uses for these than one focusing on the isolated resource. In addition, supplementary materials designed to fit the needs of a well-structured program have a modular nature which, as a total "package" could find wide application. Creating such materials is a process which becomes a skill of learning as well as teaching.

8. Cooperative responsibility

The University shares the responsibility for teaching and learning with the student, community, and school system since all take part in the process and effective content. The University structures a professionally designed course; the student arranges his time under flexible scheduling and individualized instruction, requesting and choosing resources from the University complex; the community and school supply staff assistance, curriculum materials, and classrooms. All share a common interest and benefit. A method which may be applied to more than one school system, developing materials transferable to teaching situations, may logically expect cooperation from these interested sources.

B. Factors limiting implementation

1. Cost

Any program incorporating off-campus activities must consider a budget for its operation. Justification for this must come from analysis of course benefits in terms of learning efficiency produced by this particular course design. This may take the lengthy route of educational research. Funding may also be a matter of policy with restrictive conditions. Grant-supported funding may be short-termed.

2. Time

General course scheduling is oriented to campus facilities. To comply with varying requests of students, diversity is provided through a great many combinations of time. Thus, a course which permits flexible scheduling by students and individualized instruction may face conflicts with other schedules which makes it difficult to supply course services, facilities, materials, and assistance upon demand, at all hours. In addition, logistics problems may reach a level of confusion to the student and impair the quality of the intended learnings.

3. Externalities

These are events and/or disturbances which occur outside the planned system or program of instruction. These are limiting factors when they distract from

rather than stimulate the learning experience. Examples of such factors are continued student confusion and frustration reacting to flexible course design, failure in communications and/or responsibilities which involve one or more persons; situations occuring for which adequate preparation is lacking; natural, largely unavoidable catastrophies such as adverse weather conditions, illness, etc. These provide positive stimulation for learning if the course design recognizes and provides for them, considering them job hazards with which to cope.

4. Institutional constraints

Legal and financial responsibility of the University must be compatible with arrangements made involving external resources and physical transport. In addition, desirable inter-departmental cooperation and communication may require formalizing to comply with procedures, requirements, curricula, and needless repetition of any course features. Relationships such as these often depend upon capable staff personnel who provides qualified and acceptable leadership. Where it is desired to work within existing structures and philosophies in order to facilitate enrollment, implementation, and research techniques it may be difficult to avoid the conventional grade curve requirement or credit-hour time limitations.

Finally, course progression from structured to self-directed involvement by the student requires that the instructor is trained in the knowledge and skills expected. Use of a team of experts further complicates this requirement.

5. Representing a real situation

While it is difficult to establish a generally acceptable definition of what constitutes a real experience, there are certain minimum requirements which may be established in advance and, if accomplished, satisfy the requirements. These are provided through behavioral objectives. While these will be defined in detail at a later point, these are designed to (1) provide a valid measurement of course objectives through student performance in situations described by criteria; (2) show gains in performance and comprehension through comparison of early experiences with terminal behavior; (3) objectively evaluate the roles of school and community personnel involved in experiences of students for achieving course goals; (4) supply continuous information about student achievement as feedback control accompanying field experiences. Since these are student-directed, results depend on ability and motivation of the student, adequacy of measurement devices, and validity of criteria.

6. Defining the goals of a conservation education course

Complex factors contribute to what should be included in a course in conservation education without further complicating it with a process-design. Subject matter,"to become informed", covers an astounding breadth of accountable knowledge to be recognized.

Attitudes, values, and action for conservation goals are expected which, at the university level, compete with a wide assortment being presented concurrently. Supposedly, attitudes develop from logically presented, scientifically valid, empirical information--even though research evidence exists to the contrary.

On the other hand, a system which includes student involvement in field experiences is considered on the basis of being less efficient in use of time for extensive information retrieval, preciseness of observations and examples, number of concepts covered, and utilization of instructor time and effort.

The interdisciplinary nature of the problem is reflected in the interdisciplinary complex of expertise needed to solve it: educators, who must interpret; scientists, who must find sound answers; economists, who must pay; Etc. The compatible midpoint is reached through a cooperative team effort which not only guides broad policy but contributes key concepts to specific experiences in real communities for live teachers in concerned school systems. Even then it will not be a <u>solution</u>; it will be the <u>procedure</u> for problem-solving.

An appropriate conclusion is a remark made by the Morris R. Lerner, as president-elect of the National Science Teachers' Association, in addressing a regional conference of science teachers: "This is not to say we need a mega-curriculum or that there are no common denominators, but rather to stress the idea that process and content are not enough: we must include context. For it is the setting, the context which will give meaning to the content and process and enable us to choose alternatives adequate to a changing world . . ."[10]

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CHAPTER III

THE PILOT STUDY

A pilot program was put into operation in the Spring of 1969 to test the methodology of a community-oriented action program in conservation education for preservice elementary school teachers. For the purpose of descriptive investigation and dynamic redesign, a "cybernetics loop"[1] method or system was selected as an orderly approach to organizing the complex of variables being identified and interrelated in designing the course.

Cybernetics and systems analysis share common concerns, procedures, and terminology for identifying and organizing complex information into meaningful interrelationships. Systems analysis is generally considered as handling the more "practical" engineering type problems while cybernetics is more applicable to scientific and educational situations where a model for objective analysis and a means of interdisciplinary communication are desired.

An important part of the system are control mechanisms called "feedback" mechanisms, which are means of maintaining an operationally sound system. The originator of the

term, Norbert Wiener (1948), considered a ship as a model of a cybernetic system: "It consists of (1) a captain who sets the destination and communicates it to the pilot, (2) the pilot, who compares the destination with the present position of the ship, (3) the surroundings which provide the pilot with feedback information about the position of the ship and about dangerous points to be avoided, (4) a steersman, who follows the steering commands of the pilot, and (5) the oarsman (the engine), which provides the energy for motion. The feedback information received by the pilot from the surroundings, which requires a change in course of the ship to reach the destination, is called negative feedback information."[2]

In the example given the component parts of the system are called "subsystems". When these operate as controls or feedback in relation to each other for the purpose of a whole, integrated operation, the term "high level control" or "cascade control" is applied.

The basic model being used for the course design is shown in Table 2.

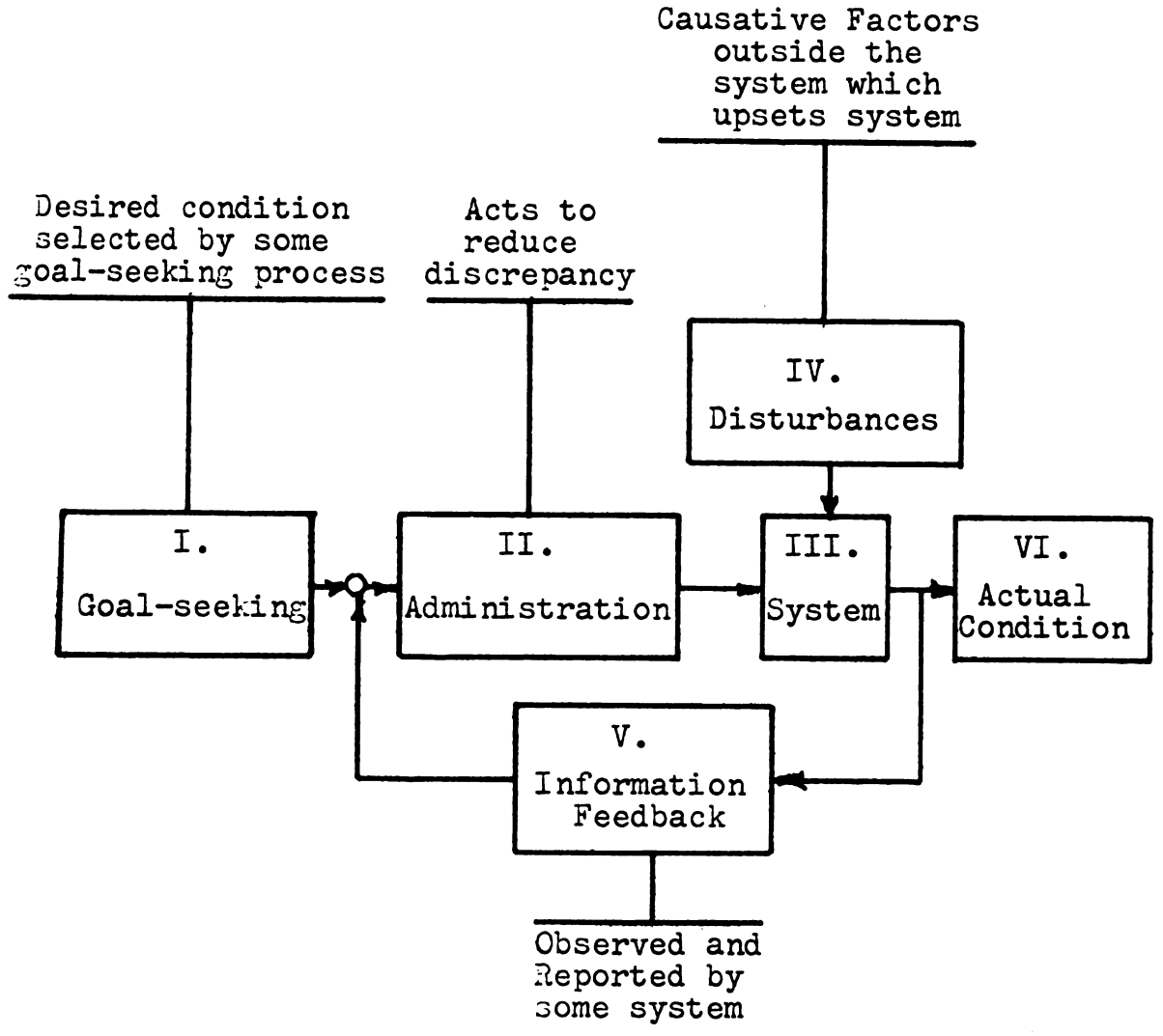

Fig. 2.--Flow chart model of cybernetics system for course design

In relation to course design, this may be applied as follows:

I. Goal-setting
   A. Course goals
   B. Performance goals

II. Administration
   A. Pre-course arrangements with community and school
   B. Design of units: content and activities
   C. Identification of student backgrounds, interests, and goals

III. System
   A. Operation of units
   B. Student performance

IV. Disturbances
   A. Natural: environmental events, change
   B. Consequential:
      1. Conditions that surround a subject
      2. Interactions with a subject
      3. Reaction of others towards a subject
      4. Perception of events as positive or aversive[3]

V. Information
   A. Pre- and post-test
   B. Written reports by students
   C. Student teaching units
   D. Evaluation questionaire by student
   E. Evaluation questionaire by in-service teachers and administrators
   F. Terminal interview with student

VI. Actual conditions
   A. Analysis of data
   B. Course redesign
   C. Development and research

I. Goal-setting

A. Course goals:

The purpose of this course is to prepare a student to take an active, more effective role in conservation education in a future job situation by providing learning and teaching experiences in conservation within the context of actual community resource areas, including the schools and children, orienting these experiences to student backgrounds, needs, and goals.

B. Performance goals:

1. Students shall become familiar with basic concepts of ecology, soil, water, wildlife, vegetation, recreation, and outdoor education as they relate to specific community and school areas and experiences.
2. Students shall become familiar with one or more community resources having special significance to the community and/or school system and be able to make interpretations based on relevant conservation concepts and field experiences.
3. Students shall design conservation units from course concepts and demonstrate their ability to apply them in on-going programs in the community and schools.

II. Administration

A. Pre-course arrangements with community and schools:

1. The community

The cooperating community of Eaton Rapids, Michigan was selected for having expressed an interest in putting a conservation program into the curriculum, as a member of the Tri-County Outdoor Education Committee, for being within a favorable (not too close, not too far) commuting distance from the university; and as representing a semi-rural, suburban, residential community.[4]

2. The school system

The school system welcomed the opportunity of continuing the development of their outdoor education program. Two of three elementary schools participated; all grades K-8 were represented by one or more sections. They agreed to (1) furnish a complete set of curriculum materials for each grade as reference materials; (2) meet with the students in the conservation laboratory on the campus for orientation; (3) work with their assigned student in preparing units so that these would be relevant to the ongoing programs, the philosophy of the school, and the interests of the children; (4) fill out an evaluation sheet at the end of the project.

Only one of the cooperating teachers had had course work in conservation education, and she was the only one, also, who incorporated any outdoor experiences into her program.

School officials wished that emphasis and development be directed towards a recently acquired outdoor site of approximately 40 acres adjoining a school site. A frugal citizenry had opposed the acquisition and teachers were not making use of it. It was a fortunate choice for course emphasis as well, since the use of a natural area represents the traditional approach to conservation education, simplifying course content and shifting more effort to course method. Topics were developed with special emphasis on school and community resources and problems and an effort made to provide environmental overview.

B. Design of units: content and activities

Total course time occupied ten weeks (a quarter) offering 4 credit hours. As designated by the catalog, this represents three one-hour lectures and one two-hour laboratory a week. Redesigned, time blocks consisted of three weeks of preparatory activities and seven weeks of community involvement, all flexibly arranged.

Preparatory sessions consisted of assigned readings; field trips to community, school, and resource areas; joint meetings with in-service teachers for unit planning; and a weekend experience in school camping.

Assigned readings, spanning course content as an overview, included choices to avoid duplication of past readings. Summaries and a culminating test were required.

Field trips to the community consisted of the orientation to community and school given new teachers, conducted by one of the principals.

Introduction to the natural area was arranged in cooperation with the in-service teachers and a professional workshop. It was conducted by representatives from the Soil Conservation Service and the Michigan State Extension Service, who mapped the area into habitats. Both groups of teachers considered applications of this information to learning situations. The pre-service teachers had the opportunity of observing current thinking of the in-service teachers on conservation and environmental topics.

A sugar-bush in operation was explored as a resource area. Marketing of maple syrup is an industry in this section, rapidly becoming mechanized. The early process still being operated by human resources alone was the object of a value-lesson for appreciation of a resource fast disappearing from the cultural and possibly the natural environments.

Joint meetings were held with in-service teachers for unit planning. In the community schools, pre-service teachers were introduced to physical facilities and staff. In the University laboratory, in-service teachers discussed course purpose, materials, scheduling, and communications. Time schedules were arranged for the submission of plans, for meeting the children, and for outdoor activities anticipated. Preliminary planning of the units went through two revisions, and included the first unit in detail.

A week-end experience at school camping culminated the first three-week preparatory sessions. The purpose was (1) to provide a whole experience in which all subject fields studied were integrated into a conceptual framework, in an environmental context; (2) to provide opportunities for the student to take a leadership role in conducting these experiences; and (3) to provide an experience including spiritual and social values with a potential for motivating learning, for the student to evaluate.

