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Sandra E. Marlatt

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Niles R. Kevern

Major professor

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THE DESIGN AND TESTING OF A SURVEY INSTRUMENT FOR NATURE CENTER DAY CAMP PROGRAMS

By

Sandra E. Marlatt

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ABSTRACT

THE DEVELOPMENT AND PILOT TESTING OF
A SURVEY INSTRUMENT FOR
SOME NATURE CENTER DAY CAMP PROGRAMS

By

Sandra E. Marlatt

Michigan nature day camps have existed in one form or another for many years. Their programs include games, nature arts and crafts, camping and woodsmanship, outdoor sports, conservation education and attitudinal development and values clarification with respect to the natural environment. Whatever their main objective, each recognizes the value of the natural world through the influence of nature on their programs. Despite the long-time popularity of such programs, little has been done to determine their impact and environmental education emphasis.

In an investigation to determine this impact on the cognitive and affective domains of four basic environmental education conceptual areas, a descriptive study was conducted during the summer of 1977 at four selected southwestern Michigan nature centers. To add meaning to the results of each center's scores and as an aid in future program planning, profile data of day camp participants were also gathered.

Information was collected by means of a questionnaire, using a statement format. Eleven profile characteristics were established for each center, and collectively. Summary tables suggest that the typical nature center day camper in this survey is an eight year old boy who lives in a house in a city with a pet for which he cares. He is interested in learning about nature and conservation and credits many sources with his current knowledge about the environment, but most especially nature centers. He may or may not have been to day camp before but has been to a nature center, probably with his family which is not a member of a nature center. He is not likely to have a scholarship to attend the summer nature day camp. There are some important deviations from this profile by some of the centers sampled which likely impact on the scores computed for that center and the ability of the participants to correctly respond to the survey form.

Information identifying environmental knowledge and attitudes was collected by designing statements around the broad environmental education concept areas of Energy, Interdependence, Adaptation and Cycles. These areas are considered by environmental educators to be fundamental to the understanding of the natural environment. Each set of statements by concept area contained four cognitive (knowledge) and three affective (attitude) statements. While the cognitive area had right and wrong response choices, the affective area essentially measured preferred

responses, many of which were neither right nor wrong.

Statements were designed to bracket as widely as possible the various contemporary dimensions of the four basic environmental education concepts, with full recognition of the difficulty in constructing statements which would be communicative, relevant, and measurable for four dissimilar nature center programs.

Results of the survey, involving some 450 youths, indicated that the four nature center summer day camp programs are most effective in gains demonstrated in the cognitive domain, particularly within the concept areas of Interdependence and Cycles. What little measureable changes were noted in the affective realm were assigned to the Energy concept area and this was a decline in preferred score.

Given the rather broad, non-specific goals of the centers surveyed regarding environmental education concept areas, not much solid support or criticism can be offered for their program results as far as the use of this particular survey form is concerned. Indeed, the form probably indicates more where each center's emphasis lies as expressed through its day camp program than their own estimation provides. It supplies them with a base from which to begin to structure a more specific effort if desired.

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CHAPTER I

INTRODUCTION

Nature Center Development

Nature centers are comprised of both a facility and a setting. The facility may vary from a simple enclosed structure for displays to highly developed year-round multi-building interpretive units. Other components have been found to range from log benches to plush chairs, simple trail maps to three-dimensional exhibits, captioned wall-hung photos to complex audio-visual presentations. Regardless of physical structures, nature centers have in common a location on basically natural grounds, varying from a few to thousands of acres. All offer some form of seasonal or continuous activites for a generally defined audience, and all have a basic concern for directing their programs at increasing the knowledge of and enchancing the appreciation for the natural world and mankind's place in it. The focus is engineered by means of various interpretive techniques, such as exhibits, multi-media displays, nature trails, demonstrations, workshops, direct interaction with center staff, or any combination of these and other efforts. Target audiences are found in school groups, families, organized youth groups, senior citizens, public administrators, and/or others.

A statewide survey in Michigan during 1976 disclosed over 40 facilities qualifying as nature centers. These included federal, state, county, municipal, college or university, and private (i.e., non-agency or institution) sponsorships. They were found to be distributed around the state proportional to population density, with the majority located in the southern Lower Peninsula.

The bulk of nature center visitation has been attributed to school groups making use of both facilities and planned programs, usually to complement a particular teaching unit within the formal education process (personal communication). As the audience of school children is unavailable over the summer as a structured group, and as many nature centers wish to continue their influence on summer visitors representing many different types of social organization, a variety of programs have been created at those centers which conduct year-round activities. Besides making available more specific learning activities such as classes in ornithology and mammology, popular informal opportunities exist in the areas of nature arts and crafts, campfire talks and campouts, gardening and outdoor skill options, and a special kind of program called summer nature day camp.

Summer nature day camps have evolved as an answer to the needs of school-aged children who do not take part in other structured learning situations during the summer months, and whose interests are thought not to be addressed

by other nature center programs. Summer nature day camp seeks to involve participants in a broad spectrum of nature-related experiences, usually for only a few hours a day over several weeks or all day for a shorter time period, during the summer months. Some centers provide an overnight camping experience at the end of the session, especially for older youths. Day camps represent a large umbrella designed to cover multiple topics, interests, and activities, aimed at a wide range of young participants.

As is true of other nature center programs throughout the balance of the year, summer nature center day camps vary in philosophy, goals, and administrative procedure, strongly reflecting the surrounding community's needs and the objectives of specific center personnel and their boards of governance. These span the continuum from factual presentations for the purpose of educating participants in basic nature study and environmental knowledge to efforts at attitudinal and behavioral manipulation for the promotion of sensitivity and responsiveness to environmental issues. In between are diverse degrees and combinations of interest in factual assimilation, positive value growth and reinforcement, and just plain "fun-in-the-out-of-doors" experiences.

Whatever their philosophy or goals, nature centers are unique in that they generally present some components of all of their predecessors within the broad area of environmental education--that is, opportunities to:

conduct nature study in the field or laboratory; acquire life-long outdoor skills; receive formal and informal instruction in the ways of nature from basic biology to ecosystem theory to resource management; explore development of a set of ethical considerations for the land.

Historical Perspective

Rudiments of nature center programs and philosophy were present long before the center concept was formalized. Well organized program efforts and physical plant structures associated with nature centers evolved both in concert with and apart from other developments in the growing environmental education movement.

Around the turn of the twentieth century, nature study was initiated in many schools as a means of learning about the natural world through direct experience (Jones, 1976). While this entailed some contact with the out-of-doors through field trips, nature study was primarily a laboratory exercise allowing students to handle previously collected specimens. It was considered equally important to gain insight into the wonders and beauty of nature and an understanding of scientific facts surrounding it. From this early program came school collections of natural ojects used to teach indentification and classification, development of curricula in earth science, botany and zoology, and the fundamentals of an outdoor education program, beginning in the 1920's.

Outdoor education had a three-fold dimension: physical, or psychomotor, aimed at the acquisition of life-long skills which, when conducted in the out-of-doors, would contribute to good health and enjoyment of the outdoor environment; intellectual, or cognitive, the addition of skills through increased knowledge of the natural world;

and emotional, or affective, an emphasis on developing self-awareness and positive feelings about the natural world (Smith, et al, 1963). Scientific knowledge was held to be less important than the development of a positive attitude regarding the natural environment and learning life-time skills best mastered outdoors.

During the 1930's the need to broaden outdoor education's base was drawn to the attention of progressive educators by events which shook American citizenry out of its complacency toward natural resource use. In between two resource-consumptive World Wars came the ravages of the mid-American dust bowl. Intensive efforts were mounted to reclaim and protect from further deterioration the basic resources of soil, water and timber. Federal programs and agencies were established to organize soil conservation districts, foster sound conservation practices and provide advisors and funding for expediting sound land-use practices (Dasmann, 1972). Conservation education emerged as a formal school subject with a strong message to preserve and protect all natural resources.

As the program progressed into the 1940's and public outcry deploring resource abuse began to subside, school children were exposed to a more subtle concept - the beginnings of an ethical aspect of resource management, or that which Leopold (1949) called the stewardship approach to resource use. Concern for balanced environments began to replace single-resource issues.

In the 1950's the influential educator Kirkpatrick, writing in his Philosophy of Education (1951), espoused the theory that, "The true unit of study is the organism-in-active-interaction-with-the-environment." Using Darwin to show that change is constant, he extrapolated the findings to people as changing through their interaction with the environment and changing the environment in the process. He suggested that not only should schools encourage study of this interaction but that they should continue to expose children to direct contact with nature in order to foster positive aesthetic values.

The way was set in the 1960's for the field of education to answer the rising concerns of the lay public for the overall quality of their total environment by focusing on problem identification and problem solving at the ecosystem level (Stapp, 1971). The development of what were to become programs in environmental education gained formal recognition in many school curricula, while other programs conducted within a framework recognizing environmental education concepts, but carried out in a less structured "hands-on" setting, rose rapidly in popularity as functions of nature centers (pers. com.).

The 1970's led off with Earth Day, a widespread demonstration of concern for the fragility of the Earth as an ecosystem, a concern manifest in many cases as alarm for the threat perceived to the planet's health and survival, and thus to the well-being of mankind. Nature centers grew

in popularity for the role undertaken by many in offering a frustrated and often angry public an opportunity to explore current issues affecting the environment and a chance to act on their new-found awareness. Increased public support led to new and expanded nature center programs, most of which were well conceived but few having any built-in feedback mechanisms of interest.

Problem Statement

Interviews and correspondence with nature center personnel, past personal experiences and a variety of unpublished nature center literature revealed that summer nature day camp activities in Michigan are an increasingly popular means of encouraging youth to interact with their natural environment, primarily in an outdoor setting. While considerable surveying and evaluating of school environmental conservation or nature education programs and their participants has taken place, nature center programs and youthful clientele have been lightly treated. It has been the vogue to evaluate instructors, naturalists, counselors and administrators involved with nature centers but center programs, especially day camps, have been largely overlooked. Indeed, Kostka (1976) reported that nature center directors in Minnesota's Twin Cities area, when queried about their greatest research need, replied unanimously, "How can we evaluate our programs?"

The problem has two major components: determining what effect summer nature day camp programs have on participants, and how that effect can be measured. These programs are felt to have a desirable impact which can be demonstrated, but the lack of information outlining audience characterization has hindered development of appropriate measuring devices with which to examine the perceived effects.

Study Objectives

The objectives of this study were to develop and pilot test an instrument which would measure the effectiveness of four specific nature center's 1977 summer nature day camp programs on participants, and to gather baseline profile data about those participants, the analysis of which would provide basic guidelines to preparation of continuing summer nature day camp programs.

These four southwestern Michigan nature centers were contacted early in 1977 to review their assessment as to the effectiveness of their day camp programs and for their perceptions as to the characteristics of the audience they served. Even though there was a wide range of program types represented, from science-oriented outdoor and indoor classrooms to nature crafts, the directors unanimously supported the general statement that their programs, overall, were successful in giving participants new knowledge and improved attitudinal sets about nature and the environment, even if involvement was of short duration. They also were confident that repeated exposure to summer nature day camp would increase the knowledge and attitudinal aspects of preferred environmental conservation outcomes. Most exhibited vagueness when asked to profile program participants and admitted to having made little effort to either support their assumptions regarding program impact or assemble demographic data on day campers when seeking to design programs for them.

This pilot study, then, conducted at the four specific Michigan nature centers during the summer of 1977, explored the contributions of select summer nature day camp programs to environmental conservation knowledge and values, and identified some characteristics of summer nature day camp participants at these four centers. It was undertaken because (a) the four nature centers with strong day camp program commitments in budget, staff and overall center goals expressed an interest in participating in an effort to develop an evaluative instrument for use in their day camp efforts, and because (b) these cooperators enthusiastically agreed to interact with the investigator to the fullest extent for the purpose of activating such an effort.

The study tested the null hypothesis that participation in summer nature day camp programs has no effect on the level of environmental knowledge attainment or attitudinal enhancement in youth.

Study Limitations

In establishing baseline information such as this study was designed to do, the effect of several limitations should be kept in mind. First, this is an assessment of summer nature day camp programs only, and should bear no reflection on any other type of nature center program. Secondly, the instrument and procedures for testing it were designed for four specific nature centers, all in a certain geographical area of the state. Data should not be extrapolated as indicative of similar program results at other nature centers anywhere else in the state of Michigan, or out of state.

Thirdly, the pilot instrument developed for this study should not be considered as a tested and standardized document which can be reproduced for the purpose of evaluating other types of environmental education programs. Test validity is a function of relevance to the subject matter tested (Cureton, 1951). The variety of program emphases at the numerous nature centers suggests that document validity can be gained only by having its author become familiar with the subject matter pursuits at each center before constructing a test instrument specific to the preferred outcomes expressed for that program (Gates, et al, 1948).

Fourthly, the programs assessed occurred during the summer of 1977. Future evaluations should not compare this data with data collected for the same programs at these centers for any other year. Due to the changes in staffs,

annual program revisions and potential fluctuations in profile characteristics of program participants, the inconsistency of such data collected would make comparisons meaningless. Fifth, only the four specific environmental education concepts named were used to measure potential learning outcomes. Many other concepts, or variations of the four chosen for this study, could be used for similar studies, but only these four named concepts should be considered here when examining study results.

There is an acknowledged lack of information about entry levels of environmental education knowledge and behavior in students (Jones, 1976). A significant level of prior information may or may not be attributable to previous nature center program experience. This study made no attempt to establish the source, or sources, of environmental information with which day camp participants began the 1977 summer program.

CHAPTER II

METHODS

Participant Selection

The four southwestern Michigan nature centers involved in this pilot study were selected on the basis of interest in the study, variety of programs, existence of a proven program of some long time standing, and type of administering body, which included privately supported, university affiliate, public agency sponsorship and resource organization directed. These centers were expected to provide a total of 500 summer nature day campers among them who would take part in the survey. In order to avoid inadvertent or unfair comparison, the centers will be identified in this report by alphabetical designation only as Centers A, B, C, and D.

The questionnaire, or survey instrument, was trial-tested at Sonoma Elementary School, part of the Harper Creek School system in Battle Creek, Michigan. They were selected because of the investigator's close working relationship to the district in the past and because of the interest on the part of its principal in furthering studies in the area of environmental education.

Parental permission to participate in the trial study and in the nature center pilot study was obtained on the

basis of efforts by the school principal involved and the directors of the cooperating nature centers.

Literature Review

A computer-assisted search of the literature using the ERIC (Educational Resources Information Center) system, an analysis of Dissertation Abstracts, and numerous informal sources, such as nature center documents, multi-level government agency information brochures, and personal clippings, files, correspondence, and interviews determined that no existing evaluative work had been done, up to the time of this study, in the area of the summer nature day camp programs. Topical subjects reviewed were environmental education, conservation education, nature centers, nature study and day camps.

Because the focal point of the study centered on the development of an evaluative instrument for use in the study, other topics reviewed were in the areas of educational psychology, learning theory, group dynamics, measurement techniques and instruments, testing and evaluation, and test construction.

A perusal of existing literature where measurement of formal environmental education programs were conducted showed that the questionnaire format, or survey instrument, had been the primary tool used in determining the impact of these programs on participants. However, unlike traditional subject matter in a school setting, the environmental education area has a philosophical as well as a content component which makes standardized questionnaires or like instruments inappropriate and unavailable for evaluating

informal nature center programs. In fact, Ahmann, Glock and Wardeberg (1960) concur that in contact areas such as conservation, the use of standardized tests has limited value, and that, furthermore, the responsibility for constructing an evaluative instrument should be the teacher's. Those questionnaires identified with nature center programs were found to emphasize measurement of attitudinal change as outcomes of the experience, although Allport (1935) has cautioned that attitudes are hard to accurately assess and changes in them are even more difficult to analyze.

In attempting to identify reliable devices for determining the environmental education impacts of nature centers on sixth graders, Kostka (1975) found through her literature search that no such measures existed.

Those who have developed their own forms or adapted others' forms to their use reported conflicting results. Carlson (1972) noted that her study of the outcomes of a resident outdoor camp experience on participants showed no overall influence on outdoor perceptions on the part of fourth, fifth and sixth graders and urged that further work to determine the effects of age, sex, IQ, and socio-economic status on participants be done. In later efforts to explore the effects of sex on environmental attitudes, Wileman (1976) found that fourth and fifth grade females scored significantly higher on attitudinal scores than their male counterparts following a school environmental

education program, while Gross (1977) found no relationship in scores for fifth and sixth grade students by socio-economic classification or sex after a field trip. Kostka's earlier assessment in 1975 of sixth graders participating in a nature center program showed that inner city children's scores were significantly lower than those of suburban children, and that inner city female's scores actually declined between pre and posttesting. Garry and Kingsley (1970) provide an explanation for these apparently conflicting sexual differences in attitudes, interests and aptitude by stating that these differences are learned, not sex-linked at birth.

Pre and posttesting was the most common means of assessing change through participation in an environmental education study and where this procedure was used in a questionnaire format, posttesting took the form of reissuing the questionnaire in same or scrambled order, usually immediately after the exposure was completed and, in some cases (Gross, 1977), again at a third period of time, from a week to a year after the experience. Most questionnaires were of a simple multiple-choice, true-false or short fill-in-the-blank answering mode, with a completion time not expected to exceed 30 minutes. Most students read their own questionnaires.

A few test instruments were constructed using illustrations and one, designed and executed by Jones (1976), was almost entirely visual, with very brief multiple-choice

questions accompanying the graphics. No instruments were identified which tested mixed-age groups of elementary children in either the cognitive, or knowledge, area or the affective, or attitudinal, area.

The Minimal Performance Objectives for Science Education in Michigan (1974) and two revised drafts (1976, 1977) were consulted for input regarding environmental education thrust, but the grade levels they addressed were expected to be beyond the grade levels of the majority of nature day campers.