Clear Lake Camp, near Battle Creek, Michigan, is a unique school camp owned, maintained, and operated by the Battle Creek School system and accredited teachers. A year-around camp and school farm program is held for elementary school children. The program includes geology, pond study, plants, animals in woods and on

the farm, outdoor skills, and recreational skills. Six separate subject-oriented experiences were provided by the University and staff for the students.

All students received a two-hour pre-session leadership training within one of the units and conducted a session for other groups throughout the day. Training was provided by resource specialists. An over-night stay, early morning bird walk, sports, skills, singing, and campfires rounded out the program.

Following the three weeks of orientation and preparation, course work centered in the community of Eaton Rapids for the remaining six weeks of the course. Three programs ran concurrently: (1) Seminar sessions one evening a week; (2) Laboratory experiences, two-hour sessions once a week; and (3) Student projects in the community and schools. These were interrelated.

Seminar sessions began the fourth week for all students at a designated time. These were held at the high school in Eaton Rapids so that (1) local people could attend and (2) fundamental concepts could be viewed in the context of community interests. The sessions were publicized within the school system and through news media. Speakers were specialists from departments of the University. Topics were on the subjects of ecology, water, soil, wildlife, vegetation, parks and recreation. Problems were integrated into basic information.

Laboratory sessions began the fourth week, also; experiences selected were those (1) conceptually important to the area and basic to the discipline; and (2) designed for open-ended "discovery" exercises to develop student awareness, observation, and skills. Each student was required to use this area at least once during the course in a creative teaching experience with children.

In addition to the natural site, use was made of other community resources: the Grand River, waste water treatment plant, and school sites. Special events included Arbor Day observation by tree planting, involving all fifth grade students and an interpretation of a previously unexplored area.

Classroom experiences began at the end of the orientation sessions. The first of the six units in the schools was an observation visit and a presentation of a lesson plan for the following week for the in-service teacher's approval and cooperation. These experiences were planned for one class period, usually an hour or less in length once a week.

The pattern established consisted of a (1) preteaching plan, prepared a week in advance, stating the desired learning in terms of a concept, preparation, activity, materials, expected outcome, and follow through; (2) narrative account of the actual experience and evaluation of it. These varied in format after the

first week and reflected individual differences in responding to sets of circumstances, suggestions of in-service teachers, continuity and development of projects, preferences of the children, etc.

A great deal of freedom was provided for designing and carrying out student teaching units in order to make use of individual student background, materials, and interests. Specific direction was given upon request or as noted desirable through weekly reports. As a result, projects varied by concept, content, type of planning, activities, etc. Suggestions were given for unit emphasis on art, social studies, and language skills in addition to science although these usually reverted to science through requests made by children or teachers in the elementary program.

Throughout the projects students maintained the communication between school and University through their project work. Contacts made by the course instructor were those suggested by students through weekly reports and mainly involved the use of resources. Most of the students arranged teaching dates to coincide with laboratory schedules because of transportation. Those who made separate schedules combined transportation.

C. Identification of student background, interests, and goals.

It is important for efficient course administration to know something about the backgrounds, interests, and goals of the students enrolled in the course in order to (1) advise the student regarding the choices provided him; (2) provide the kinds of information and experiences in the course most relevant to these levels of learning; (3) correlate this information with the outcome of the course to provide a base for future prerequisites, additional information and experiences, improvement of measurement and feedback.

Recognition of individual differences and provision for student choice were made at three points: (1) In the first class session students were presented with the options of a course to be <u>situation-stimulated</u> (oriented to experiences in an actual community environment) or <u>information-stimulated</u> (oriented to abstracted experiences on campus). Because this was the pilot program, this was decided through discussion before student differences were identified by the instructors.

Of the 45 students who responded favorably for the pilot program, 23 ultimately decided their required course schedules were too inflexible to permit participation.

A second choice centered around academic fields of interest. Three were identified: (1) resource specialists, (2) recreation majors, and (3) pre-service teachers, the predominate group.

Within these categories a third choice was provided in the selection of experiences and involvement desired by the student. In order to provide better direction, a questionaire identified student backgrounds, interest, and goals; specific information relating to professional and personal experiences in conservation and related fields; and type of involvement desired.

Course content and materials were designed, therefore, to meet two requirements; (1) scientifically valid conservation units conditioned in their selection by the experiential reference, the community; and (2) needs expressed or implicit in the student questionaires.

Implementation becomes an important part of meeting these requirements. Preparation for projects, experiences, procedures, and reference materials takes on the additional benefits of building a resource center and broadening its use.

III. System

Identification of student goals with course goals with the first step of the pilot study procedures, relating course objectives to an actual community and school environment. The process that followed was the result of sequencing units, activities, and experiences to reach the goals. This process will be examined, along with student performance.

A. Operation of units

The following diagram represents a functional description of the process (Figure 3) and the operational methodology and scheduling of units (Figure 4).

It will be noted from Fig. 3 that the pilot course functions initially as a student choice for an action-oriented program, featuring field experience. The strength of this conviction as a motivating force must be appreciated, for at this point very little else is known about the new course by the student.

The next step identifies student area, interest, and goals. Major categories are the academic fields of resource development, teaching, and recreation, with a potential for others. Additional information provides a basis for advising and guiding students in their choices of field experiences in their specific areas, according to their interests and goals.

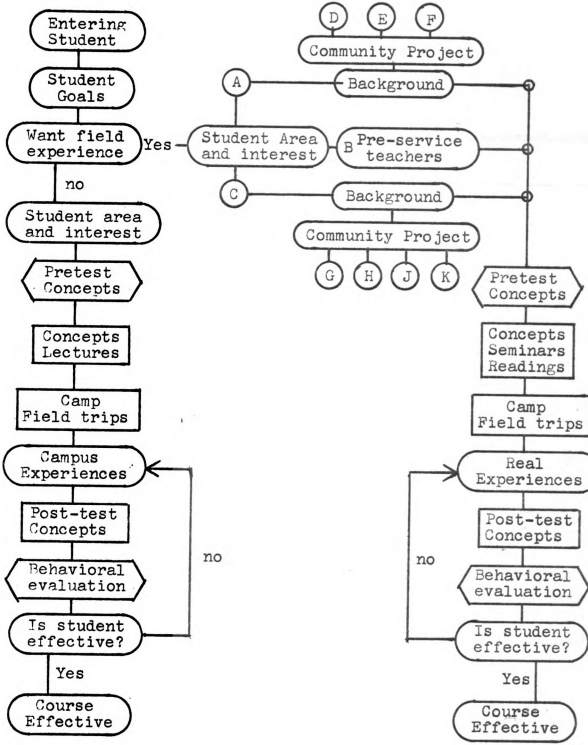

Fig. 3.--Flow chart showing evolution and system of Pilot Study.

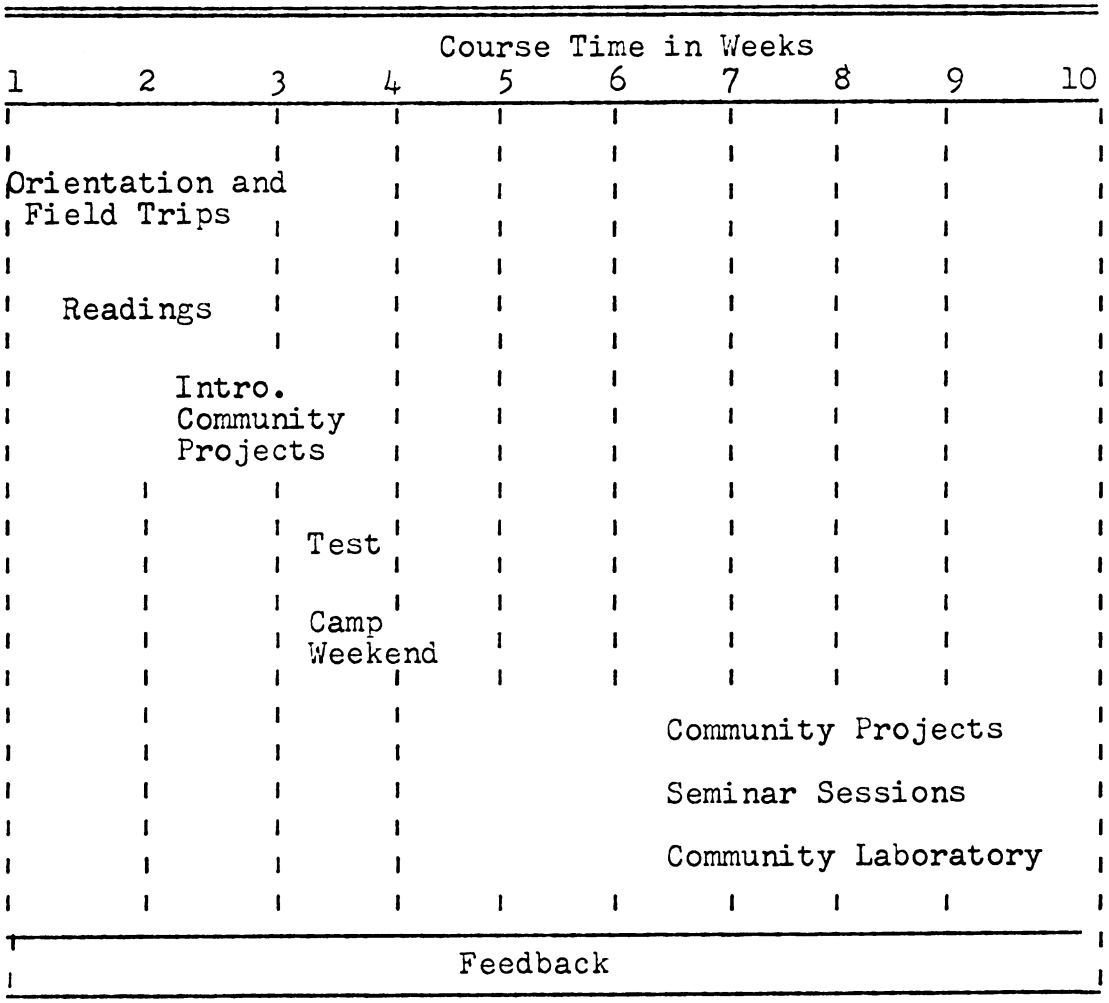

Fig. 4.--Scheduling for pilot course, showing distribution of units over ten weeks

Pretest for conceptual knowledge is designed to sample the student's academic understandings of basic information to be covered in the course. It is preceded by a structured introduction to course content intended to orient the student to new and review information. The students are aware that this is an exploratory procedure and that they may make choices.

Continued information inputs are supplied by regular seminar sessions.

Camp and field trips are designed to provide "micro-involvement" experiences as steps towards increasing responsibility in environmental situation; to provide experiences which interrelate subject units into environmental context; and to promote attitudes and values beyond information-seeking.

The real experiences are those the students wanted in the first place. At this point they function to provide the optimum combination of information, skills, techniques, and experiences which a student may make to carry out a well-conceived conservation project. The assumption is made that successful experiences are likely to occur, controlled by student choice and course implementation, to provide confidence and attitudes transferable to a later job situation. This is reinforced by repeated performances where possible, as in a series of teaching experiences.

Behavioral objectives are achievement levels determined by course criteria. As a part of course procedure, they are formalized and specific. A continuum provides comparison of initial and terminal behavior. This is intended to inculcate a problem-solving behavior, also, so that performance is evaluated on the basis of how thoroughly and completely the procedures are followed.

Post-test concepts are a combination of academic information, field experiences, and observations, revealed in comparison with pre-test which is primarily factual.

The final evaluation is by questionaire and by interview, with students and with in-service teachers. Subjective evaluation of the interviews is of value because of the instructor's close contact with the student projects. Conclusions are spot-checked by independent interviewers.

Functional units described above, when scheduled within the required time framework, become the operational methodology outlined in Figure 4. Putting this design into action provides observations and evaluations based on student responses.

B. Student performance

Three field trips and two orientation sessions with school and community resource people were carried out during the first three weeks. Students completed

an average of 73% of the readings by examination time, conditioned somewhat by the system of reserving books. However, these assignments were accepted as routine and were not highly motivated by the flexible scheduling. Later in the course comments referred to these assignments as needing more emphasis to supply basic course information.

The students' strong motivation for field experiences resulted in early rapport and productive response once the sessions initiating these programs were underway. It was suggested by the students that reading and field trip units be integrated more closely into these field experiences which could then be initiated earlier in the course to provide faster orientation.

Although these suggestions are creditable, it is natural to expect initial confusion and delay in orientation when confronted with course innovations of the pilot study.

One of the high points of this preparatory period was the camping session. As noted from schedule Figure 4, it occurred as a culminating experience for the first three weeks as well as an introduction to the field projects. Described earlier, it consisted of a weekend school camping experience at Clear Lake Camp, Battle Creek, and was preceded by a slide-talk orientation by a staff member of the camp. The following are comments made by students reporting the experience in a slide presentation:

I just wanted to add something that happened to me. I imagine most of us have gone to summer camp and experienced . . . but while I was at this camp it brought back a lot of the memories of things I went through when I was a child . . . and so that was an added point . . . it made it a little easier to understand how to present it when I get the chance to teach children . . .

Throughout the day we went through all these different groups. It wasn't as it is here in the lab where one day we'll work on insects and then the next week you come back and you may work on trees and the next week you come back and its birds. I'm not taking anything away from the lab--they're good--but it's the idea here we put everything together in one day. As you got going on in the day, the first time out just about everything the leader told you you listened to and picked up something new from it, but as you went out you found the different areas overlapped each other. The wildlife area had a lot to do with forest ecology, and both of these had something to do with the geology area and so by putting everything together in one day you had a chance to see how everything fits together in real life . . .

I'd like to clear up the idea of splitting up into groups . . . There were about 35 of us and we split up into various groups and for the first two hours of the first day, Saturday, we spent time in this group learning ourselves what was in a pond, what was in a forest, what the gravel pit was all about, and then we worked out a program of how we would teach it to kids and specifically to the rest of us when it came our turn to go through an hour in the geology area, an hour in the forestry area, an hour in the wildlife area. Then each of us had a chance to teach one of these things during the day. So the whole idea, of course was it was a practical experience in teaching some phase of conservation education. We've gotten a whole term of book learning and now it is our turn to do the same thing: lead, point out things, talk about what was going on around us . . .

Pre-service teachers indicated their preference for teaching units according to grade and subject in the questionaire at the outset of the course, and arrangements had been made with the schools throughout orientation.

Students selected, planned, and carried out their program according to the individual curriculum requirements, their own interests and abilities, course experiences and resources, interests of the children, and stimulation of school and community environments. Consequently, an interesting variety resulted, shown with some of the individual differences of the students themselves in Table 1.