Instrument Design

Based on the literature review, anticipated characteristics of survey respondents and objectives of the study, a pre and posttest questionnaire or survey form was selected for development, keeping in mind that this method of achievement testing is most appropriate for measuring a representative sample of learning outcomes and subject matter and should not be considered all-inclusive (Gronlund, 1978). In order to construct an individualized instrument for the measurement of knowledge and attitudes in accordance with the needs of this study, and to do so in a manner which would most efficiently, effectively and reliably allow for estimations of change provided for in a pre and posttesting format, the author of such a document needs many things: an understanding of the learning processes in youth; the mechanical requirements of proper test or questionnaire design; recognition that assessing participant growth in informal settings is more difficult than in traditional schools (Stodolsky, 1975); writer skills, such as mastery of the subject matter, rational, well-developed sense of educational values and knowledge of the expected audience (Ebel, 1951); and a clear understanding of what the instrument should and should not attempt to do.

An obstacle to developing instruments for collecting and assessing data on summer nature day camp programs resides within the composition of the participants. All of the programs surveyed had mixed age groups from five to 13

years old which could be expected to have dissimilar reading and writing abilities and reading comprehension skills (Garry and Kingsley, 1970). The Dolch Basic Word List (Appendix A) was used to try to minimize this potential difficulty, but terms specific to the environment, such as "ecosystem" and "conservation", while not on the list, were left in the statements where they applied. It was felt that many youngsters who could not read these words might have heard of them and as the test would be administered orally, it was hoped that these campers could relate the words to the statements under consideration, although Gagne (1977) found that children in early elementary grades may have very limited ability for handling as large and remote a social issue as conservation.

To partially compensate for the differences anticipated in the reading level abilities, it was decided that the oral presentation offered the simplest means of equalizing some of those differences.

Learning Processes in Designing

In developing individual survey statements, or test items, an item being a scoring unit (Ebel, 1951), two learning categories were considered, the cognitive and the affective. Gronlund's (1978) continuum of learning in the cognitive domain begins with recognition of the cognitive realm as representing knowledge of specific terms and facts, which progresses to ways and means of dealing with these specifics, such as trends, sequences, categories and classification, and methodology, and arrives at knowledge of principles and theories in the realm of both the universal and the abstract. He sees the development of intellectual abilities as preceding from simple comprehension through application, analysis, synthesis and finally the complexities of evaluation.

Numerous investigators failed to find distinct stages in the development of children's thinking but Gagne (1977) asserts that children, even preschoolers, can reason, discover a principle and apply it. Mental age seems to be more important than chronological age when learning is involved, and although a general increase in thinking, problem solving and imagination occurs with age, maturity, motivation, intellectual capacity, personality traits, physical well-being, family backgrounds, travel exposure, access to books and tools and other characteristics affecting learning have been found to be particularly significant in youngsters between the ages of nine and a half

and 13 (Garry and Kingsley, 1970).

The taxonomy of the affective domain, comprised of attitudes, beliefs and feelings, has five components, all of which must be present to complete the process whereby values are formed. Lien (1971) described these as follows:

RECEIVING	RESPONDING	VALUING	ORGANIZATION	CHARACTER-IZATION BY VALUE
·Awareness ·Willing-ness to receive ·Controlled attention	·Compliance ·Willing-ness to respond ·Response satisfac-tion	·Acceptance ·Preference ·Commitment	·Value conceptual-ization ·Value organiza-tion	

This pilot study instrument concerned itself with test items which measured the VALUING component, mainly at the "preference" level. Recognizing that family and friends play a primary role in the development of attitudes at an early age, which form the base of an individual's value system throughout life (Garry and Kingsley, 1970), it was considered important in item creation to allow for that aspect of attitudinal development which is learned by modeling (Gagne, 1977) and which allows for short-term modification of basic attitudes when the proper conditions are present. Long-term retention of attitudinal modification, which is a function of constant reinforcement and which is most likely to lead to behavioral modification, was not addressed by this study.

Instrument Item Selection

Item writing in designing test instruments is an art which is essentially creative (Ebel, 1951) and which demands ingenuity and persistence (Ahmann, et al, 1960). There is no set of rules which will guarantee a "good" test item. In deciding what kind of test to write, Gates, et al (1948), asserts that the author should construct the test that they do best, where their critical sense and subject knowledge can best be demonstrated. Subsequently, an objective test that combined multiple-choice and true-false responses was decided upon. These tests have the greatest structure, and therefore there is greater control over the response (Gronlund, 1978).

While recognizing that true-false test items are far more difficult to construct than commonly thought (Ahmann, 1962), they are generally considered to have the attributes of being able to sample a large amount of subject matter in a short time, eliminate subjectivity and score variability, offer rapid scoring, and provide opportunities to refine items for future re-use by increasing validity and reliability (Ausubel, 1968).

Some fundamental requirements of good true-false item construction are that only one central idea should be present in each statement, each item should be in simple language with all items about the same length, and patterns in responses should be avoided. As is true of all kinds of objective tests, true-false items should be spaced on a

page so that they can be easily read and scored, and items should be arranged so that all of the same type are together when measuring the same learning outcomes (Gronlund, 1978).

Test items should be based on fundamental concepts, not on facts acquired by rote (Wood, 1961), and if a test or survey instrument is to measure familiarity with concepts or the ability to apply concepts, the items representative of each concept should be grouped together (Gates, et al, 1948).

Instrument validity depends on relevance to subject matter tested (Lien, 1971) and accuracy and consistency with regard to subject matter tested (Cureton, 1951), and by no means operates as an all-or-none principle (Gates, et al, 1948). Indeed, Ausubel (1968) considers test validity to be a problem caused by the tendency of educational measurement to be indirect and inferential and not based on direct behavioral samples of the trait or ability in question. He further concludes that the length of a test is the single most important factor influencing reliability, a statement supported by Gronlund (1978) and Lien (1971). All agree that the shorter the test the more the scores will be influenced by chance, and that objective tests offer superior reliability over subjective tests.

While young children have been shown to be highly inattentive (Gagne, 1977) and with attention spans correlating to age (Ausubel, 1968), Smith (1975), reporting on

Piaget's stages of cognitive growth for ages seven through 11, sees the development of the ability to organize concepts into categories and sequences. This suggests that the intended format of simple true-false type items and a conceptualized approach to content analysis should be valid, reliable and appropriate for the target audience.

In an effort to increase the ease of usability of the document itself, attention must be paid to such concerns as readibility or legibility of the form, provision of simple and consistent directions, reproductive and analytical cost factors, ease of scoring, and ready identification of the instrument through a short title or code (Lien, 1971).

Instrument Construction

The trial instrument (Appendix B) contained a total of 48 statements. The first 11 items were basic demographic questions which were identified by participating nature center directors as applicable to their needs and interests. They were followed by four general statements about environmental or natural history facts and five general environmental attitude items. The majority of these were simple "yes-no" forced choice items, these answers having been judged to be less confusing than the word choices of true and false when dealing with very young children, many of whom were just beginning to learn reading and language comprehension skills.

On the reverse side of the survey instrument were 28 items, deliberately but not obviously grouped according to the four basic environmental education concepts, popularly taught in the formal classroom, which were selected for this study. The concepts used, in order of their listing on the document, are as follows:

1. Living things exchange matter and energy with the environment and with each other (Energy Concept).
2. The universe is in constant change (Cycles Concept).
3. A living thing is the product of its heredity and environment (Adaptation Concept).

4. Living things are interdependent with one another and with their environment (Interdependence Concept).

(From FW 485, "Environmental Conservation Program Design", R. W. George, 1972).

Four cognitive statements and three affective or attitude statements for each concept were developed in the same "yes-no" (or agree-disagree) format.

The basic statements 12 through 20 did not adhere to any particular concept but were useful as a bridge to ease the respondents from answering personal or profile data items items into the mode of response for the conceptual statements. Statements, rather than questions, were used because it was felt that questions might be viewed as threatening - ie, looked upon as a real test or a judgment. Given the informality of the programs being assessed and the fact that "school" in the summer months has a negative connotation to so many youngsters, it was felt that audience participation would be enhanced, especially on the posttest, by this approach.

Certain profile characteristics were deliberately left out. These included family economic status, parental education-occupation, and race. It was decided that the younger day campers would be unable to accurately assess the first two items and that the third had no bearing on the study objectives as written. Indeed, there had been some concern expressed by nature center directors that

parental permission to conduct the study might be denied if any or all of the above socio-economic factors were to be included.

The greatest challenge in designing instrument statements was to try to keep them broad enough so that they might be adaptable to the four different centers, given their different program content and approach, and yet identifiable with the ecological or environmental education concept they were intended to portray. The author received considerable help in reviewing the representative items from nature center staff, educators in the public school systems who teach conservation, and the study committee.

Instrument Trial Study

The trial test instrument (Appendix B) containing 48 statements was administered to four grades in the Sonoma Elementary School on May 31, 1977. One hundred students in grades two, three, four and five took part in the early survey, as these grades were expected to represent the grade levels encountered in the actual field testing. The investigator explained the study interest and survey procedure, read the survey instrument, item by item, to each class separately, and made notes regarding class reaction and response to the mechanics of participating in the survey. Completion time was 15 minutes for the fourth and fifth grades and 25 minutes for the second and third grades. Teachers were in the room while the survey was read but did not participate in any way. Test results were not analyzed beyond the abilities of the children to mechanically complete the survey.

Instrument Redesign

Close scrutiny of responses and student reactions to completing the trial test instrument pointed up the need for some changes in the document. In accordance with Lien's (1971) criteria for test usability it was decided to change the profile questions to statements in order to provide a more proper and consistent answering system.

Despite uncertainty on the part of second graders as to what a nature center was, there being none in the immediate Battle Creek area at the time, the statements referring directly to nature centers were left unaltered because it was expected that the day campers would not find this to be a problem.

At the request of one of the centers seeking the information, a statement regarding receipt of a scholarship for the summer nature day camp program was added. More choices were included at the suggestion of Sonoma elementary teachers in the request for information as to where the respondent thought they had gained most of their knowledge about nature and conservation. An alteration was made on the statement regarding previous visits to a nature center, so that those who had never been to one before could skip statement 10a., which asked them to identify whom they had accompanied if they had been to a nature center before. Six statements were amended for clarification and/or simplification, in recognition of Wood's (1961) admonishment to keep test items precise and economical of

language, features of a good test which also make its construction the most difficult.

Although it was apparent that many affective statements were neither "right" nor "wrong", they were basically left unchanged, as the spirit of the instrument development was to identify values or attitudes toward natural resources on the part of survey participants, not to judge them. In fact, Gagne (1977) maintains that attitudes do not determine actions but only allow prediction of probable response.

Drafts of the revised document were sent to the four nature centers participating in this pilot study, and to the study committee where they were approved or amended and then printed in final form (Appendix C).

Pilot Pre and Posttest

A visitation schedule to the four nature centers surveyed in the study was prepared for on-site pre and posttest presentations of the pilot instrument which had been designed to test the null hypothesis that participation in summer nature day camp programs has no effect on the level of environmental knowledge attainment or attitudinal enhancement in youth.

Two basic problems arose with the planning for administration of the test instrument. The most critical was scheduling, owing to overlap of program start-ups and conclusions between some of the centers. The second was some distance-time factors when the investigator would be unable to get to the sites to give the test. Because it was important to give the pretest immediately upon the day camper's entering the program and the posttest immediately following the end of each session rather than at a delayed date and because the four centers represented 11 separate sessions among them, each with a pre and posttest component, some compromises had to be made. To minimize the overlap and distance problems, the investigator planned to concentrate efforts on the largest audience represented by the four centers. One of the centers, Nature Center A, provided almost 400 of the nearly 500 participants expected to take part in the survey of summer nature day campers, and was easily accessible for all of the four sessions, two weeks each. Center B, the most distant from the investi-

gator, graciously agreed to administer the entire questionnaire sequencing themselves for all four week-long sessions, carefully following instructions from the investigator. Center C, with two critical overlaps in its four-time presentation schedule, also agreed to proceed on its own with specific directions. Center C had two two-week and two four-week sessions. Center D had only one overlapping presentation, which was handled by interning staff while the principle investigator met the others. Theirs was also the shortest of the programs, meeting four weeks but only twice a week for half-day sessions.

Each center made notification of the questionnaire or survey presentation available to the parents of all children participating in their programs. Purpose of the survey and general background on the investigator were included along with assurances that involvement was purely voluntary, no personal questions would be asked, and anyone not wishing to be part of the survey had only to say so.

Center A's four sessions each had nearly 100 participants. Michigan law requires one counselor to supervise each ten youngsters under these circumstances so the groups were broken up to meet with their assigned counselors outside on the lawn, building steps, or at benches on the playground. With a group so large and boisterous en masse, it was unwise for one person to try to administer the survey instrument. Rather, each counselor, after proper instruction, conducted his or her own survey with the group

assigned to them, reading each statement carefully and watching for any youngsters needing help. In accordance with Gronlund's recommendations (1978), special effort was made to keep interruptions to a minimum and to separate the youngsters to a degree to avoid their copying one another. The investigator observed each group from the background on a roving basis and made notes relative to the presentation and participant reaction. Unlike the other centers taking part in the survey, Center A's youth brought sack lunches and stayed a full day during the two-week sessions. At the end of each session a parent's night and campout for the youngsters was held.

Center B's staff gave three pre and three posttest questionnaires to their groups which met half-days for an entire week, a campout climaxing the last session.

Nature Center C conducted morning sessions only for both their two and four-week programs. Staff administering the evaluative instrument reported minimal procedural problems. Surveys at Centers B, C and D were conducted indoors.

Center D had two counselors who assisted in distributing and collecting pencils and papers. The investigator picked up the posttest questionnaire administered by Center D to the second of their two sessions and also picked up all pre and posttest forms administered by Centers B and C.

Data Analysis Procedures

Educational test evaluation is a very conclusive process which relies on data provided by educational test measurement, which is a descriptive process (Lindeman and Merenda, 1979). This pilot study is seeking to measure, to provide data for evaluation, not to evaluate nature center summer day camp programs. Therefore, the instrument designed and executed is not an evaluative instrument but is, instead, a measurement device.

Gronlund (1978) stated that there is no statistical procedure which will allow for the determination of how adequately a test within the educational framework has sampled intended outcomes. He further suggests that achievement tests of a pre and posttest nature are best used to measure representative samples of learning outcomes and subject matter. He cautions that test score interpretations must all contain some margin for error, due to variation in testing conditions and student responses. Ausubel (1968) concurs, with the notation that test anxiety may depress performance, setting up a response error.

In this analysis the descriptive study approach used does not call for a formal statistical analysis. Rather, simple percentages were reported. In the case of profile data, these percentages represented component parts of a total population identified by specific categories. Where statements regarding knowledge or attitudes about environmental subject matter have been surveyed, the percentages

used are percents of those students responding who answered "Yes" to the statements, regardless of the correct or preferred answer. Interpretation allows for a comparison of any changes which may be noticed between pre and posttesting as an indicator of trends in learning or thinking about environmental education concept areas as represented by each of the different nature centers involved in the pilot study and all four centers collectively.

To more accurately depict percentages reported as true values indicative of the survey respondents' knowledge or attitudes, the computer was used to adjust the scores for missing values. Those values occur when a statement received either no response or multiple responses when multiple responses were inappropriate. The percentages reported are the percents of those youngsters accurately responding to a test item in a given manner and in many cases will not be percents of the total population actually available during the pre and/or posttest.

Demographic data was looked at in two ways. First, it was used to determine a representative or average profile of a summer nature day camper, in which case percentages were averaged between pre and posttest audience responses. Secondly, the differences noted in profile data categories between pre and posttesting were used to determine the characteristics of the populations starting and completing the programs so that any significant shifts in any category could be referred to in interpreting data from the concept

statements.

CHAPTER III

RESULTS

Profile Data

Aggregate

Aggregate data (Table 1) identifies eight year olds as the single most numerous age group, with 25% of the total population, of the 496 nature day campers completing the pretest and 451 who completed the posttest. The combined seven, eight and nine year olds represent the bulk of the summer day camp audience with approximately three-fourths of the total. Boys outnumber girls nearly two to one in participation. There were very few apartment dwellers identified in the study, the greater majority of the students identifying "house" as the type of residence in which they lived.

Pet ownership and care was high at more than three-fourths of the total population, and about 66% of the respondents came from urban-suburban communities. Nearly 94% claimed to be interested in learning about nature and conservation.

When asked to name the source they felt was primarily responsible for what they knew about nature, 27% of the youngsters named nature centers. However, as over 43% of

SUMMARY TABLE 1.: CHARACTERISTICS OF SUMMER NATURE DAY CAMP PARTICIPANTS[a/]

	CENTER A			CENTER B			CENTER C			CENTER D			AGGREGATE		
	Pre-test	Ave.	Post-test	Pre-test	Ave.	Post-test	Pre-test	Ave.	Post-test	Pre-test	Ave.	Post-test	Pre-test	Ave.	Post-test
N															
CHARACTERISTIC	336	352	338	54	53	53	38	33	28	38	35	32	496	473	451
AGE															
5				1.9	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	.2	.2	.2
6	2.2	2.0	1.8	16.7	16.8	17.0	0.0	0.0	0.0	21.6	20.5	19.4	5.1	4.9	4.7
7	24.5	24.2	24.0	25.9	25.2	24.5	0.0	0.0	0.0	45.9	48.7	51.6	24.2	24.3	24.5
5-7	26.7	26.2	25.8	44.5	43.9	43.4	0.0	0.0	0.0	67.5	69.2	71.0	29.7	29.5	29.4
8	27.5	27.2	27.0	20.4	20.6	20.8	23.7	26.1	28.6	18.9	12.7	6.5	24.4	24.6	24.9
9	22.6	23.1	23.7	9.3	10.3	11.2	36.8	34.4	32.1	8.1	12.1	19.1	25.8	24.0	22.3
10	11.8	12.6	13.4	16.7	16.8	17.0	23.7	24.3	25.0	5.4	5.9	6.5	12.8	13.4	14.0
8-10	61.9	63.0	64.1	46.4	47.7	49.1	84.2	84.9	85.7	32.4	30.7	29.1	59.7	60.4	61.2
11	8.3	7.7	7.1	9.3	8.4	7.5	13.2	13.6	14.0	0.0	0.0	0.0	8.1	7.6	7.1
12	2.5	2.1	1.8	0.0	0.0	0.0	2.6	1.3	0.0	0.0	0.0	0.0	2.0	1.6	1.3
13	.6	.9	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.4	.6	.9
11-13	11.4	10.7	10.1	9.3	8.4	7.5	15.8	15.0	14.3	0.0	0.0	0.0	10.5	9.9	9.3
SEX															
Female	37.1	36.1	35.2	40.7	40.1	39.6	47.4	46.9	46.4	29.7	29.3	30.0	37.8	36.9	36.1
Male	62.9	63.8	64.8	59.3	59.8	60.4	52.6	53.1	53.6	70.3	70.1	70.0	62.2	62.6	63.1
PLACE															
City	50.4	48.1	45.9	40.2	39.2	38.0	24.3	24.6	25.0	60.5	64.2	27.9	48.2	46.6	45.1
Farm	2.8	3.4	4.0	0.0	0.0	0.0	8.1	9.4	10.7	0.0	0.0	0.0	2.7	3.2	3.7

[a/] All numbers except N are expressed as percents of the total N and are adjusted for missing values.