In assessing student response to the teaching units, three aspects of these experiences were used in the evaluation, outlined below. This information was supplied through weekly reports by the student on each unit. As individual problem-solving proceded, these reports soon became less formalized and more narrative.

1. Procedures
   a. Pre-planning and pupil-orientation to unit
   b. Narrative account of the teaching experience with the pupils.
   c. Evaluation, by the student and by the pupils, for the student.
   d. Follow-up plan, if any.

2. Conservation concepts utilized
   a. Statement of the concept around which the lesson is built.
   b. Objective, expressed in terms of desired outcome.
   c. Procedure and implementation.

3. Experiences planned for the children
   a. Extent of involvement for children
   b. Extent of involvement with environment
   c. Extent of involvement of in-service teacher

TABLE 1.--A sampling of individual differences of students selecting pilot program, including their selection of teaching units.

Academic fields and standing		Teaching units selected	
Elementary education	19	Community improvement	1
Recreation	3	Use of Natural Area	19
Seniors with jobs	6	Use of school site	19
Seniors without jobs	5	Other community res.	4
Seniors	5	Insect study	6
Juniors	6	Trees, forestry	4
		Aquaria	2
GPA: 3.5-4.0	1	Pond Study	6
3.0-3.4	2		
2.5-2.9	14	Weather	3
2.0-2.4	5	Flower study	5
Subject preference:		Soil	6
Art	1	Plants	2
Social Studies	5	Birds	3
English	4	Four seasons	1
Science	9	Sounds of environment	2
Recreation	3	Terrarium	2
		Ecology	19
		Earth history	1

In the pilot study a level of achievement was the extent to which the students completed the requirements of each unit described above, and if the student applied methods of the course to their own units, including pupil participation and environmental experiences. In addition, as planned, the progression of experiences would indicate growth of learning level through total use of sound concepts, procedures, and planning. The forms used were only partially effective in demonstrating this as they became more narrative in form.

In addition to factual information, case histories often illuminate important factors of attitude and conditions. Therefore, a brief description of the experiences of six students without previous student teaching experience follows:

1. Diane, a junior with background in social studies and German, considered the procedures

> . . . very good experience for both students and myself. The students learned some things about conservation from my visits, and I learned a lot about teaching it. This is the first time I have had the chance to teach. I was very nervous at first, but learned to enjoy it and that it was even fun.

She enjoyed researching the information, particularly the experiments. Her first lesson was orientation and showed a natural aptitude.

> It was the first time that I really talked with children. This is also the first time I have ever been in front of a class . . . The curriculum which my teacher wanted me to follow was that dealing with the subjects of soil, water, and

> wildlife. The lessons which I used were my own formulations, with help from Mrs. Cooper at times. In this first lesson we discussed that soil is. I believe in class participation and, therefore, this first class was a class discussion where I posed the questions and had the children answer them. My objectives in this lesson were to have the children discover what makes up soil . . . I was surprised how responsive these children were and how alert . . . ours is not the only community on earth and also the relationship all living things have to earth . . .

She spent the next two lessons on soil, outdoors, and continued it in a pond study, then related it to weather, and terminated with an ecology lesson. In her final lesson she used the spaceship analogy presented in seminar.

> In this discussion we brought into it some ideas of recycling wastes, food chains, fertilizers . . . and also brought into play our discussions on soil, weather, insects, and other living communities which affect our life and which we affect. I also asked a few questions about conservation, what it meant, if killing animals is always bad, if conservation meant saving something and not using it at all. The children were very good at discussing this and remembered everything fairly well, even soil.

2. Charity found it difficult to learn about teaching the subject, about the subject, and about the age group all at once. Without previous experience with children, even in her own family, the second graders caused her great anxieties. Her background was strong in music and English; she worked as a singer for a "rock-band". Her background of a science minor seemed to her too highly specialized in subject material to help in formation of practical concepts. Her purpose in selecting the action program was an overwhelming desire to communicate with youngsters

regarding beauty in their own environment. Her first efforts in preparing units were science-centered, intensively prepared, on plants and animals in natural settings, and a trip to the outdoor area and pond.

To all outward appearances Charity was making satisfactory and interesting progress. It was startling to read her confession, that science just wasn't her "dish". She was very unhappy and discouraged. We immediately began planning lessons involving music and English with the help of the other students. The next session was also a pond study in which she conducted a game, "Who Am I" in which the children described plants and animals of the pond in many ways. A written account of individual observations concluded the lesson. Charity enjoyed this session enormously and evaluation indicated to her it was mutual with the children.

The following week was an outdoor story telling session beside the pond in which an imaginative approach was off to a good start with a reading of Dr. Seuss', "McGillagot's Pool". The children drew pictures and told stories of their own versions of life in that pond. The many questions and discussion caused Charity to say in her account, "I enjoyed this session more than all the rest of them put together".

The last session was spent on a grassy knoll, learning "The Green Grass Grows All Around" accompanied by Charity's guitar, and writing poetry about what they

could see around them. Charity's reactions included the satisfaction of problem-solving and the discovery that conservation teaching does not have to go through science formally, but could be taught through English so the students "would never know what they were getting".

3. Daryl, a junior with good science background, was eager for the personal experiences of the pilot program. His in-service teacher was above average in her complete cooperation with our program and her assistance was invaluable. In consultation with her, Daryl arrived at the following:

> Our main long-range objective is to teach children not just labels or segregated facts, but a general awareness of what surrounds them and what they might do to conserve it, tying in such things as succession, life cycles, and natural predators.

In preparation he "made short reconnaisance missions gathering visual aids and materials I would need for class participation" and "had the children slide desks into groups of four to encourage a more informal atmosphere". This was his first meeting with the class, and he conducted demonstrations with soil and rocks, concluding with

> . . . the final proof, however, in what they have actually learned will come next week when they take what they learned . . . and adapt it to some sort of experiment dealing with how plans grow . . . They should be able to come up with some good experimental ideas.

His following experiences with the children were sequenced from soil, to plants, to insects, and to flowers for which he tried a change of pace with an art lesson. His enthusiasm grew and he began spending an entire morning with this classroom activity, involving the children in investigations. He was keenly interested in applying conservation philosophy in many ways.

4. Dorothy, junior and science-oriented, quiet and strongly individualistic, responded promptly to all assignments. Her planning with the in-service teacher went smoothly from planting seeds, to vegetative propagation, to the culminating experience of a field trip and construction of terraria. This produced some unexpected experiences which provided valuable learnings of a different kind:

> I did not explain to them before we left school that we would be gathering only field plants and that no one was to uproot any of the wooded or wild-flower plants. At the site I attempted to tell . . . we were only collecting grassplants and weeds . . . It was my mistake to let the child keep the bush which he had already planted in his tin can . . . Back at the school I reclaimed the trees which we re-planted that afternoon . . . I returned the following day to talk with my class about what had happened and its bearing on conservation.

The entire pre-service group learned something from this lesson. Subsequent units on plants, related to earth history and to Michigan history were classroom oriented, however, using pictures and discussion. The culminating activity was an art lesson, showing the children's impressions of their experiences with this unit.

5. Kathee, as a junior in special education, had had case work and observation, and was anxious to try her own ideas in a class situation. She seemed thoroughly at home with her third graders and sensitive to their needs. In contrast to many in the class who structured their lesson plans either completely over the entire session, she chose to follow the interests of her class.

> I told them how excited I was about the camping trip I had just been on and all the things I had been learning about the world around us. As I shifted from one aspect of nature to another I watched for any hint of enthusiasm. I introduced the word 'community' and defined it as Eaton Rapids, a pond, birds. This was just the spark they needed. Their ideas came fast and furious and in five minutes they had decided they wanted to find out about ants and make an ant farm so they could see a community in action. I admitted to them I knew very little about ants and that we would all have to find out all we could before my next visit.

From this lesson plans evolved all others: collecting ants for the colony, expressing observations and knowledge through creative poetry, visit to a pond as another community, pantomine of things observed. Some of Kathee's observations were especially revealing:

> This day I gained a lot, much more than the satisfaction of having stimulated a few young minds to search for a little more knowledge, more than the pleasure in knowing that I had given these children a fun-type learning experience. I had learned that one of the qualities of a good teacher . . . is the ability to see the importance of the moment . . . which has the potential for learning . . . rather than wait till tomorrow or the next time it should come up.

The fore-going case histories serve to illustrate some of the conditioning factors of student differences.

IV. Disturbances

Brief mention is made of two kinds of disturbances to the system:

A. Operational, caused by disjunctive functioning of the processes and informational inputs to the student, often resulting in negative or aversive responses and output. Robert Mager states it very well:

> An aversive condition or consequence is any event that causes physical or mental discomfort. It is any event that causes a person to think less highly of himself, that leads to a loss of self-respect or dignity or that results in a strong anticipation of any of these. In general, any condition or consequence may be considered aversive if it causes a person to feel smaller or makes his world dimmer.

He gives as examples pain, fear and anxiety, frustration, humiliation and embarrassment, boredom, and physical discomfort.

B. Environmental disturbances, which are those events occuring unexpectedly, are not predicted by some provision of course design. While there is an overlapping in these two kinds of disturbances, there are always those illogical and unreasonable happenings for which flexibility and resourcefulness prepare for the best.

Evaluation of course design and student response recognizes these as conditioning factors in the pilot program which, as a functioning step in the "loop", may be modified upon redesign. Provision is made for this through feedback information system.

V. Information

Feedback is defined as specific information coming from the interactions of a system, used to alter the system with some measure of predictableness. In the pilot program, each unit had information outputs which were intended to be used to make these units more useful in reaching course goals. Overall feedback consists of objective and valid means for making the final evaluation.

To summarize, information systems in the pilot study consist of the following:

Course Unit	Feedback Procedure
1. Field trips	Written accounts
2. Readings	Examination and pre-test
3. Community pre-planning	Topic outlines
4. Camp weekend	Performance, evaluation
5. Classroom projects	Complete lesson units
6. Seminar sessions	Written reports
7. Laboratory	Performance
8. Final evaluation	Student questionaire In-service questionaire Student interview Post-test

VI. Actual conditions (final evaluation)

Final evaluations provide a summary of accumulated factors and an overview. Student interviews were especially valuable, not only for qualified explanations not covered in any other way, but also as a means of reinforcing certain objectives such as continuation of learning, application to future job situations, and relative importance of basic conservation concepts. These sessions produced constructive dialogue on course design.

The results of questionaire, interview, and post-test analysis, as well as accumulated evaluations, will be discussed in the next section.

CHAPTER III REFERENCES

1. V. G. Drozin. "Cybernetics" The Science Teacher, November 1969. Pp.21-3.
The author is Professor of physics, Bucknell University and concludes his article with a recommendation: "It is time for departments of education, particularly those educators who are involved in curriculum development, to give serious consideration to cybernetics as a science which may make an important contribution towards better preparation of our students for dealing with complexities of life ahead of them."

2. Ibid.

3. Robert Mager. Developing Attitudes Towards Learning, Pp. 31-65.

4. Eaton Rapids, Michigan, is a city of 4,200 residents who depend largely on Lansing for wages, shopping centers and recreation. There are a few large farms left, but the founding woolen industries and sheep have disappeared, leaving the block-long grouping of red brick factories beside the river as a reminder, now occupied by a modest retail shop for imported woolens and a miscellany of other shops.
Main Street, going straight through town from the mills, is the business district of small locally owned businesses, including Miller's Dairy Store, representing the largest industry. The Grand River runs under the shop and further up the river the Dairy Farm operates the only remaining of four power dams once producing.
The Grand River and its tributaries make the business district an island, and in the river itself is an island which is a park in the center of town. The mill is the only industry on the River, although the primary waste-water treatment plant occupies a site below the town. The river is an amenity in the life of the community, and historically important as the longest river in Michigan, a factor in the development of the area and State.
Recreation locally is largely through the schools and consists mostly of sports. There are three elementary schools, a junior high school, and a high school. Most are fairly new and well equipped, located in pleasant natural areas, and directed by administrators who grew up in Eaton Rapids. Schools receive federal aid because of the classification "economically depressed", due to a low tax base.

Eaton Rapid's problems include an inadequate waste water treatment plant, poor roads for commerce, limited water supplies for new industries because of a limited sewage system, and a struggling economy supported by by few industries. Transportation is a political problem awaiting priorities. A new projected land-use plan has just been completed.

CHAPTER IV

ANALYSIS OF DATA

The objectives stated at the beginning of the pilot study the intent to (1) produce a conservation education program relevant to the needs, background, and interests of the individual student; (2) teach broad based fundamental concepts of conservation in their environmental context; (3) present conservation education as a process as well as a body of interdisciplinary information; and (4) produce a professional skill for applying conservation concepts in a job situation.

Final evaluation questionaires by the student provided a strong endorsement for course methodology, for its relevance to student needs, and for professional skills. Analysis of this evaluation is made by means of the following tables.

In Table 2, items of the questionaire are distributed according to strong response, whether strongly agree or strongly disagree, in descending order, to provide a general trend. Four sub-tables distribute these items into the four categories of the objectives stated above.

It will be noted that in Table 2 there is a strong feeling expressed for the kinds of experiences the course

TABLE 2

COURSE EVALUATION BY STUDENT QUESTIONAIRE:
Items in Descending Order
"Strongly Agree" to "Strongly Disagree"

		* SA	A	U	D	SD
18.	This course could have been taught as effectively in the regular classroom.	0	0	0	5	15
1.	The freedom and flexibility of this course permitted me to plan a program best suited to my needs.	15	4	1	0	0
4.	Although I have not learned a quantity of subject matter, through applying what I have learned, I now know how to research out what is needed to teach any given unit in the curriculum.	14	6	0	0	0
2.	Through the various experiences in this course, I feel I can continue to develop conservation understandings myself.	14	6	0	0	0
8.	I didn't learn a great deal in this course.	0	0	1	6	13
11.	It was a valuable experience to organize my thinking about conservation into a plan of action, then carry it out.	13	4	3	0	0
14.	I used methods and materials already learned in other courses to teach conservation; this course taught me nothing new.	0	0	0	8	12

* Key to Symbols

SA - Strongly Agree
A - Agree
U - Uncertain
D - Disagree
SD - Strongly Disagree

"TABLE 2 (cont'd)"

		SA	A	U	D	SD
5.	Through my experiences, basic subject matter became more meaningful as well as more useful.	11	9	0	0	0
15.	As a result of this course, I will probably continue to learn more about environmental matters through my own curiosity and desire to become informed and involved.	11	9	0	0	0
13.	This course has been among the most interesting I have taken.	11	8	0	1	0
17.	I thought about activities and subject matter of this course outside of the usual time spent on a four-hour course.	10	10	0	0	0
24.	I have learned to apply basic information to conservation concepts through these practical experiences.	10	9	1	0	0
10.	I do not feel confident in my ability to teach conservation attitudes in an actual job situation.	0	0	1	11	8
19.	I have added new skills to my teaching abilities.	8	10	2	0	0
22.	Each part of the course contributed a valuable segment of the whole experience. I never missed any session of the course unless there was an unavoidable conflict or illness	8	9	1	2	0
7.	As a result of this course, I am anxious to develop a full-time approach to putting conservation into a regular curriculum.	8	6	5	1	0
9.	Conservation education aims at preparing students to take an active part in environment resource problems.	8	6	2	4	0

"TABLE 2 (cont'd)"

		SA	A	U	D	SD
3.	A teacher must have a solid foundation of factual knowledge about the natural resources about which she seeks to teach a conservation attitude.	4	12	2	3	0
23.	The course was enhanced because of the variable time scheduling.	4	8	4	3	1
6.	Conservation attitudes are acquired after basic information is obtained.	1	2	1	12	4
21.	Although it is essential to acquire basic information, subject matter is not the important objectives in teaching conservation.	3	11	3	4	0
12.	The objective of conservation education is to preserve the natural resources.	1	11	4	3	1
20.	I felt the course lacked basic subject matter information.	1	8	3	6	2
16.	Without basic information, you can still teach conservation.	0	3	9	6	2

provided, which are not in conflict with the desire for more conservation information. To some extent this reflects the experiential concept basic to the pilot course, in which information is selected applicable to the environmental situations rather than to textbook coverage. It also reflects the criticism already mentioned of the off-campus seminars and concentrated reading unit referred to in Item 22, both being primarily sources of subject information. However, Item 4 for which there is strong agreement places the need for comprehensive subject coverage below the need for having information that is relevant and practical to a specific situation.

There is a conflict of opinion indicated in relating conservation education to basic information and to preservation of natural resources in items low in the list of Table 2. To some extent these indecisive responses indicate the effects of specific experiences qualifying generalizations of this kind. In addition, course method aimed at reinforcing the concepts of conservation as an attitude rather than a body of information; as interdisciplinary rather than restricted to the natural resources; as applicable to all subject areas of the curriculum; and as a learning experience beginning with awareness. Questionaire items may not have adequately reflected these concepts.

In Table .1, Personal Stimulation and Motivation, response is strongly positive and consistent in all items and indicates a satisfactory achievement of this course

TABLE 2. 1.

PERSONAL STIMULATION AND MOTIVATION

		SA	A	U	D	SD
1.	The freedom and flexibility of this course permitted me to plan a program best suited to my needs.	15	4	1	0	0
8.	I didn't learn a great deal in this course.	0	0	1	6	13
13.	This course has been among the most interesting I have taken	11	8	0	1	0
15.	As a result of this course, I will probably continue to learn more about environmental matters through my own curiosity and desire to become informed and involved.	11	9	0	0	0
17.	I thought about activities and subject matter of this course outside of the usual time spend on a four-hour course.	10	10	0	0	0
22.	Each part of the course contributed a valuable segment of the whole experience. I never missed any session of the course unless there was an unavoidable conflict or illness.	8	9	1	2	0

TABLE 2. 2.

BASIC CONSERVATION CONCEPTS

		SA	A	U	D	SD
3.	A teacher must have a solid foundation of factual knowledge about the natural resources about which she seeks to teach a conservation attitude.	4	12	2	3	0
6.	Conservation attitudes are acquired after basic information is obtained.					
9.	Conservation education aims at preparing students to take an active part in environment resource problems.	3	11	3	4	0
12.	The objective of conservation education is to preserve the natural resources.	1	8	3	6	2
21.	Although it is essential to acquire basic information, subject matter is not the important objectives in teaching conservation.	1	11	4	3	0

TABLE 2.3.

COURSE FORMAT AND OPERATION

		SA	A	U	D	SD
2.	Through the various experiences in this course, I feel I can continue to develop conservation understandings myself.	14	6	0	0	0
5.	Through my experiences, basic subject matter became more meaningful as well as more useful.	11	9	0	0	0
11.	It was a valuable experience to organize my thinking about conservation into a plan of action, then carry it out.	13	4	3	0	0
18.	This course could have been taught as effectively in the regular classroom.	0	0	0	5	15
20.	I felt the course lacked basic subject matter information.	1	2	1	12	4
23.	The course was enhanced because of the variable time scheduling.	4	8	4	3	1

TABLE 2. 4.

PROFESSIONAL SKILLS

		SA	A	U	D	SD
4.	Although I have not learned a quantity of subject matter, through applying what I have learned, I now know how to research out what is needed to teach any given unit in the curriculum.	14	6	0	0	0
7.	As a result of this course, I am anxious to develop a full-time approach to putting conservation into a regular curriculum.	8	6	5	1	0
10.	I do not feel confident in my ability to teach conservation attitudes in an actual job situation.	0	0	1	11	8
14.	I used methods and materials already learned in other courses to teach conservation; this course taught me nothing new.	0	0	0	8	12
	I have added new skills to my teaching abilities.	8	10	2	0	0
24.	I have learned to apply basic information to conservation concepts through these practical experiences.	10	9	1	0	0

objective. This is supported by feedback information and procedural results. The dissension noted in Item 22 reflects on units, such as seminar and reading, which have been discussed.

Evaluation of course format and operation, Table 2.3, shows a strong agreement for course method and a lack of agreement regarding subject matter information and variable time scheduling. Items 25 through 34, in Table 3, Course Evaluation Related to Specific Sessions, touch upon aspects of subject matter information units and will be discussed shortly.

The item of variable scheduling as a technique for individualized instruction is separated from other feature of the course. This procedure refers specifically to the first three weeks in which students scheduled reading and field trips, and to field experiences of the laboratory and teaching experiences. Variable time scheduling presented difficulties in conflict with other scheduled courses, heightened by the requirement for transportation to the off-campus site. Adjustments resulted in schedules being established early in the course, except for teaching units which retained a measure of flexibility throughout. This experience with flexible scheduling is reflected,in the final evaluation, to the degree each student could use it in relation to an established class schedule.

Inasmuch as this became a scheduling problem, it appeared desirable to establish these events in advance,

with provisions for change to accomodate student requests. Greater use of this technique was made in activities in which the student was in complete charge.

Student Evaluation of Professional Skills, Table 2.4, shows strong agreement for achievement of this goal. Items show a variation of response to be expected in broad generalizations, showing the need to relate these skills to experiences of the course more precisely. Class rank may account for the response to Item 7, referring to putting conservation into job situation.

In Table 3, class ranking shows 9 graduating seniors, 5 undergraduate seniors, and 6 juniors. Eleven students have a potential for taking additional course work before applying conservation education professionally.

Three units of the course are evaluated directly in Table 3. Seminar sessions, by strong agreement, would be better held on campus. Also, a resource specialist is preferred to course instructor for seminar sessions.

Evaluation of classroom teaching units showed the strongest agreement of the three units for course method. Modifications noted by fourteen students possibly account for the uncertainty of three to six students. Because of the complexity of these situations greater analysis needs to be provided by additional items to the questionaire.

Similar comments apply to the outdoor laboratory, although there is a greater consistency in responses. Two students feel the laboratory could be as effective if

TABLE 3

GENERAL COMMENTS ON SPECIFIC PARTS OF THE COURSE

		SA	A	U	D	SD
	Seminar Sessions: (In Eaton Rapids)					
26.	Holding the seminars in Eaton Rapids added a dimension of reality to these problem areas.	1	2	1	9	7
25.	Since the purpose of the seminars was to teach facts and problems in the basic areas of conservation, I felt it accomplished this purpose.	1	14	2	3	0
33.	The seminar sessions could be:					
	1. taught just as effectively on campus.	16				
	2. taped and used in carrels, independent study.		1			
	3. taught by the instructor of the course.			0		
	4. made more relevant to community problems and taught in the community.				1	
	5. left as they are					1

TABLE 3 (cont'd)

		SA	A	U	D	SD
	Classroom Teaching Assignment (In Eaton Rapids)					
27.	Since the purpose of the weekly classroom teaching assignment was to provide a continuity with the on-going program and at the same time show how conservation could fit into any such program, I felt it accomplished this purpose.	7	7	6	0	0
28.	The weekly classroom teaching session provided an opportunity to develop and improve teaching units in conservation.	7	10	3	0	0
34.	The teaching sessions could be:					
	1. taught just as effectively on campus.	0				
	2. include a team approach for assisting on class outings.		4			
	3. have a training program for both in-service and pre-service teachers for orientation to the program.			6		
	4. have more direct connection with other information and activities of the course.				4	
	5. remain as they are.					9
	Outdoor Laboratory (In Eaton Rapids)					
29.	Since the purpose of the outdoor laboratory at Eaton Rapids was to relate concepts of conservation to a specific resource in order to use this resource for classroom teaching enrichment, I felt it accomplished this purpose.	3	13	4	0	0
30.	The purpose of teaching outdoors is to teach appreciation for the outdoors and so cannot be taught as well in any other way.	5	11	2	2	0

TABLE 3 (cont'd)

		SA	A	U	D	SD
32.	The outdoor laboratory could be:					
	1. taught just as effectively on campus.	2				
	2. replaced by field trips.		2			
	3. supplemented with concentrated basic information about the natural resources.			6		
	4. designed for individual investigations dictated by personal interest.				1	
	5. remain as they are.					11
	General:					
31.	The best way to understand conservation concepts is as they relate to a community, its schools, people, problems.	10	8	2	0	0
39.	My class rank is:					
	1. Graduating senior with job	5				
	2. Graduating senior without job		4			
	3. Senior			5		
	4. Junior				6	
	5. Sophomore or Freshman					0
40.	My cumulative grade point average is:					
	1. 3.5 - 4	1				
	2. 3.0 - 3.4		5			
	3. 2.5 - 2.9			14		
	4. 2.0 - 2.4				5	
	5. Below 2.0					0
41.	As I compare this course with others I have or am taking, I feel I have earned the grade of:					
	1. A	15				
	2. B		5			
	3. C			0		
	4. D				0	
	5. Inc.					0

taught on campus, eleven are satisfied with its present condition, and the remaining seven selected redesign options. Most of the laboratory experiences were conducted on the natural site, and it was generally agreed this should be expanded to include other of the community resources, expressed to some extent by six students in Option 3, Item 32, "supplemented with concentrated basic information about the natural resources . . ." These kinds of experiences would make the off-campus laboratory a more unique unit.

There is strong agreement for closely relating conservation concepts to real community experiences expressed in Item 31 in the last section of Table 3. Evaluative uncertainty here, even though minor, might be explored profitably by expanding the questionaire, by building for inner consistency, and through comparisons with control groups.

As a final summary of the categories rated by the students in the questionaire, these were averaged and put on a uniform scale, 0 through 3. On this scale the most favorable response is "0" and the least favorable is "3". This gives a relative value of these categories to the students as a measure of the effectiveness of the course.

The following is a summary of student evaluations:

I. Personal stimulation and motivation	.48
II. Professional skills	.61
III. Course format and operation	.63
IV. Basic conservation concepts	1.36

From this final evaluation by the students, it is concluded that the course methodology (1) provided experiences relevant to student needs, interests, and backgrounds; (2) presented conservation concepts in meaningful context with experiences in an actual community environment; and (3) produced an awareness for the professional skills and continuous learning skills necessary for applying conservation in a job situation.

It was desired to know to what extent student responses would be reflected in an evaluation of the program by those cooperating in the school systems. A questionaire, sampling these responses, was completed by each of the twenty cooperating in-service teachers and two administrators. These responses are analyzed by means of the following tables.

General trending is provided by Table 4 in which items are listed in order of strong responses, either agree or disagree. Strong agreement is expressed for the harmonious interaction of the two programs in Items 9 and 1, and reflects the cooperation which existed throughout the program.

The distribution in Item 9 approximates the degree of this cooperation as expressed by students during the teaching experiences and is an important factor. To some extent, this agreement between in-service and student ratings on course relevance provides a measure of validity to each.

It will be noted that the items which received ratings showing strong convictions are related to the student, while those lower in the list refer mostly to in-service teachers. This may be a natural trending in view of the limited direct involvement provided in course procedures. After the two orientation and planning meetings, held jointly in the school and on campus, students communicated directly with the in-service teachers. Item 22 indicates that there is not a strong desire for additional involvement.

The in-service teacher may assess her graduate standing and job position as already providing the competencies being taught or she may be reluctant to admit they do not. Item 6, for example, firmly disagrees with the problem of disagrees with the problem of discipline as conditioning the use of the outdoors, yet Item 16 is equally agreeable to the suggestion that with more help on supervision the outdoors would be used more frequently. Item 6 may possibly make an inference that could be interpreted as critical.

Items of the questionaire were grouped into categories, sub-tables of Table 8, to evaluate (1) student

TABLE 4

COURSE EVALUATION BY IN-SERVICE TEACHER QUESTIONAIRE

		SA	A	U	D	SD
9.	This program contributed to my program and I am pleased I was a part of it, and I would do it again.	13	6	1	0	0
1.	The student-teacher planned her lesson to fit into my on-going lesson plans.	12	4	2	1	0
2.	The student-teacher was always well prepared, well informed.	9	7	2	2	0
17.	I felt the children gained conservation insights and attitudes from these experiences.	8	9	4	0	0
19.	The student-teacher used "real" experiences and involved the children most of the time.	7	12	0	1	0
11.	Your students developed greater interests in and awareness of their environments.	7	11	1	0	0
5.	The experiences steadily improved in content and presentation.	7	8	3	1	1
14.	My students enjoyed this experience a great deal mostly because it was a "treat", "something different".	7	5	3	5	0
21.	I can see where this type of program gives the student-teacher a way of learning about conservation that would be hard to duplicate.	6	12	2	0	0
8.	The student-teachers worked the outdoor experiences into a good teaching plan with follow-through.	6	11	1	1	0
7.	This experience gave me a broader/ better understanding of conservation.	6	8	3	2	0

TABLE 4 (cont'd)

		SA	A	U	D	SD
20.	This has been a unique experience for me, providing insights into putting conservation into action that I didn't have before.	6	4	3	6	0
13.	The students were highly motivated by the learning through these environmental outdoor experiences, and there were a minimum of behavior problems.	5	14	1	0	0
23.	It is my opinion that every pre-service student who had this type of experience would be very likely to carry out this program when they had their own classroom.	5	11	3	0	0
12.	This helped me see ways I could use the outdoors more in my own teaching.	5	11	0	2	0
15.	I would like to take an in-service course in conservation myself and find ways of using our own Eaton Rapids resources more in my teaching.	5	5	6	3	0
3.	I would like to try some of the methods, experiences and/or materials used myself sometimes.	4	13	1	0	0
10.	I participated in these sessions and learned a little bit myself.	4	13	3	1	0
16.	With help on the supervision, I would use the outdoor resources in my teaching frequently.	4	11	0	3	0
22.	I would like to see this program developed further to include in-service teachers.	4	6	4	1	0
18.	The evaluation planned by the student-teacher to measure its effectiveness for your pupils was consistent with the over-all presentation and gave a fairly accurate estimate.	3	12	3	1	0

TABLE 4 (cont'd)

		SA	A	U	D	SD
4.	I was glad to help the student-teacher learn to put conservation into practice, but I actually did not learn anything about this myself.	1	4	1	7	5
6.	One of the main reasons I do not use the outdoors more is because of the discipline problems with that many children.	1	2	1	5	10

TABLE 4. 1.