Table 1 (con't.).

Suburb	19.7	20.6	21.6	34.6	35.3	36.0	18.9	18.4	17.9	10.5	8.8	7.1	20.5	21.3	22.1
Small town	14.7	14.6	14.6	17.3	17.6	18.0	10.8	10.7	10.7	7.9	9.3	10.7	14.1	14.3	14.5
Country	12.5	13.2	14.0	7.7	7.8	8.0	37.8	36.7	35.7	21.1	17.1	14.3	14.5	14.6	14.7
HOME															
House	92.3	92.0	91.8	98.1	98.0	98.0	94.6	95.5	96.4	94.7	93.9	93.1	93.3	93.1	92.9
Apartment	6.6	7.1	7.6	1.9	2.0	2.0	0.0	0.0	0.0	5.3	6.1	6.9	5.5	6.0	6.4
Mobile home	1.1	0.9	0.6	0.0	0.0	0.0	5.4	4.5	3.6	0.0	0.0	0.0	1.2	0.9	0.7
PETS															
Yes	77.7	76.6	75.6	81.5	81.3	81.1	86.8	86.2	85.7	86.8	84.0	81.3	79.6	78.4	77.3
No	22.3	23.3	24.4	18.5	18.7	18.9	13.2	13.7	14.3	13.2	15.7	18.3	20.4	21.5	22.7
INTERESTED?															
Yes	96.1	96.8	97.6	98.1	94.2	90.4	97.4	98.7	100.0	94.7	91.1	87.5	96.3	96.2	96.1
No	3.9	3.1	2.4	1.9	5.7	9.6	2.6	1.3	0.0	5.3	8.9	12.5	3.7	3.8	3.9
EDUCATION SOURCE															
School	14.4	10.8	7.1	16.7	14.1	11.4	8.8	6.3	3.7	27.6	15.8	4.0	15.4	11.2	7.0
TV	3.3	3.7	4.1	13.9	11.3	8.6	0.0	9.3	3.7	10.3	9.2	8.0	5.0	5.1	5.1
Books	7.2	7.2	7.1	0.0	0.0	0.0	5.9	4.8	3.7	0.0	0.0	0.0	5.4	5.3	5.1
Scouts	7.2	4.5	1.8	5.6	2.8	0.0	5.9	6.7	7.4	6.9	5.5	4.0	6.8	4.6	2.3
Nature Center	42.5	48.2	53.8	63.9	69.1	74.3	17.6	18.1	18.5	37.9	55.0	72.0	41.8	48.3	54.7
On my own	9.9	8.8	7.7	0.0	0.0	0.0	29.4	24.0	18.5	3.4	3.7	4.0	10.4	8.9	7.4
Family	4.4	4.9	5.3	0.0	1.5	2.9	11.8	13.3	14.8	3.4	3.7	4.0	4.6	5.3	5.9
Summer Camp	9.4	8.9	8.3	0.0	1.5	2.9	14.7	22.2	29.6	3.4	1.7	0.0	8.2	8.6	9.0
Other	1.7	3.2	4.7	0.0	0.0	0.0	5.9	3.0	0.0	6.9	5.5	4.0	2.4	3.0	3.5
PRIOR CAMPER?															
Yes	44.4	45.4	46.4	66.0	64.2	62.3	72.2	68.3	64.3	48.6	44.3	40.0	49.1	49.1	49.0
No	55.6	54.6	53.6	34.0	35.9	37.7	27.8	31.8	35.7	51.4	55.7	60.0	50.9	51.0	51.0

Table 1 (cont'd.).

CENTER VISIT BEFORE?															
Yes, with															
family	36.4	40.9	45.4	30.8	29.3	27.7	41.2	45.6	50.0	13.2	19.1	25.0	34.1	38.3	42.4
friends	12.6	10.4	8.1	7.7	9.2	10.6	11.8	14.3	16.7	10.5	14.7	18.8	11.8	10.9	9.9
School group	13.1	11.0	8.8	23.1	22.2	21.3	35.3	30.2	25.0	21.1	15.3	9.4	16.9	14.2	11.5
Others	11.9	12.1	12.3	11.5	14.3	17.0	8.8	4.4	0.0	15.8	12.6	9.4	12.0	12.0	12.0
Family & friends	6.0	8.0	9.9	5.8	8.2	10.6	0.0	0.0	0.0	13.2	11.3	9.4	6.1	7.8	9.4
Family & school	7.6	7.0	6.3	11.5	9.0	6.4	0.0	0.0	0.0	2.6	1.3	0.0	7.1	6.3	5.5
Friends and school	1.7	1.2	0.7	5.8	2.0	0.0	0.0	0.0	0.0	2.6	1.3	0.0	1.9	1.2	0.5
No	10.6	9.6	8.5	3.8	5.1	6.4	2.9	5.6	8.3	21.1	16.8	12.5	10.1	9.4	8.6
CENTER MEMBERSHIP?															
Yes	33.6	34.0	34.4	54.7	54.8	54.9	16.7	10.2	3.7	5.7	10.7	15.6	32.6	33.1	33.6
No	43.6	44.0	44.4	20.8	24.2	27.5	58.3	66.2	74.1	62.9	59.6	56.3	43.6	44.4	45.2
Don't know	22.8	22.0	21.1	24.5	21.1	17.6	25.0	23.6	22.2	11.4	28.6	25.8	21.8	22.5	21.1

the total audience available failed to heed directions to select only one source and instead named multiple sources for this item, or did not reply at all, the 27% figure is not representative of the total population, only of those who correctly responded to the statement answer format.

A similar problem arose with the solicitation of information regarding prior nature center visitation, with a substantial number of missing (no response) or mechanically incorrect responses. More than 9% of the youths said they had never been to a nature center before, but then went on to name a category selection which identified with whom they had attended. Those who correctly responded "Yes" to prior visit (90.6%) and identified "family" as the group they had attended with were the largest segment of the "Yes" population at over a third of the total. Attending with "school groups" ranked second and averaged about 14% of the choices.

Respondents were almost evenly divided between previous participation in nature day camp or not, with 49% and 51% respectively.

More than 22% of the day campers did not know if their families belonged to a nature center and 40% claimed to have received a scholarship to attend day camp sessions.

While the number of day campers taking the posttest declined to 451 from 496 on the pretest, the profile characteristics remained only a few percentage points or parts of a percentage point apart. The exceptions were in the

categories of "Education Source", "Scholarship" and "Previous Center Visit".

On the posttest, "schools", "scouts" and "on my own" lost substantial support as providers of information about nature and conservation, while "nature center" gained nearly 13%. If one accepts the truthfulness of the reporting, more day campers with scholarships completed the summer program than did those without scholarships. For those youngsters who had visited nature centers before, 80% more of the total population attributed their visits to attendance with family on the posttest than did so on the pretest, while attendance with school groups declined 5%.

A composite profile of summer nature day camp attendees might be said to be basically eight year old boys who live in private houses in a city/suburb, who have pets they care for, have attended a nature center previously with their families, who do not likely have a nature center membership. The campers are interested in learning about nature and conservation and credit the nature center with most of the previous knowledge about nature. They probably have not been to day camp before and did not receive a scholarship to attend the 1977 session.

Profile by Center

In a breakdown by center, Center D with 7.3% of the total population had the youngest group with no one over ten years of age and the greatest percent of their total population who were males and the greatest percent of their total who were city residents. They registered no responses to books as sources of learning and most frequently had an incorrect or missing response to all categories of statements. Other differences which were noted were that no children identified summer nature day camp on the posttest as having an influence on their source of information on nature and conservation, but there was a substantial percentage increase in those crediting nature centers themselves as a learning source.

Nature Center B, with 11.1% of the total day camp participants, had a population which was fairly evenly split in numbers between the ages of five through seven and eight through ten. Of all the centers surveyed they had the greatest percent of respondents who identified "house" as a type of residence. They gave the nature center the most credit for supplying information on nature and conservation, with no credit given to "books" or "on my own" and almost none for "summer camp" or "family". Nearly a fourth or so said that their families were not members of the nature center which was an obvious error as only member's children may take part in the nature day camp.

Center C, with over 8% of the total program

participants, had some profile characteristics quite different from all other centers'. Overall, their participants were older, about 85% being between the ages of eight and ten and with no one under the age of eight. In addition, populations of boys and girls were almost evenly divided. No apartment dwellers were listed and this center had the greatest percent of the rural non-farm and farm residents. In terms of ability to handle the questionnaire, this group had the fewest errors, or missing responses. They gave low scores to "TV" as a learning source and the highest scores to "on my own" and "summer nature day camp". Visits to a nature center scored high, with an average of more than 94% having been to one before, about half of those having attended with their families. School group involvement with the center was also very high.

Nature Center A's participants in the day camp program had a general profile which varies only slightly by percentile but was otherwise identical in trend to that of the average combined or aggregate center profile, and with notable changes in the areas of "Educational Source" and "Previous Center Visit" similar to the aggregate completing both pre and posttests. Nearly 75% of all respondents originated from this source so that the aggregate data essentially speaks for Center A as well. The availability of private funding for scholarships at this center is documented by the large number of youngsters answering "Yes" to being in receipt of this form of support.

General Information Statements

Cognitive

Combined scores for all four centers demonstrated by summary Table 6. showed two statements improving in score for correct answer and two declining between pre and post-tests. The cardinal was thought to be the state bird of Michigan by 21.5% of pretested youths, while only 19.4% of those responding on the posttest thought so, which is an improvement in correct answer response. Those who thought animals cried tears, while small at 18.6% on the pretest, rose to 20.1% on the posttest, which is a decline in correct answer, or a decline in preferred score. A large percent (85.5%) pretested that conservation of natural resources meant to save them, with the posttesting score going to 88.5%, another decline in preferred score. Contrarily, 58.9% who properly identified forests and marshes as ecosystems on the pretest improved to where 75.7% did so on the posttest.

In the breakdown by centers, Centers D (Table 5.) and A (Table 2.) had incorrect responses on the pretest which were high and stayed so on the posttest regarding the statement that animals cry tears. Center D showed improvement on the three remaining general cognitive statements, particulary regarding the definition of conservation, with nearly a 20% improvement in correct score. Center A's correct answers improved between pre and post-testing regarding the state bird and the identification of

some ecosystems, but declined in correct response to the definition of conservation as a "save" philosophy and regarding animals as being capable of crying tears.

Center C (Table 4.) responded incorrectly in substantial percentages both pre and posttest where conservation was suggested as a "save" issue. They improved slightly in correct response regarding the identification of the state bird and ecosystems. In addition, Center C had a low percentile (compared to the other three nature centers studied) to begin with of its day campers calling the cardinal the state bird.

Center B (Table 3.) showed some improvement in correct responses to all but the statement suggesting animals cry tears. The latter statement had an increase from 19.6% to 28.3% between the pre and posttest of those who replied "Yes" to the statement.

SUMMARY TABLE 2.: CENTER A ITEM RESPONSE PRE AND POSTTEST WITH EVALUATION OF CHANGE

CONCEPT AREA		ITEM	CORRECT/ PREFERRED ANSWER	RESPONDING "YES" (IN AGREEMENT TO ITEM)		SCORE CHANGE		
				PRETEST	POSTTEST	IMPROVE	DECLINE	SAME
GENERAL KNOWLEDGE	12.	The state bird of Michigan is the cardinal.	No	21.1	19.0	X		
	13.	Conservation of natural resources means to save them.	No	84.1	90.2		X	
	14.	A forest or marsh is an ecosystem.	Yes	60.1	79.1	X		
	15.	Animals cry tears when unhappy.	No	16.7	17.5		X	
GENERAL ATTITUDES	16.	I like to be in the out-of-doors.	Yes	94.5	93.4		X	
	17.	My family should use returnable bottles.	Yes	85.6	95.3	X		
	18.	I try to not waste natural resources.	Yes	84.8	89.1	X		
	19.	I pick up other people's litter.	Yes	84.2	80.4		X	
	20.	I object when people smoke around me.	Yes	81.3	85.7	X		
ENERGY CONCEPT KNOWLEDGE	21.	Mice and grasshoppers eat grass and are eaten by foxes.	Yes	48.6	49.0			X
	22.	Plants produce oxygen for animals to breath.	Yes	81.6	92.5	X		
	23.	The wind is a source of energy.	Yes	85.7	91.8	X		
	24.	The soil gives us solar energy.	No	52.6	43.2	X		
ENERGY CONCEPT ATTITUDES	25.	The land must be saved to grow food.	Yes	93.9	94.0			X

Table 2 (cont'd.).

	26.	We will run out of oxygen if we cut down our forests.	No	56.4	72.7		X	
	27.	Hunting deer helps to keep the deer herd from starving.	Yes	46.4	53.0	X		
CYCLES	28.	Erosion is good for the soil.	No	53.9	55.5		X	
CONCEPT	29.	Smog is a kind of air pollution.	Yes	88.0	88.6			X
KNOWLEDGE	30.	Nature changes rocks into soil.	Yes	51.4	69.0	X		
	31.	Rain which falls on your school yard came from the ocean.	Yes	38.3	48.5	X		
CYCLES CONCEPT	32.	Forest fires can be good for wildlife.	Yes	14.1	21.9	X		
ATTITUDES	33.	Air pollution is okay in cities.	No	11.4	13.7		X	
	34.	We should dump waste in our rivers if it saves us money.	No	6.4	8.6		X	
ADAPTATION CONCEPT	35.	Baby rabbits look like their father and mother.	Yes	61.8	63.1	X		
KNOWLEDGE	36.	Moles, which live underground, have good eyesight.	No	54.7	61.0		X	
	37.	Fish have lungs for breathing.	No	55.2	48.9	X		
	38.	Owls can see to hunt at night.	Yes	94.2	93.7		X	
ADAPTATION	39.	I think cities smell good.	No	17.0	15.6	X		
CONCEPT	40.	Plants which are weeds are no good.	No	45.9	43.2	X		
ATTITUDES	41.	Snakes are slimy.	No	58.4	57.8	X		
INTER-DEPENDENCE	42.	Living things depend on each other and their environment.	Yes	87.3	91.2	X		
CONCEPT KNOWLEDGE	43.	One day we will run out of oil, coal and gas.	Yes	81.7	90.9	X		

Table 2 (cont'd.).

	44.	Snapping turtles eat ducks and fish.	Yes	41.8	56.0	X
	45.	Many tiny creatures live in a drop of pond water.	Yes	69.2	77.2	X
INTER-	46.	I am part of nature.	Yes	86.3	91.0	X
DEPENDENCE	47.	Wildflowers should be left unpicked for others to enjoy.	Yes	94.2	94.9	X
CONCEPT ATTITUDES	48.	We should drain swamps and marshes to get rid of insects.	No	12.5	11.1	X

SUMMARY TABLE 3.: CENTER B ITEM RESPONSE PRE AND POSTTEST WITH EVALUATION OF CHANGE

CONCEPT AREA		ITEM	CORRECT/ PREFERRED ANSWER	RESPONDING "YES" (IN AGREEMENT TO ITEM)		SCORE CHANGE		
				PRETEST	POSTTEST	IMPROVE	DECLINE	SAME
GENERAL KNOWLEDGE	12.	The state bird of Michigan is the cardinal.	No	27.5	25.0	X		
	13.	Conservation of natural resources means to save them.	No	90.6	88.7	X		
	14.	A forest or marsh is an ecosystem.	Yes	60.8	67.3	X		
	15.	Animals cry tears when unhappy.	No	19.6	28.3		X	
GENERAL ATTITUDES	16.	I like to be in the out-of-doors.	Yes	88.9	81.1		X	
	17.	My family should use returnable bottles.	Yes	88.7	82.7		X	
	18.	I try to not waste natural resources.	Yes	86.8	80.0		X	
	19.	I pick up other people's litter.	Yes	61.1	55.8		X	
	20.	I object when people smoke around me.	Yes	75.9	75.0			X
ENERGY CONCEPT KNOWLEDGE	21.	Mice and grasshoppers eat grass and are eaten by foxes.	Yes	46.3	45.3		X	
	22.	Plants produce oxygen for animals to breath.	Yes	86.8	78.8		X	
	23.	The wind is a source of energy.	Yes	96.2	82.7		X	
	24.	The soil gives us solar energy.	No	41.5	46.2		X	
ENERGY CONCEPT ATTITUDES	25.	The land must be saved to grow food.	Yes	94.3	90.4		X	

Table 3 (cont'd.).

	26.	We will run out of oxygen if we cut down our forests.	No	54.7	63.3		X		
	27.	Hunting deer helps to keep the deer herd from starving.	Yes	43.4	41.2		X		
CYCLES	28.	Erosion is good for the soil.	No	50.0	55.1		X		
CONCEPT	29.	Smog is a kind of air pollution.	Yes	79.2	84.9	X			
KNOWLEDGE	30.	Nature changes rocks into soil.	Yes	46.3	50.0	X			
	31.	Rain which falls on your school yard came from the ocean.	Yes	31.4	37.3	X			
CYCLES CONCEPT	32.	Forest fires can be good for wildlife.	Yes	13.7	22.0	X			
ATTITUDES	33.	Air pollution is okay in cities.	No	15.1	13.5	X			
	34.	We should dump waste in our rivers if it saves us money.	No	13.2	13.2			X	
ADAPTATION CONCEPT	35.	Baby rabbits look like their father and mother.	Yes	77.4	69.8		X		
KNOWLEDGE	36.	Moles, which live underground, have good eyesight.	No	43.4	45.3		X		
	37.	Fish have lungs for breathing.	No	34.0	37.7		X		
	38.	Owls can see to hunt at night.	Yes	94.3	90.6		X		
ADAPTATION	39.	I think cities smell good.	No	26.4	23.5	X			
CONCEPT	40.	Plants which are weeds are no good.	No	38.9	42.3		X		
ATTITUDES	41.	Snakes are slimy.	No	74.1	59.6	X			
INTER-DEPENDENCE	42.	Living things depend on each other and their environment.	Yes	79.2	83.0	X			
CONCEPT	43.	One day we will run out of oil, coal and gas.	Yes	76.9	74.5		X		
KNOWLEDGE									

Table 3 (cont'd.).