STUDENT-TEACHER EVALUATION

2.	The student-teacher was always well prepared, well informed.	9	7	2	2	0
8.	The student-teachers worked the outdoor experiences into a good teaching plan with follow-through.	6	11	2	1	0
18.	The evaluation planned by the student-teacher to measure its effectiveness for your pupils was consistent with the over-all presentation and gave a fairly accurate estimate.	3	12	3	1	0
19.	The student-teacher used "real" experiences and involved the children most of the time.	7	12	0	1	0
5.	The experiences steadily improved in content and presentation.	7	8	3	1	1

TABLE 4. 2.

VALUE TO SCHOOL CURRICULUM

		SA	A	U	D	SD
1.	The student-teacher planned her lesson to fit into my on-going lesson plans.	12	4	2	1	0
9.	This program contributed to my program and I am pleased I was a part of it, and I would do it again.	13	6	1	0	0
15.	I would like to take an in-service course in conservation myself and find ways of using our own Eaton Rapids resources more in my teaching.	5	5	6	3	0
16.	With help on the supervision, I would use the outdoor resources in my teaching frequently.	4	11	0	3	0
23.	It is my opinion that every pre-service student who had this experience would be very likely to carry out this type of program when they had their own classroom.	5	11	3	0	0

TABLE 4. 3.

VALUE TO CHILDREN

11.	Your students developed greater interests in and awareness of their environments.	7	11	1	0	0
13.	The students were highly motivated by the learning through these environmental outdoor experiences and there was a minimum of behavior problems.	5	14	1	0	0
14.	My students enjoyed this experience a great deal mostly because it was a "treat", "something different".	7	5	3	5	0
17.	I felt the children gained conservation insights and attitudes from these experiences.	8	9	4	0	0

TABLE 4. 4.

VALUE TO SELF

		SA	A	U	D	SD
3.	I would like to try some of the methods.	4	13	1	0	0
4.	I was glad to help the student-teacher learn to put conservation into practice, but I actually did not learn anything about this myself.	1	4	1	7	5
7.	This experience gave me a broader/ better understanding of conservation.	6	8	3	2	0
10.	I participated in these sessions and learned a little bit myself.	4	13	3	1	0
12.	This helped me see ways I could use the outdoors more in my own teaching.	5	11	0	2	0
20.	This has been a unique experience for me, providing insights into putting conservation into action that I didn't have before.	6	4	3	6	0
22.	I would like to see this program developed further to include in-service teachers.	4	6	4	1	0

performance; (2) value to school curriculum; (3) value to children; and (4) value to self (in-service teacher). These are compared in Figure 5 by using total ratings of strongly agree to strongly disagree.

From the summary of responses in Figure 5 it will be noted that there is definite agreement as to total course values. The four category curves show a great similarity, the difference in peaks representing the uneven number of number of items included in each category as will be noted from the sub-tables. For example, Tables 4.1 and 4.2 include five items apiece while Tables 4.3 and 4.4 have four and six items respectively. The variation in Table 4.2, "Value to School Curriculum", shows a trend toward towards Strongly Agree. In Table 4.4, Value to Self, some of the possible causes for disagreement have been discussed already and will be summarized below.

This positive response from in-service professional teachers is regarded as a confirmation that the course has relevancy to the job situation, a total course objective. In the pilot course no effort is being made to equate this objectively but, rather, these results will be used to weigh strengths and weaknesses for redesign and for establishing quantifying criteria.

Examination of the tables must be made with the thought in mind that these are evaluations of individual student performance, reported by individual in-service teachers. No attempt was made to organize in-service teachers into a cooperating group; each student communicated directly in

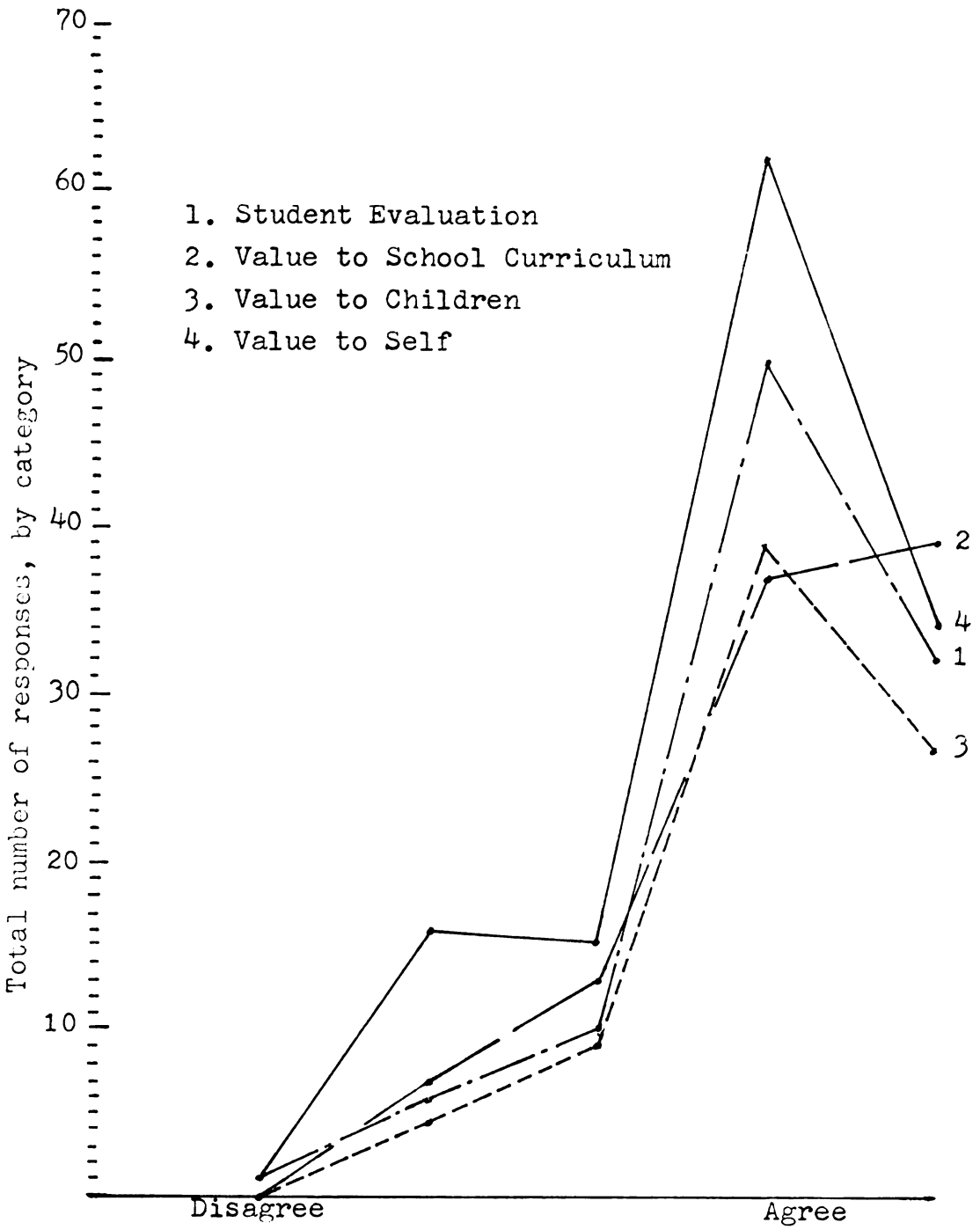

Fig. 5.--Summary of course evaluation by categories: In-service teacher questionaires

relation to the project work underway in order to effect a greater efficiency and economy of time. In addition, teachers were from three separate schools.

Group work took place in pre-project orientation sessions as discussed previously. At the conclusion of the course, in-service teachers were extremely busy concluding their own programs and school year so that it was not only difficult but seemed irrelevant at the time to arrange. The emphasis by this point was completely related to the student and the class project.

However, in consideration of the great value of student interviews for unique evaluation and insights, it would be advisable to schedule this session for in-service teachers as well, in future course experiences. From responses to the questionaire, there is every indication that in-service teachers would be willing and effective in the formulation of improvements to course design, criteria, and evaluation valuable for meeting course objectives.

In Table 4.1, the general feeling expressed trends towards strong agreement that the students were well prepared and used "real" experiences. There is some uncertainty regarding the student evaluation of their own teaching units, which reflects the procedure of the course which involved the in-service teacher primarily in planning the lesson only. There is a need to formalize total procedures to include the in-service teacher at each step, including the evaluation of the lesson. This would provide

a more accurate measurement for the student of immediate success and of progress, as well as supply another means of feedback on student projects. Such improved procedures might prevent the evaluation appearing in Item 5 for one student whose in-service teacher expressed a lack of progressive improvement, with this interpretation, which did not appear in feedback procedures.

In Table 4.2, strong agreement is expressed for the harmony which existed between the two programs and the pre-service and in-service teachers. More conservative agreement is given for the course as a stimulant to school curriculum, which was discussed previously as items such as Item 16 having an interpretation somewhat threatening to the in-service teacher. However, there is more positive agreement expressed for its value to the pre-service teacher (Item 23).

A satisfaction was expressed by in-service teachers for the value to children in Table 4.3. Agreement on gains in, and motivation for, environmental understandings is indicated. Interpretation of the lack of agreement on Item 14 (whether children enjoyed the experiences as "something different") needs more information on what is considered the children's favorable responses.

The relatively low position given for "Values to Self", Table 4.4, only distracts slightly from total conclusions confirming the positive values of these experiences. Teachers agreed they would like to try some of the methods

(Item 3) and that they had learned from participating (Item 10). For more positive responses and agreement: improvements to the general procedures throughout, revision to questionaire items, and more provision for defined participation by the teachers are a few of the factors to consider.

Some of the remarks voluntarily added to the questionaire include:

> 1. Mr. L. was excellent. He had some problems planning at first but did very well overall. He brought resources of his own that were quite unique. I learned a great deal about the use of conservation in the classroom. I was equally pleased by the response my class had to the program. I feel this has been a very creative experience for all involved.
>
> 2. The youngsters looked forward to science conservation on Thursday. It was a day of enrichment to them. The teacher did a good job of keeping the attention of the youngsters. They were always interested in what she brought to them. I must admit that I could have developed some of these lessons too but never felt I had the time.
>
> 3. I was skeptical but it worked out well. The children loved the trip to the woods. We went at a time when we saw a great many things. Miss M. had good rapport with this age of student. Her experiments were well received and carried through.
>
> 4. I was disappointed the evening we went to E. Lansing to a meeting. I didn't care to be entertained as I'd left a family at home. I felt it should have been a time for an explnation on what was expected of us, and also to have a longer time of planning. My student came at 2:15 and this is a short period and hard to plan too much for; also children are getting restless at the end of the day. I do feel Miss H. gained experience. She had plans, and one of them I had to down (the trip to river and along and up by Hastay's) as we'd need permission slips from parents plus property owners; with all our outdoor facilities I felt it unneeded. Biology was my minor and I've taken electives in agriculture and have used conservation all through the year.

> 5. My student teacher was so sweet and so humble and completely honest, we just loved having her come. I was called to the phone and didn't get a chance to tell her the last day. I never saw my children so thrilled with something that held their interest for so long. Do it for me again.

Evaluations from the two principals of the schools concerned were complimentary and favorable and expressed a willingness for continued cooperation in this program. Their complete evaluation statements are included in the Appendix.

Final interviews with the students in the course were structured through a prepared outline, conducted individually and taped. Two interviewers followed this procedure, the instructor of the pilot study and the advisor to the program who had had no direct involvement with the students in the operation of the pilot study.

The purpose of the interviews originally was to check attitudes of the students towards conservation, teaching conservation, the process approach for teaching conservation, and towards the course itself. These are explained in terms of the specific topics explored in the interviews, summarized below.

The interviews were productive dialogs for summarizing and emphasizing course objectives and for constructive criticisms by the students. Therefore, the following discussion will not only evaluate attitudes revealed by this method, but also combine the suggestions made, into final conclusions and recommendations.

1. Attitude towards conservation

Students were asked to describe their concepts of conservation, any changes in it brought about by the course, and if these understandings were to be used to put a program into action, what the essential guidelines would be.

Replies were given to the first question by all the students to include management and use as important to natural resource preservation; that this is a responsibility of everyone; that all living and non-living things are interrelated, including man.

Changes in conservation understandings emphasized the personal nature of these realizations, as personal feelings of responsibility, awareness of ways and means understandings were interpreted into the many divisions of the environment, the different ways a problem could be approached, especially in subject matter, the variety of interrelationships, and the stimulation of practical viewpoints of different people in community and school.

Regarding guidelines for an action program, most of the students expressed this as situation-stimulated, related to interests and abilities of the children and to the subject, using a method of discovery and inquiry. They indicated the need for more information. Some saw this as more course work; others saw this as research related to situations. One student thought in terms of group effort, getting others involved, setting up a school program. Variations in replies were individualistic.

2. Attitude towards teaching conservation:

Students were asked to elaborate on their attitude towards teaching conservation, comparing it to other subject fields including biology, stating objectives, and professional skills required. The prevalence of the convictions that it overlay other subjects as enrichment and as a way of life was conclusive evidence that all students related conservation directly to the environment and to the building of values. Frequent mention was made of the real experiences, arousing awareness, interests, and curiosity to build ideas. Relating people to subject matter, such as biology, was stated by many as the understanding of human relations in conservation, this starting with the child himself. Students were amazed at the span of knowledge encompassed by conservation and the need to keep learning. One student who had spent more and more time on lesson plans, suggested this expansiveness of conservation be used as an approach to curriculum in general. It was reassuring to note that the students saw conservation in relation to other subjects and not entirely as a new body of information to acquire before teaching it. Many of the students commented on the use of past experience and information in their lesson planning. This usually led to a conclusion that research skill through inquiry was the way to continue on after this course in job situations.