	44.	Snapping turtles eat ducks and fish.	Yes	34.0	57.7	X	
	45.	Many tiny creatures live in a drop of pond water.	Yes	64.7	73.1	X	
INTER-	46.	I am part of nature.	Yes	81.1	84.0	X	
DEPENDENCE	47.	Wildflowers should be left unpicked for others to enjoy.	Yes	94.2	98.1	X	
CONCEPT ATTITUDES	48.	We should drain swamps and marshes to get rid of insects.	No	20.4	23.1		X

SUMMARY TABLE 4.: CENTER C ITEM RESPONSE PRE AND POSTTEST WITH EVALUATION OF CHANGE

CONCEPT AREA		ITEM	CORRECT/ PREFERRED ANSWER	RESPONDING "YES" (IN AGREEMENT TO ITEM)		SCORE CHANGE		
				PRETEST	POSTTEST	IMPROVE	DECLINE	SAME
GENERAL KNOWLEDGE	12.	The state bird of Michigan is the cardinal.	No	7.9	3.6	X		
	13.	Conservation of natural resources means to save them.	No	89.2	89.3			X
	14.	A forest or marsh is an ecosystem.	Yes	62.5	65.4	X		
	15.	Animals cry tears when unhappy.	No	21.1	21.4			
GENERAL ATTITUDES	16.	I like to be in the out-of-doors.	Yes	91.9	100.0	X		
	17.	My family should use returnable bottles.	Yes	84.2	92.6	X		
	18.	I try to not waste natural resources.	Yes	89.5	100.0	X		
	19.	I pick up other people's litter.	Yes	92.1	92.9			X
	20.	I object when people smoke around me.	Yes	94.7	78.6		X	
ENERGY CONCEPT KNOWLEDGE	21.	Mice and grasshoppers eat grass and are eaten by foxes.	Yes	28.9	32.1	X		
	22.	Plants produce oxygen for animals to breath.	Yes	89.5	92.9	X		
	23.	The wind is a source of energy.	Yes	92.1	100.0	X		
	24.	The soil gives us solar energy.	No	71.1	50.0	X		
ENERGY CONCEPT ATTITUDES	25.	The land must be saved to grow food.	Yes	100.0	92.3		X	

Table 4 (cont'd.).

	26.	We will run out of oxygen if we cut down our forests.	No	68.4	57.1	X		
	27.	Hunting deer helps to keep the deer herd from starving.	Yes	39.5	46.4	X		
CYCLES	28.	Erosion is good for the soil.	No	64.9	52.0	X		
CONCEPT	29.	Smog is a kind of air pollution.	Yes	78.9	78.1		X	
KNOWLEDGE	30.	Nature changes rocks into soil.	Yes	64.9	63.0			X
	31.	Rain which falls on your school yard came from the ocean.	Yes	57.9	67.9	X		
CYCLES CONCEPT	32.	Forest fires can be good for wildlife.	Yes	7.9	10.7	X		
ATTITUDES	33.	Air pollution is okay in cities.	No	7.9	0.0	X		
	34.	We should dump waste in our rivers if it saves us money.	No	5.3	3.7	X		
ADAPTATION CONCEPT	35.	Baby rabbits look like their father and mother.	Yes	48.6	53.6	X		
KNOWLEDGE	36.	Moles, which live underground, have good eyesight.	No	67.6	53.6	X		
	37.	Fish have lungs for breathing.	No	57.9	50.0	X		
	38.	Owls can see to hunt at night.	Yes	97.4	100	X		
ADAPTATION	39.	I think cities smell good.	No	5.3	21.4		X	
CONCEPT	40.	Plants which are weeds are no good.	No	57.9	50.0	X		
ATTITUDES	41.	Snakes are slimy.	No	50.0	53.6		X	
INTER-DEPENDENCE	42.	Living things depend on each other and their environment.	Yes	89.2	100	X		
CONCEPT	43.	One day we will run out of oil, coal and gas.	Yes	86.8	78.6		X	
KNOWLEDGE	44.	Snapping turtles eat ducks and fish.	Yes	37.8	82.1	X		

Table 4 (con't.).

	45.	Many tiny creatures live in a drop of pond water.	Yes	89.5	89.3			X
INTER-DEPENDENCE CONCEPT	46.	I am a part of nature.	Yes	91.9	89.3		X	
	47.	Wildflowers should be left unpicked for others to enjoy.	Yes	97.4	100	X		
ATTITUDES	48.	We should drain swamps and marshes to get rid of insects.	No	2.6	0.0	X		

SUMMARY TABLE 5.: CENTER D ITEM RESPONSE PRE AND POSTTEST WITH EVALUATION OF CHANGE

CONCEPT AREA		AREA	CORRECT/ PREFERRED ANSWER	RESPONDING "YES" (IN AGREEMENT TO ITEM)		SCORE CHANGE		
				PRETEST	POSTTEST	IMPROVE	DECLINE	SAME
GENERAL KNOWLEDGE	12.	The state bird of Michigan is the cardinal.	No	31.4	29.0	X		
	13.	Conservation of natural resources means to save them.	No	87.9	69.0	X		
	14.	A forest or marsh is an ecosystem.	Yes	40.6	50.0	X		
	15.	Animals cry tears when unhappy.	No	33.3	33.3			X
GENERAL ATTITUDES	16.	I like to be in the out-of-doors.	Yes	94.7	82.1		X	
	17.	My family should use returnable bottles.	Yes	62.2	85.2	X		
	18.	I try to not waste natural resources.	Yes	68.6	88.5	X		
	19.	I pick up other people's litter.	Yes	64.7	78.6	X		
	20.	I object when people smoke around me.	Yes	67.6	77.8	X		
ENERGY CONCEPT KNOWLEDGE	21.	Mice and grasshoppers eat grass and are eaten by foxes.	Yes	40.5	60.9	X		
	22.	Plants produce oxygen for animals to breath.	Yes	61.1	85.2	X		
	23.	The wind is a source of energy.	Yes	91.7	66.7		X	
	24.	The soil gives us solar energy.	No	41.9	41.7			X
ENERGY CONCEPT ATTITUDES	25.	The land must be saved to grow food.	Yes	97.2	77.8		X	

Table 5 (cont'd.).

	26.	We will run out of oxygen if we cut down our forests.	No	63.9	60.0	X	
	27.	Hunting deer helps to keep the deer herd from starving.	Yes	62.2	75.0	X	
CYCLES	28.	Erosion is good for the soil.	No	38.9	50.0	X	
CONCEPT	29.	Smog is a kind of air pollution.	Yes	91.7	73.1		X
KNOWLEDGE	30.	Nature changes rocks into soil.	Yes	51.4	64.5	X	
	31.	Rain which falls on your school yard came from the ocean.	Yes	32.4	40.9	X	
CYCLES CONCEPT	32.	Forest fires can be good for wildlife.	Yes	10.5	33.3	X	
ATTITUDES	33.	Air pollution is okay in cities.	No	11.1	34.6		X
	34.	We should dump waste in our rivers if it saves us money.	No	2.7	8.0		X
ADAPTATION CONCEPT	35.	Baby rabbits look like their father and mother.	Yes	56.8	76.0	X	
KNOWLEDGE	36.	Moles, which live underground, have good eyesight.	No	40.5	28.0	X	
	37.	Fish have lungs for breathing.	No	51.4	34.8		X
	38.	Owls can see to hunt at night.	Yes	91.9	84.0		X
ADAPTATION	39.	I think cities smell good.	No	41.7	36.0	X	
CONCEPT	40.	Plants which are weeks are no good.	No	59.5	37.5	X	
ATTITUDES	41.	Snakes are slimy.	No	68.6	70.8		X
INTER-DEPENDENCE	42.	Living things depend on each other and their environment.	Yes	83.8	80.0		X
CONCEPT KNOWLEDGE	43.	One day we will run out of oil, coal and gas.	Yes	86.1	76.0		X

Table 5 (cont'd.).