3. Attitude towards this course:

Students were asked to discuss their expectations in terms of the results of the course, whether they would make the same choice again, take additional courses. A basis for these comments were course elements of personal freedom, "break-throughs" in conservation understandings, and field experiences including value to children. Although a certain amount of "politic" agreement was to be expected regarding course choice, qualifications were specifically defined in favor of these items. The students expressed in various ways that the course had contributed to their search for personal relevance in the application of subject matter, realization of personal responsibility for learning as the project work proceeded. The confusion and doubts held during the first part of the course were dispelled when student involvement became the major activity, and the students expressed appreciation for the autonomy of their situations with the classroom and children.

Attitudes toward continued course work was favorable although the difficulties of scheduling and required course work made this largely doubtful. Suggestions made included graduate work, inservice classes and workshops, and "promoting" the course by advance announcement. Students were satisfied with the results of the course, both for themselves and for children involved.

4. Attitude towards the process approach for teaching conservation:

As a final opportunity for critical analysis, students responded to questions regarding the necessity of having these experiences off campus, whether this was too advanced for their states of knowledge, and whether this methodology added unique skills to professional abilities. There was emphatic support for the community action program and no qualifying substitutions offered for these experiences as being equally obtainable in a campus situation. Admitting to time, scheduling, and transportation problems at times, the students were insistent that experiences in the field were the essence of the course value to them, especially the teaching units. To some extent, a varied laboratory program could include campus locale, and the seminars would be most efficient on campus, but the projects were unanimously upheld as essential in community context. The ideas generated: practical situations, resource help, and practical learning experiences to use information learned in "piles". In addition, there was satisfaction expressed for acquiring measures of confidence and environmental concerns. One student added: "Without the community program it would be like a composer composing music and never listening to it".

In response to extent of professional skill gained, most students simply stated, "I plan to use it".

As a summary, suggestions growing out of these interviews and from feedback instruments, are as follows:

1. Distribute readings throughout the course, integrated into other information areas of the program, such as seminars and laboratory.
2. Intensive preliminary learning sessions should be interspersed with discussion groups or comparable means for student dialogue.
3. Early orientation to project work to minimize initial confusion and to give purpose to the contingent exercises.
4. Regulation of scheduled times where it does not detract from individualized instruction: establishing times for seminars and laboratory periods, continuing flexibility for projects, field trips, resource units.
5. Closer integration of field work with project work to use information more efficiently.
6. Greater diversity of community resource units in laboratory sessions.
7. Early scheduling of involvement with in-service teachers to provide more planning time if desired by the student.
8. Include instructional modules within community resource units which are examples of teaching units in all subjects, other than science. Carry them out as well as provide them as resource units to complete the offered modular experiences of laboratory and seminar.

9. Provide a basic text for "security".
10. Extend the course beyond one quarter, by "alumni" membership, with continued communication through consultant services.
11. Include children's literature and resource information as required reading.
12. Involve the seminar experts in the course in team teaching.
13. Include school site development as an instructional module.
14. Develop a method for researching resource and community units which may be used to duplicate the work of the class in job situations.

CHAPTER V

COURSE DESIGN AND DEVELOPMENT

This research has clearly indicated the relevance of a community action program for providing the kinds of experiences satisfying individual interests, needs, and backgrounds of pre-service teachers to relate conservation education to the environment and to children in a school system. Further, it provides a means of integrating the combination of disciplines that are recognized as the "interdisciplinary nature of environmental problems".

It is a flexible approach to supplying individualized instruction because it views the diversity found in the community as a "system", developing within it significant environmental areas and situations as subsystems which, as complete conceptual units, are used by the student immediately in individually selected projects of his own choosing, for the course and under its supervision.

The results and evaluation of the pilot study show that the students were "ready" for the personal responsibilities and choices this program utilizes. The students rated this as "essential" and "very desirable" if not essential, indicating a motivation not dependent upon conventional course credits. The resultant value judgments and creative

experiences exhibited by students in their projects provided behavioral evidence that they were headed in the direction of continuing self-education and action in conservation education.

This technique, as a choice of alternatives, meets the goals and objectives set forth for an operational methodology. As a developmental stage, this has been unique in providing insights into all constituents of the program through combined learnings from the community-university interaction. The following revised design reflects this combination of values.

Goals and Objectives of Conservation

To the broad goals set forth at the start of this study as guidelines a revision is made to emphasize an essential quality of purpose clearly defined in the school-community action program and often over-looked in objective analysis. A restatement of the goal interrelating human ecology with that of the natural sciences, fundamentally seeks to: "Create an attitude of love or concern for the natural environment in harmonious perspective with the man-made environment, especially in relation to teaching children."[1]

These objectives seek to:

1. Acquaint the student with scientific knowledge, concepts, and principles specifically related to resources and problems of a selected community environment; employ procedures and techniques for

investigating and interpreting these concepts in context; require the student to design lesson plans applicable to a classroom situation in the community, identifying environmental concepts and principles, and using appropriate techniques; put these into classroom operation.

2. Design the course as a model for achieving these goals which will provide learning experiences based on individual differences in backgrounds, abilities, interests, and goals. The student will include methods in designing lesson plans which recognize individual differences among their own students.
3. Divide the course into units which make it possible to simplify the complexity of the environment for analysis while maintaining interrelationships through the high level controls of the model. Examples of units are in categories of water, soil, wildlife, etc., components of the natural and man-made, human environments and related to specific resources of the selected community. Students will identify broad and fundamental concepts and principles selected as necessary for the analysis of the specific environmental experiences of the course. Topics such as succession, cycles, and food chains are examples to be explored in the immediate conditions of the environment.

4. Design the course unit-contents and methods so that these are adaptable to recombinations and act as resources in situations beyond the immediate influence of the course.
5. Design and build into course design specific procedures for evaluation which provide (a) adminstrative review and approval of course objectives; (b) tests designed to measure student achievement; (c) pre-test and post-test to determine student gains made within the influence of the course; and (d) provisions for dynamic course redesign.

Course Units

Choice of topics or units follows a prevailing, logical selection. Limitations on comprehensive coverage and depth are imposed by time limitations of a one-quarter course bounded by ten weeks and four weekly credit hours. The majority of students in the pilot study stated this block of time realistically fitted into their tightly structured programs. In addition, it provides a means of comparison with standard courses for educational research.

The ultimate selection includes those topics which are related to the particular community-school environment. As units, these consitute a "bank" from which to add and subtract as other environments are chosen. For example, other environments in which learning experiences can be provided include: (1) Low density rural community; (2) High density suburban

area; (3) industrial community; (4) Community on major aquatic thorofares; (5) combinations of all of these. Some of these choices would require adjustment to conventional parameters of scheduling and course credit hours in order to make these environmental classes feasible on an undergraduate level.

Using the community situation of the pilot study as the focal point for resource choices throughout the course design, the following topics or units are recommended. Note that each topic is scheduled for one week. A theme is designated, as the common experiential reference, to provide a focus on the community resource to be explored for interdisciplinary considerations. This also provides a beginning point for student programs, community awareness, and an insight into the interrelated environmental concerns of school and community.

Week	Subject	Common Experiental Reference
1	Philosophy of Conservation Education	Land-use Planning
2.	Ecology	Teaching Stations
3	Water	The River
4	Soil and/or Land	The Farm
5	Vegetation	Natural Areas: School Site Dev.
6	Trees	City Forestry
7	Wildlife	Wildlife Sanctuary
8	Recreation	School Camping
9	Problems	Student Symposia
10	Action programs	Future teaching jobs

The order is important, selected by means of two criteria: (1) each unit carries along a portion of preceding units, so that the most basic units come first; and (2) the most basic units represent resources important within the selected community. Water has a primary position in the above schedule, for example, because of the dominant position of an important Michigan river and a critical problem with waste water disposal in the community of the pilot study. Likewise, soil precedes vegetation because of its fundamental nature also, and the strong urbanization forces disrupting an important farming industry.

Designating a theme makes possible specific selections of concepts and goals,[2] as well as suggesting methodology. By narrowing topics in this manner it is possible to provide specific information in depth, supplying usable information for the student in project work. In addition, it makes it possible for these units to be designed as instructional modules, complete experiences which may be presented through a variety of instructional methods for greater efficiency, motivation, experimentation, etc. For example, programmed instruction, as an alternative to the lecture, would provide factual background information, individualized instruction, and flexible scheduling.

Sequencing

Sequencing is used to arrange information more efficiently and with increased individual relevancy. Information is provided through readings, audio-visuals, simulation, seminars, laboratory, and classroom teaching experiences by the student. These are arranged in various combinations which best prepare the student for building his own teaching units and carrying them out in an actual classroom during the course.

Essentially, there are two patterns of learning observed: (1) skill progression, from student awareness to self-directed involvement; and (2) broad conceptual understandings to problem solving, synthesizing complex understandings. This is illustrated in the following chart:

Content	Method
I. Orientation	
1 - Philosophy of Conservation Education	1. Readings: adult and children levels
2 - Ecology	2. Films and slide tapes for programmed instr.
3 - Water	3. Simulation exercises
	4. Field assignments
	5. Enrichment resources
II. Action	
4 - Land	1. Readings
5 - Vegetation	2. Seminar sessions
6 - Trees	3. Classroom teaching
7 - Wildlife	4. Field laboratory
8 - Recreation	5. Enrichment: skills
9 - Problems	6. Resources

Part I of the program is teacher-oriented, with student choices being made at each step within the framework presented. For example, choices of readings, selection of slide tape concepts, and kind of field assignment allow the student to supplement previous background information and specific areas of interest. Minimum course understandings are presented through readings and programmed instruction or equivalent. Student-teacher interaction occurs through field experiences and other preparations occuring within the orientation session for the classroom teaching experiences. These will be described shortly.

In Part II emphasis shifts to student responsibility. Information is still supplied by the teacher, in seminar and laboratory sessions, oriented to the selected community resource or problem. Other aides are available to the student as optional enrichment, which may serve to instruct him or provide skills and techniques which may be incorporated into a desired lesson unit of the student's design. The lesson units are related to the on-going curriculum, worked out in cooperation with the in-service teacher, so that primary decisions lie with the student. Besides resource help offered the student from the course program described, the on-campus laboratory is well-stocked with the kinds of resources anticipated for both student and classroom needs.

Total course content places emphasis on philosophy of conservation education, ecology, and water since these occupy a greater time block than the succeeding topics. The first

pervade the course and are reinforced throughout the other topics. The third, water, represents the major feature of the community chosen. Also, as an orientation these are most likely to fit into pre-existing student backgrounds, lessen anxiety, and motivate inquiry. Interaction with the student during seminar and laboratory provide guidance directly related to the students' programs of involvement and, as such, stimulate student performance. Procedural feedback supplies continual evaluation.

Instructional Modules

Reference is made to instructional modules, which supply information and understandings needed by the student to reach designated goals. A flexible and efficient teaching tool is the programmed instruction technique, replacing the traditional lecture. A brief description at this point provides a reference to its use in the sequencing time tables which follow.

Programmed learning techniques have three major objectives: (1) to present that is desired to be taught so that (2) the learner may reach the desired goal within a reasonable amount of time, (3) working at his own speed and on his own time.

The technique involves a script written from performance goals, illustrated by pictures, such as slides, a means for student responses to questions, such as worksheets, and a means for student performance, such as simulated experiences or intermittent activities.

Simulated experiences are gamelike and have the same dynamic continuity as the script, requiring a developmental type of response which indicates to the student his degree of understanding as he progresses.

The variety of responses possible for achieving behavioral goals using this technique is indicated by the following chart. Simulation, involving the learner in vicarious experience, provides a motivation and stimulation often considered lacking in the usual programmed instruction.

Behavior desired:	Learning Desired:	Type of Response:
To identify	objects by name pictures by name systems by name	write match select
To describe	objects systems concepts functions	write match select
To define	words phrases	write match select
To use	tools instruments devices systems	write select do

Steps in preparing a simulator unit include:

1. List performance goals in sequence
2. Divide into two parts for instructional flexibility
3. List critical responses essential to unit topic
4. Decide depth of coverage to keep script fifteen to twenty minutes in length
5. Write a tape learning sequence, using slide list and response sheet
6. For planning supplementary activities and testing, allow four hours per unit per week.

Design Criteria

1. The student will match concepts and principles of conservation and ecology included in the prescribed readings, seminar, and laboratory sessions to case-study situations provided by films and tape-slide commentaries.

Performance Goals:

See Unit I, Philosophy of Conservation Education
See Unit II, Ecology

2. Students will make decisions and rationalize them in simulation exercises of community planning and problems related to the real community-school environment in which the course is to be operating.

Performance Goals:

See Unit II, Ecology

3. Students will secure information regarding the natural, social, political, economic, and cultural resources and problems of the cooperating community-school environment through primary investigation and team work, using prescribed methods and forms.

Performance Goals:

See Unit III, Water

4. Students will prepare, teach, and evaluate six classroom units on conservation in a community elementary school, conforming to its on-going curriculum and philosophies and to criteria of the course. The course shall supply preparatory instruction and perform as a resource to the student.

Performance Goals:

See Unit IV, Land

5. Students will demonstrate a competence in field interpretations of environmental concepts presented in course design and taking place within the community concerned.

Performance Goals:

See Unit V, Trees

6. Students will identify and acquire field skills and techniques needed for teaching experiences but not included in scheduled class sessions through use of enrichment procedures provided, such as tape-slide modules, laboratory kits, and intro-departmental resources of the university.

Performance Goals:

See Unit IV, Land
See Unit VII, Wildlife

Unit I

Philosophy of conservation education:
"Land-Use Planning"

Concepts:

1. The ultimate goal of conservation policy should be to manage the environment in such a manner that it contributes to the physical and mental health of man and to the "flowering of civilization".

2. The world's population is increasing, the earth's supply of some natural resources is decreasing. This behooves man to use nature's resources wisely and with minimum waste.

3. To live healthily and successfully on the land, we must live with it, respect it, love it: it is not enough to have wise use and enlightened practices in natural resources utilization.

4. The goal of environmental conservation is the preservation and creation of diversity among human societies and in their organic environments.

5. A comprehensive sample of existing animal and plant species and natural communities should be preserved for the enjoyment and benefit of future populations of man.

Design Criteria:

1. Students will study conservation as a way of life, a general social movement with political-economic overlays.

   Performance Goal 1:

   Students will match historical events of environment changes with changing concepts of conservation by

contrasting: (1) resource management::multiple use; (2) wise use::quality of living; (3) land economics:: land ethic; (4) resource management::wilderness areas; (5) natural areas::regional land use comprehensive planning; (6) proper land use::ecological conscience or land ethid; (7) discipline::interdiscipline.

Performance Goal 2:

Students will be able to define natural resources as renewable and non-renewable, human resources as personal and institutional, and describe examples of management in terms of their interaction in real community situations.

a. Renewable resources: water, vegetation, soils and land, wildlife, human, air.

b. Non-renewable resources: Minerals, natural areas, specimen wildlife, urbanization of soil

c. Personal human resources: great works of man

d. Institutional resources: group and organizational accomplishments in environmental improvement

e. Interaction: park systems, urban planning, science research

f. Comparison with agrarian, natural resource-oriented conservation and a combination of open-ended decision-making situations where good management is involved: background information needed, consideration of values and attitudes, priorities of multiple use requirements, long range planning.

2. Students will be able to identify types of conservation concerns and analyze these in terms of a definition for "quality of the environment".

Performance Goal 1:

In a given environment students will identify existing action in areas where conservation is physical improvement of natural resources, where social concerns are open space and recreation, where science and technology advances the standards of living, and where economics maximizes resource use.

Performance Goal 2:

Students will design environments and justify uses of environmental features on the basis of concepts of conservation.

3. Students will identify values with diversity of common, easily available natural objects in the environment.

Performance Goal 1:

Students will be able to identify and interpret a specified number of the species of important food chains; primary producers important to successional patterns; abiotic material related to geologic or geographic fundamental concepts.

Performance goal 2:

Students will design creative experiences using a selection of the natural objects identified, illustrating specific concepts and principles.

Unit Design:

A. Summary of content:

1. Attitudes
   a. Personal identification of such values as esthetic, recreational, space, health; providing for them
   b. Institutional: social, economic, political, scientific, natural; values and roles

2. Historical continuity of conservation education, interrelating personal and institutional roles.

3. Environments and communities: natural and human ecological principles; selection process.

4. Present conservation concerns: quality, multiple use, priorities, carrying capacities

B. Methods and activities: 3 sessions, 1 hour each

1. Slide-tape presentation, "Quality of the Landscape", following philosophy of Aldo Leopold's, Sand County Almanac, with kits of the habitats and a plan for student interaction as a simulation experience. This kind of session may be self-directed and scheduled.

2. Assigned readings on resources, management, problems.

3. Adaptation of programmed instruction to common experiential reference, the community, with student responses including mapping, locating areas for additional investigation, becoming familiar with human and natural resources.

4. Group discussion of concepts and principles, generally and specifically, concluding with a focus on the community and investigations desired, and a plan for implementation. This includes course topics and individual projects.

5. Use of multiple media to relate to type of learning desired and to provide a model for student methods.

6. Field trips as a follow-through of simulated experiences, to field-inspect investigations selected for course projects, and to define them more specifically.

WEEK 1 UNIT Philosophy of Conservation Education THEME Land-Use Planning

	Scheduled Course Time (in hours)						
	Classroom Instruction				Outside Study		
	1	1	1	Lab-2	1	1	1
1. Unit content:							
a. Instructional module, on campus	.DC-1	. DC-2.	.Comb				
b. Reading, on campus					x	x	x
c. Activity, on campus				DC-2 PG-2			
d. Laboratory module, community							
e. Seminar, campus			DC-3				
f. Evaluation: student performance	x	x		DC-3 PG-2			x
2. Teaching experiences:							

Key to Symbols:
DC - Design Criteria
PG - Performance Goal
x - Assignment, outside class

Figure 6.--Unit I Schedule: Philosophy of Conservation Education

Unit II

Ecology: "Teaching Stations"

Concepts:

1. Living things are interdependent with one another and their environment, operating through time.

2. Organisms and environments are in constant change. One species, population, or community is replaced by another with greater genetic potential for utilizing the resources of the changing environment.

3. A productive and stable environment comes from maintaining a good mixture of early and mature successional changes with interchanges of energy and materials.

4. Natural resources affect and are affected by the material welfare of man's culture and directly or indirectly by philosophy, religion, government, and the arts.

Design criteria:

1. Students will interrelate the concepts of diversity to interrelatedness, change, adaptation in becoming acquainted with biogeochemical cycles, energy cycles, food webs, limiting factors, symbiotic activities within the community ecosystem.

   Performance Goal 1:

   Students will match descriptive statements about the community and appropriate concepts related to structure and function, presented in context of real situations, as an activity of programmed instruction: community, ecosystem, energy flow, biotic pyramid,

food webs, limiting factors, producer-consumer-decomposer, succession, and climax.

Performance Goal 2:

Students will compare human ecology processes with natural processes and be able to list (1) ways in which man interfers with natural processes; (2) controls natural processes; (3) changes the rate of natural processes; (4) lives harmoniously with natural processes.

Performance Goal 3:

Students will compare and identify natural ecological processes of terrestrial communities with those of aquatic (river and pond) communities.

Performance Goal 4:

Students will list and compare influences related to human ecology on natural river and pond ecosystems.

2. Students will examine by field trip and laboratory specimens, examples of concepts enumerated in Performance Goal 1: communities, energy cycles, food chains, succession, limiting factors, etc.

Performance Goal 1:

Students will identify field examples of the listed concepts presented in the laboratory: by description, by hypothesized function, giving supporting evidence.

Performance Goal 2:

Students will design a field exercise, setting up teaching stations on campus to illustrate related

concepts of ecology: diversity, interrelatedness, change, adaptation. Identification of specific items is not required.

Unit design:

A. Summary of content:

1. Community structure and function
   a. Habitat
   b. Biotic community
   c. Ecosystem
   d. Trophic levels
   e. Niches
   f. Diversity
   g. Interrelatedness
   h. Ecotone

2. Energy flow
   a. Food chains
   b. Trophic levels
   c. Energy budgets and natural flows: plants and animals
   d. Biogeochemical cycles

3. Life requirements and environmental influences
   a. Essential chemicals
   b. Food
   c. Temperature
   d. Water and moisture
   e. Wind
   f. Light
   g. Microclimates

4. Succession
   a. Primary, secondary
   b. Animal, vegetation
   c. Aquatic, terrestrial
   d. Climax
   e. Influences, man and natural

B. Methods and activities: 3 sessions, 1 hour each

1. As a continuation of the community development slide tape presentation, an area will be singled out and subdivided into a number of habitats, described by a new slide tape unit. The student will select one of the habitats of this area. Each of the habitats will have a kit consisting of a tape, slides, specimens,

and worksheets. The student will map the area, locate members of the habitats, and use a worksheet as directed by the tape.

2. Continuing to work with the model and new programs, the student will experiment with food chains, trophic levels, energy flow by manipulations, measurements, computations, diagrams, and simple experiments.
3. A reading list, with required and optional references, includes children's books on subjects of this unit.
4. Continued use of simulation will combine an increasing number of items from the environment with the taped exercise. Eventually the student locate these in the environment.
5. These exercises are self-directed, arranged as topics from which the student may select additional subjects most relevant to his needs. Field trips, a follow-through to the simulations above, may be self-directed or with the instructor. Method in both cases is active discovery by the student through well-structured requirements.
6. Performance is measured by completed exercises in the laboratory and field, and through student design by grade level and topical experiences for children, patterned after those activities completed by the student in the course.

WEEK 2 UNIT Ecology THEME Teaching stations

	Scheduled course time (in hours)						
	Classroom Instruction				Outside study		
	1	1	1	Lab-2	1	1	1
1. Instructional module (campus)	DC-1 PG-1,2	DC-1 PG 3,4	Comb.				
Reading and/or enrichment (campus)					x	x	
Activity (campus)				DC-2 PG-1,2			
Laboratory module (community)							
Seminar (campus)							
Evaluation: Student Performance	x	x		DC-2			
2. Teaching experiences							
Orientation (community)			x				x

Key to Symbols:
DC - Design Criteria
PG - Performance Goal
x - Assignment outside class

Figure 7.--Unit II Schedule: Ecology

Unit III

Water: "The River"

Concepts:

1. Water is a reusable and transient resource, but the available quantity may be reduced or quality impaired.

2. Water supplies, both in quantity and quality, are important to all levels of living.

3. Since water occurrence and movement recognizes no political boundaries, water management should provide for intergovernmental cooperation, coordination, and control of water resources among users.

Design criteria:

1. The students will become acquainted with the principles of the water cycle as it applies to The River.

   Performance Goal 1:

   The student will be able to sketch a cross-section of ground water showing an aquifer, water table, artesian spring, permeable and impermeable strata, and watershed as related to the geology of the area and to the River.

   Performance Goal 2:

   The student will be able to sketch the transpiration-evaporation part of the hydrologic cycle, explaining variable factors related to existing vegetation, soil, water budget, and man's uses which may cause changes to the quality and quantity of the water.

2. Students will investigate the characteristics of water which make it vital to all life.

Performance Goal 1:

Students will make a stream or pond survey of the physical characteristics of the water: turbidity, pH, BOD, mapping, temperature; and sampling of the plant and animal populations.

Performance Goal 2:

Students will identify water conditions with plant and animal adaptations which enable them to live in the varying conditions of water habitats: oxygen, temperature, salinity, calcium, water movement, man-introduced chemicals.

3. Students will be able to relate man's uses of the River in a historical frame of reference and state priorities, conflicts, and problems.

Performance Goal 1:

Students will be able to recall historic uses and events in the life of the River, with specific reference to its role in the development and life of the community, including the present.

Performance Goal 2:

Students will investigate the community's waste water disposal system and its relationship to the River, describing and evaluating the processes.

4. Students will become aware of political control of waterways and watersheds.

Performance Goal 1:

Students will be able to relate the control and regulation exercised by state, region, and local authority.

Performance Goal 2:

Students will be able to identify the function and structure of the Watershed Council.

Unit design:

A. Summary of content:

1. Water cycle, with special emphasis on the river
   a. Ground water: aquifer, water table, artesian sources, permeable, impermeable strata, watershed
   b. Transpiration-evaporation cycle, related to vegetation, soil, water budget, man's uses

2. Physical-chemical characteristics
   a. Stream or pond survey
   b. Habitat requirements
   c. Related factors: eutrophication, succession, index organisms, dominance, limiting and controlling factors of ecosystems

3. Historical and multiple uses: priorities and conflicts
   a. Historical uses
   b. Waste water treatment

4. Political control and regulation of waterways and watersheds
   a. State, region, local
   b. Watershed councils

B. Methods and activities:

1. The role of water, structure and function, in the ecosystem will be presented in two ways: illustrated lecture and tape-slide, each containing essentially the same information, designed to stimulate questions. The tape lesson will serve as a reference resource. Other enrichment modules on separate subtopics of water and the river will be available to students, on topics in Unit Design, and include activities.

2. A multiple media approach to the historical aspects will include audio-visuals and artifacts. From these students will list investigations and activities.

3. Field trips to the community and river will be designed around those listed by the students, investigating questions generated. Such areas might include flood-plains, non-conforming uses, land use including parks, dams and water power plants, monitoring devices, preserves, effluent discharge, storm flow, glacier footprints.
4. Laboratory session would be used for stream survey: physical and biological measurements, habitats, food chains, change.
5. Seminar session would discuss management and multiple uses and the problems of regulation. A panel would represent these various interests, including political, social, and economic interests.
6. A trip to visit the waste water disposal facility and water systems investigation would be valuable in contrast to a nearby metropolitan comparison of similar facilities. Investigations of septic tanks and recycling operations in cooperation with public health officials would be small-group investigations.
7. Students would designate school use for these topics and experiences: subject, grade level, purpose, etc.

WEEK 3 UNIT Water THEME The River

	Scheduled course time (in hours)						
	Classroom Instruction				Outside study		
	1	1	1	Lab-2	1	1	1
1. Unit content:							
Instructional module (campus)	DC-1	DC-3 PG-1,2					
Reading, enrichment (campus)							x
Activity (campus)							
Laboratory module (community)				DC-2 PG-1,2,3			
Seminar (campus)			DC-4 x				
Evaluation - Student performance	x	x		x		x	
2. Teaching experiences:							
Orientation (community)							
Orientation (campus)			x				x

Key to Symbols:
DC - Design Criteria
PG - Performance Goal
x - Assignment

Figure 8.--Unit III Schedule: Water

Unit IV

Soil: "The Farm"

Concepts:

1. Factors which determine the nature of soils are parent material, vegetation, climate, topography, time, and man's management.

2. Michigan soils are heavily influenced by glacial action.

3. Soil supplies man's food and other fundamental needs.

4. Land is exploited for its highest economic use which takes good agricultural land out of crop production.

5. Land may be used for various purposes such as forests, agricultural crops, grazing, recreation, building sites, roads.

Design criteria:

1. Students will study soil profiles in genetically developed soils to identify and understand the significance of the horizon development and such influences as climate, vegetation, topography, time, and man's management.

Performance Goal 1:

Students will be able to identify glacial features of the landscape: moraines, alluvial plains, outwash plains, till plains, potholes, and relate characteristics to parent material of soil formation.

Performance Goal 2:

Students will take and analyze a soil sample from different locations on the farm, varying in topography and vegetative cover. Explanations will be recorded for observed structure, texture, composition, color, horizons, age on map of area.

Performance Goal 3:

Students will find evidence of development of soil from glacial origins through man's management and select samples for displaying this story.

2. Students will study the chemical, biological, and physical functions of the soil for supporting plant life.

Performance Goal 1:

Students will be able to identify the elements essential to life of plants being grown on the farm, supplied by soil, and relate effects of deficiencies from observation.

Performance Goal 2:

Students will describe the transport system of nutrients between soil and roots and identify ways this is achieved in land management such as the farm.

Performance Goal 3:

Students will design experiments or demonstrations to illustrate relative amounts of support given by the soil to the plant, chemically, biologically, physically.

3. Students will become familiar with man's methods and techniques for managing the soil, as practiced at the farm presently or as potential for increasing land productivity in the future.

Performance Goal 1:

Students will identify and describe methods being used to increase land productivity.

Performance Goal 2:

Students will compare community land-use patterns as a trend of agricultural land use and investigate locally.

Performance Goal 3:

Students will investigate problems confronting local farmers in the management of farmlands such as the dairy.

B. Methods and activities:

1. Basic information will be provided in two forms: tape-slide and readings with selections possible. These are prepared as preliminary to laboratory experiences which follow.
2. Laboratory experiences are held at the dairy farm: soil sampling, analysis of uses, vegetation mapping.
3. Seminar sessions are conducted by the County Agent, together with a local farm manager and city planner.
4. Supplementary materials provided in module form, both written and in tape-slide sequences, on all subject categories of soil applicable locally and world-wide.
5. Make up a kit for soil sampling and activities to be conducted by the students, including all materials needed.
6. Student demonstrations of information acquired on soils and lands:: Make available a portion of the campus which corresponds to a road-cut or excavation such as are commonly found on landscapes.
7. Start plant experiments at beginning of course for nutrient experiments; arrange with horticulture department to do the same, for comparisons and learnings.

WEEK 4 UNIT Soil THEME The Farm

	Scheduled course time (in hours)						
	Classroom Instruction				Outside study		
	1	1	1	Lab-2	1	1	1
1. Unit content:							
Instructional module (campus)	DC-1 PG-1	DC-2 PG-1,2,3					
Reading, enrichment (campus)					x		
Activity (campus)				DC-1 PG-1			
Laboratory module (community				DC-1, PG-2 DC-2, PG-1			
Seminar (campus)			DC-3				
Evaluation - Student Performance	x	x	x	x	x	x	
2. Teaching experiences							
Orientation (community)							
Orientation (campus)							
Classroom observation (community)			x				x

Figure 9.--Unit IV Schedule: Soil

Unit V

Wildlife: "Wildlife Sanctuary"

Concepts:

1. Wildlife management involves the creation, preservation or completion of habitats for desirable wild animals.

2. Populations of animals occupy specific habitats throughout the environment in direct relation to their abilities to adapt to dynamic change.

3. Successful stocking or introduction of new species by man requires a knowledge of life cycles, an available habitat, adaptability of the species to the new habitat, and a desirable effect on other species of the new area, including man.

4. Wildlife refuges, undisturbed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool.

Design criteria:

1. Students will become aware of habitats, daily and seasonal movement, and life cycles of aquatic wildlife of the area: ducks, geese, and swans.

   Performance Goal 1:

   Students will be able to tell from memory the life cycle, habitat, foods, cover, resting areas, and range of the swan, relating these to the types of refuges provided for migrating birds.

   Performance Goal 2:

   Students will be able to identify other members of species found locally and identify natural conditions,

relating these to carrying capacity, competition, territorialism, predation.

2. Students will investigate the effect of the swan sanctuary on the diversity of wildlife occupying similar habitats and native to the area.

   Performance Goal 1:

   Students will interview residents living within range of the swans and obtain information regarding numbers, kinds, and habits of other wildlife in the range, over time. Relate these to developments made by man locally.

   Performance Goal 2:

   Students will give a written evaluation of sanctuaries of this kind, based on theory, observations, and interviews. Students will give a written analysis of concepts as they apply to the school curriculum.

3. Students will study management problem of introducing new species, or stocking wildlife and become aware of advantages and disadvantages, methods, and requirements.

   Performance Goal 1:

   Students will be able to name five successfully introduced species, stating reasons for success or failure.

   Performance Goal 2:

   Students will be able to defend their opinions of stocking procedures, hunting, game preserves, zoos, and exotic pets.

Methods and activities:

1. Audio-tutorial and/or module introduction to the concepts of wildlife management, with special emphasis on the aquatic wildlife population in the river habitats.
2. Interviewing of residents within vicinity to assess degree of interest, knowledge, and value attached to the wildlife, to detect practical problems such as loss of species, interference in habitats, competition, predation, etc.
3. Laboratory sessions in the area to inspect populations, observe behavior, physical characteristics, habitats, feeding, nesting, cover as well as vegetative types. Learn to identify wild foods, cover, nesting and hiding sites, edges, and man's influences.
4. Seminar sessions to discuss practical aspects of refuges and sanctuaries, wildlife management as a sport, with an exercise in identifying ducks and geese.
5. Students will prepare interpretations of the concepts and experiences for teaching units.

WEEK 5 UNIT Wildlife THEME Wildlife Sanctuary

	Scheduled Course Time (in hours)						
	Classroom Instruction				Outside Study		
	1	1	1	Lab-2	1	1	1
1. Unit content							
Instructional module (campus)	DC-1 PG-1,2						
Reading, enrichment						x	
Activity (campus)							
Laboratory module (community)				DC-2 PG-1			
Seminar (campus)			DC-3				
Evaluation - Student Performance	x		x	x	DC-2 PG-2		
2. Teaching experiences							
Orientation (community)							
Orientation (campus)							
Classroom observation (community)							
Classroom teaching units (community)		x					x

Figure 10.--Unit V Schedule: Wildlife

Unit VI

Plants: "School Site Development"

Concepts:

1. Plants are renewable resources.

2. Energy is supplied to an ecosystem by the activities of green plants.

3. Outdoor recreation is an increasingly important part of our culture, fundamental to which is the preservation and development of natural landscapes and plant diversity. Education is essential to obtaining these goals.

4. Plants are ultimate sources of all food and are essential to clothing, shelter, energy, and spiritual well-being of living things, including man.

Design criteria:

1. Students shall study a natural area endowed with diverse natural habitats and plant communities available to the schools as a resource for an outdoor classroom or laboratory.

   Performance Goal 1:

   Students shall become familiar with a specified number of common wildflowers, herbs, shrubs, and trees of the area, to identify, know uses, plant associations, animal associations, and soil relationships.

   Performance Goal 2:

   Students shall become familiar with plant diversity, adaptations, succession and relate these to an area.

2. Students shall consider outdoor areas surrounding the school in which student projects are being designed as as a curriculum resource and plan ways to develop its use.

Performance Goal 1:

Students shall inventory the present school areas and indicate ways its resources may be used to enrich the curriculum.

Performance Goal 2:

Students will suggest ways by which to improve the site for specific intended uses.

Methods and activities:

1. Students will select either the natural area or school site in which to sample the concepts of this unit. The following topics are basic to this analysis: identification of plant cover in an evolutionary framework; mapping and sampling an area; interrelationships to animals and soil; uses and disuses; diversity and adaptation; esthetics and multiple use of this site; habitat potential; experiments in learning through observations; land use in relation to community.
2. Exercises for identification of the above topics are provided, using varied techniques and resources, and permitting student choice.
3. Techniques for field investigation accompany the above topics. Wherever feasible these will be in the form of instructional modules or units, completely implemented. However, component parts of the topic will be available for student recombinations for open-ended investigation.
4. A model will be offered of utilizing an area by theme and teaching stations which students may then vary.
5. Students will design an outdoor school site and explain features in terms of dynamic use.

Unit VII

Forestry: "City Forestry"

Concepts:

1. There is an increasing need for improved forest management, especially in and around urban areas.

2. Trees depend on water, soil nutrients, sunlight and air for growth and proper development.

3. Forestry as practiced in urban areas manages these resources for multiple uses and values for a great many people.

Design Criteria:

1. Students shall become familiar with urban areas as habitats for trees.

   Performance goal 1:

   Students shall be able to identify species of trees found in urban areas and associate these with factors responsible for their distribution.

   Performance goal 2:

   Students will be able to describe the structure and function of trees and habitat interrelationships.

2. Students shall recognize forest management practices and problems in urban areas.

   Performance goal 1:

   Students will describe silviculture practices in urban areas.

   Performance goal 2:

   Students will identify multiple uses and values of trees and related vegetation in urban areas.

Methods and activities:

1. The laboratory session will be held in a city park with city forester as a resource person to explain management practices with the present park as an example. Students will map the area and identify the principles in evidence. From this, students will redesign the park to make it an ideal park as they see it, showing diversity, texture-color-shape-size considerations, nuisance plants, tolerances, screening, light and air, etc. where these are logical.
2. Students will learn to identify examples of common problems, remedies, and care of trees. An exercise in tree transplanting will be provided.
3. A tour of the area will identify practices, needs, uses, values, and ideas for future changes. Private plantings will be identified on the tour-mapping as a resource.
4. Students will learn skills and techniques such as measurement of microclimates, "cruising" for lumber, pruning, woodlot management procedures and be able to use these or secure the aid of proper resource people who will assist.
5. A map of specimen trees will be made by the students, and a "tour guide".
6. Students will develop a variety of activities for Arbor Day.
7. All background information, including that which is specific to local resources, will be available on a slide-tape series. Students in the course may use these as resources.
8. Students will make collections for display, using preferred and scientific techniques.
9. Seminar sessions will present the varied viewpoints of the multiple-users and planners.

Unit VIII

Recreation: "School Camping"

This unit will be patterned after the experience planned for the Pilot Study. It consists of a weekend, or overnight, trip to Clear Lake School Camp near Battle Creek, or a comparable facility. Patterned after the experiences provided for school groups, the students will be instructed in each of the areas of the program so that each student may act as a resource person on a specific topic, instructing the remainder of the group during one session of the time. In addition to subject areas handled in this way, students experience outdoor recreation activities such as archery, canoeing, hiking, and camping and acquire a measure of the skill to teach.

Singing, skits, and campfire experiences make this a very busy session. The response is overwhelmingly in favor of this concentration as opposed to a longer session. The students acquire a feeling of integrating the many subjects presented.

Unit IX

Problems: "A Community over-view for Action"

For this concluding session the students submit a tour of the city, with brief commentary on selections made. A composite is drawn up, "teaching stations" designated, and the tour is conducted as a cooperative effort. This may be done with slides, also. An effort will be made to make this a "fun" tour and, through its relaxed informality, stimulate meaningful discussion and questions.

Summary of Course Design

Action-oriented:

Each unit has a common experiental reference relating it to an actual community situation involving a combination of natural resources and human ecology. These are then related to children in the classrooms of the community schools.

Problem-solving:

All situations require a base of specific information, scientifically valid, appropriate to a recognition of problems. The complexity of each situation requires a consideration of alternatives and priorities dependent upon attitudes and values of the individual. Solutions or action reveal these, more often stimulating significant inquiry as a search for answers.

Ecological base: interdisciplinary

No situation is a closed system. While acquiring minimum understandings about a specific subject, emphasis and direction is given interrelated factors of the environment which stimulate inquiry for continued self-education for a broader base of understanding.

Modular instruction:

Each unit is oriented to a specific environmental area which embodies fundamental concepts of a categorical division of conservation. These environmental areas or combinations of these areas fit most human communities. They serve as focal points to stimulate further inquiry and to initiate

specific action on particular circumstances. The enrichment modules supply specific information and skills needed by teachers with limited science backgrounds to be used for self-education or as teaching aids in the classroom. This form of presentation is more efficient for the individual student and shifts the burden of learning to him. Effectiveness of the modules is evaluated through student performance which is integrated into them.

Concise approach:

The student is made aware from the beginning of the course scope and sequence, designed input and expected output. Objectives are clearly stated, requiring student choices and decisions throughout, progressing from teacher-oriented to student-oriented action. Each unit contains a measure of student achievement which works toward the student-centered goal. In the community action experiences, outside disturbances and confusion is minimized by anticipating externalities through modular instruction devices, resource assistance, and controlled feedback procedures.

Multi-media approach:

Slide-taped programmed instruction, simulation, micro-teaching, demonstrations, exhibits, a well-equipped laboratory supplement field experiences and active classroom teaching. These not only utilize media which function best in the specific learning situation, but also provide examples of working techniques which the student may wish to incorporate into future job situations, once tried.

Student-centered:

Although the procedures outlined are highly structured, they are components of a system which is put into motion by student decisions and direction.

Practical and relevant instruction:

The orientation to real situations is directly related to future job situations of the teacher by the nature of the orientation designed and the implementation provided by objectives that are testable and observable.

CHAPTER V REFERENCES

1. Gilbert W. Mouser. From lecture notes: a point he never deviates from himself.

2. Basic concepts in these units were selected as appropriate to this study from five authoritative sources:

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   b. Hanselman, David L. Interdepartmental Teaching of Conservation at Ohio State University. Doctoral thesis, 1963.
   c. Roth, Robert. "Fundamental Concepts for Environmental Management Education (K-16)" Unpublished doctoral thesis, 1969.
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CHAPTER VI

FUTURE DEVELOPMENT AND RESEARCH

The methodology and modular design of units in course content suggest possibilities for future development through additional applications and research. This chapter will enumerate these briefly:

I. Future development:

A. Team teaching:

Mutual benefit would derive from experts in topical areas applying their expertise to specific problems in conservation education, at a local level. At the present time this interdisciplinary approach, put together like a symposium, is a problem-solving complex with an empirical approach for reaching fundamental concepts, principles, and problems. The next step, to help translate these properly to the obscure, but very real, complex of problems in the day-to-day life of an ordinary community, is seldom taken. Yet, this is the teacher's assignment. Although each discipline makes its contribution at the present time, a "confrontation" among experts over a common experiential reference, a specific community, might redesign

some of the procedures and outlooks being used today, in the disciplines, that were products of an agrarian society and do not offer alternatives to new pressures and compromises. A case in point is a book entitled Conservation of Natural Resources, edited by Guy-Harold Smith, 1971. The chapter dealing with floodplain problems dwells at great length on the single problem of natural flooding, farmlands versus forested lands along the fringe, power uses, and the solution "effective zoning of bottomlands may result in dedicating large areas to use by the river in times of flood. Only higher and easily protected lands should be approved for residential and industrial purposes". No mention is made of the problem of run-off, urbanization pressures, new problems of land-use, the inadequacy of zoning to protect these lands, the new agencies, etc. A student using this text would be poorly prepared to recognize or understand the local problem.

Teamwork would give direction to a higher level of analysis in problem solving, better techniques and tools, where it is needed.

B. Course guide for instructors:

Team action could result in the design of a Guide, interrelating all units, procedures, activities, and objectives so that course units could be assigned to additional instructors. The experts would then

serve as consultants and directors, providing supervision and dynamic updating for the course. Such a guide could be used for individualizing instruction, providing a smaller student-teacher ratio, encouraging the use of modular units, and standardizing evaluation procedures.

C. Instructional modules:

Design and construction would accompany curriculum development of the course in conservation education, effectively using present materials, selecting, and designing additional. These need not be specifically applicable to a single course method but, using agreed-upon objectives for a course in conservation education, relate to as many alternative methods as occur. Variations to fit alternate uses could be made by "add-on, take-off" of basic component parts.

II. Applications

A. Professional service-center for conservation education:

The modules could be used for off-campus courses and workshops within a community and school system, initiating a program of self-help and consultation for the school, and a test of their use in the job situation for the course designers.

B. In-service teacher instruction:

Supply a program to present to school systems, citing the above-named advantages, and enlisting the cooperation of school administrators to provide a high-level of professional cooperation and program continuity.

III. Research programs:

A. Design an alternate course method to the pilot study design, using the same objectives, as a compromise in recognition of costs of the off-campus course. Such a course would be campus-based but focus course content, materials, and procedures on a common experiential reference, a near-by community and its school system. Compare the achievements of each course, using valid and objective means, for selecting the most efficient method for teaching a course in conservation education for preservice teachers.

B. Use course materials with other variables:

1. Instructional method: Compare teaching by lecture with teaching by programmed instruction, using the instructional modules.

2. Content: Using instructional modules, vary by pre-design of unit content as compared to permitting student choices, using same course objectives that are testable and observable.

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