	44.	Snapping turtles eat ducks and fish	Yes	21.6	54.5	X		
	45.	Many tiny creatures live in a drop of pond water.	Yes	59.4	68.0	X		
INTER-	46.	I am part of nature.	Yes	69.4	60.9		X	
DEPENDENCE	47.	Wildflowers should be left unpicked for others to enjoy.	Yes	89.2	88.0			X
CONCEPT ATTITUDES	48.	We should drain swamps and marshes to get rid of insects.	No	16.7	16.0			X

SUMMARY TABLE 6.: AGGREGATE CENTER ITEM RESPONSES PRE AND POSTTEST WITH EVALUATION OF CHANGE

CONCEPT AREA		AREA	CORRECT/ PREFERRED ANSWER	RESPONDING "YES" (IN AGREEMENT TO ITEM)		SCORE CHANGE		
				PRETEST	POSTTEST	IMPROVE	DECLINE	SAME
GENERAL KNOWLEDGE	12.	The state bird of Michigan is the cardinal.	No	21.5	19.4	X		
	13.	Conservation of natural resources means to save them.	No	85.5	88.5		X	
	14.	A forest or marsh is an ecosystem.	Yes	58.9	75.1	X		
	15.	Animals cry tears when unhappy.	No	18.6	20.1		X	
GENERAL ATTITUDES	16.	I like to be in the out-of-doors.	Yes	93.7	91.6		X	
	17.	My family should use returnable bottles.	Yes	84.0	93.0	X		
	18.	I try to not waste natural resources.	Yes	84.2	88.7	X		
	19.	I pick up other people's litter.	Yes	80.9	78.1		X	
	20.	I object when people smoke around me.	Yes	80.7	83.5	X		
ENERGY CONCEPT KNOWLEDGE	21.	Mice and grasshoppers eat grass and are eaten by foxes.	Yes	46.2	48.1	X		
	22.	Plants produce oxygen for animals to breath.	Yes	87.3	90.5	X		
	23.	The wind is a source of energy.	Yes	87.8	89.7	X		
	24.	The soil gives us solar energy.	No	52.1	43.9	X		
ENERGY CONCEPT ATTITUDES	25.	The land must be saved to grow food.	Yes	94.7	92.5		X	

Table 6 (cont'd.).

	26.	We will run out of oxygen if we cut down our forests.	No	57.7	69.9		X	
	27.	Hunting deer helps to keep the deer herd from starving.	Yes	46.7	52.4	X		
CYCLES	28.	Erosion is good for the soil.	No	53.2	55.0		X	
CONCEPT	29.	Smog is a kind of air pollution.	Yes	86.6	86.3			X
KNOWLEDGE	30.	Nature changes rocks into soil.	Yes	51.9	66.1	X		
	31.	Rain which falls on your school yard came from the ocean.	Yes	38.6	48.0	X		
CYCLES CONCEPT	32.	Forest fires can be good for wildlife.	Yes	13.3	21.9	X		
ATTITUDES	33.	Air pollution is okay in cities.	No	11.5	14.0		X	
	34.	We should dump waste in our rivers if it saves us money.	No	6.7	8.8		X	
ADAPTATION CONCEPT	35.	Baby rabbits look like their father and mother.	Yes	62.1	64.1	X		
KNOWLEDGE	36.	Moles, which live underground, have good eyesight.	No	53.4	56.7		X	
	37.	Fish have lungs for breathing.	No	52.8	46.9	X		
	38.	Owls can see to hunt at night.	Yes	94.3	93.2		X	
ADAPTATION	39.	I think cities smell good.	No	19.0	18.1	X		
CONCEPT	40.	Plants which are weeds are no good.	No	47.1	43.2	X		
ATTITUDES	41.	Snakes are slimy.	No	60.2	58.5	X		
INTER-DEPENDENCE	42.	Living things depend on each other and their environment.	Yes	86.2	90.1	X		
CONCEPT KNOWLEDGE	43.	One day we will run out of oil, coal and gas.	Yes	81.9	87.4	X		

Table 6 (cont'd.).

	44.	Snapping turtles eat ducks and fish.	Yes	39.1	57.8	X		
	45.	Many tiny creatures live in a drop of pond water.	Yes	69.6	77.0	X		
INTER-	46.	I am part of nature.	Yes	84.9	88.5	X		
DEPENDENCE	47.	Wildflowers should be left unpicked for others to enjoy.	Yes	94.1	95.2	X		
CONCEPT ATTITUDES	48.	We should drain swamps and marshes to get rid of insects.	No	12.9	12.1			X

Affective

Preferred scores on the five affective or attitudinal-type general statements were very high overall and three of the five went higher still on the posttest while two declined slightly. One of those statements experiencing a preferred score decline was the statement identifying the outdoors as a place the participants liked to be. The response agreeing to the obligation to pick up other people's litter also fell, from 80.9% to 78.1%.

On an individual center basis, Center B's overall preferred affective scores, while relatively high on the pretest, all declined on the posttest except for the statement objecting to smoking in the student's presence. Center D's preferred scores overall were lower than the other centers' but did improve on the posttest. Like Center B, however, Center D showed a decreasing percentage of those responding on the posttest who liked to be in the outdoors.

Center A's respondents showed high preferred scores overall which increased on the posttest for the items recommending use of returnable bottles, avoiding resource waste, and objection to smoking in their presence. Preferred scores declined slightly regarding the picking up of other people's litter but negligibly in the area of affinity for the outdoors.

Center C's day campers had the highest overall preferred scores, three of which went still higher on the

posttest. Liking to be in the outdoors and endorsement of efforts to not waste natural resources rose to 100% agreement. Litter pickup for other people scored very high on both pre and posttest, testimony to environmental attitude and behavior. Alone among the centers, Center C respondents indicated a marked decrease in objection to people smoking in their presence.

Conceptual Data By Statement

Cognitive

Collectively, the day campers did well on their choice of correct scores in the cognitive or knowledge areas of the four environmental education concepts investigated. Twelve of the sixteen scores improved between the pre and posttest although not generally by an impressive amount. Exceptions were in the concept areas of Cycles and Interdependence where the correct answer to the statement "Nature changes rocks into soil" improved by almost 15%, a correct pretest of "Yes" having a response of 51.9% and posttest having 66.1%. The statement about rain having its source in the ocean had an improved "Yes" response of nearly 10% although the overall score was correct for less than half of the youngsters. A posttest improvement in score of more than 18% was demonstrated by a correct "Yes" response to the statement "Snapping turtles eat ducks and fish." The only score which did not change, which was for recognition of smog as an air pollutant, had a very high "Yes" pre and posttest score, which was the correct and preferred response. Three correct score responses declined between pre and posttesting but by less than 4% each.

The percent of "Yes" scores for two items where "Yes" was an incorrect answer were fairly high to begin with and over half of the day campers continued to select the wrong response by agreeing with the statements on the posttest. These were the items regarding erosion as being good for

the soil, and the assertation that "Moles, which live underground, have good eyesight". A 1.1% decline in correct score for those who thought "Owls can see to hunt at night" was not considered note-worthy because the correct "Yes" answer was selected by 90%-plus of the respondents on both pre and posttest.

Individually, Center A respondents mimicked the overall center scores, also improving in correct responses by percentage points on some statements. Center D's day campers, while not having as high a set of scores as Center A's or the collective scores, improved their correct scores on nine of the sixteen items, stayed the same with over 40% selecting the wrong response regarding soil as a supplier of solar energy, and declined in number of correct answers on six statements, in three cases dramatically so. A high pretest score of 91.7% correctly identifying wind as a source of energy declined by 25% on the posttest to only 66.7% who did so. The pretest score of 91.7% of those who correctly labeled smog as a form of air pollution fell by 18.6% on the posttest to only 73.1% who now agreed with the statement. On the pretest 86.1% correctly agreed that we would one day run out of oil, gas and coal, but only 76% continued to support this statement on the posttest.

Nature Center C's campers correct score improved on twelve of the sixteen statements with one staying the same and three falling slightly. Two statement responses stood out: the very small percentage who agreed that "Mice and

grasshoppers eat grass and are eaten by foxes", which improved only from 28.9% to 32.1% on the second survey, and the 44.3% increase in score from 37.8% to 82,1% of the population who correctly labeled snapping turtles as predators of ducks and fish. Overall, Center C's scores were very high for correct answers in most areas.

Center B's correct answers on the posttest showed six statement responses experiencing gains while ten declined. Declines were usually exceedingly small in percentile change, however, and collectively the frequency of their correct scores tended to be fairly high. The item "Snapping turtles eat ducks and fish" had a change in correct answer of 23.7% between pre and posttest as more campers recognized the predator-prey relationship and agreed with the statement.

Affective

The preferred affective or attitudinal scores in the concept areas tended to be high overall for the collective centers. Of the twelve total item responses, correct scores for seven improved, one remained virtually unchanged and four declined. Only one decline was substantial, a change from 57.7% to 69.9% of the respondents who felt we would run out of oxygen if our forests were cut down. Two preferred score declines between pre and posttesting were in the items of air pollution as being acceptable in cities, and the statement "We should dump wastes in our rivers if it saves us money." Where "Yes" answers were given when "No" was preferred, it represented such a small percent of the total responses that with only 2.1%and 2.5% increases respectively in incorrect reply, no further consideration was given.

One preferred score, a decline of 2.2% of those answering who felt the land should be saved for food production, was also dismissed as both pre and posttest responses in agreement with the item, the preferred choice, exceeded 90%. Improvement which was noted for all centers individually as well as collectively was in response to the statement that "Forest fires can be good for wildlife." Collectively, 13.3% of the population answered "Yes" to this item on the pretest, rising to 21.9% who agreed on the posttest.

By individual center, Nature Center A again had scores

closely correlating with the overall set of scores, due to their representation of nearly three-fourths of the total population participating in the survey. Their most substantial decline or loss in preferred response was in the statement "We will run out of oxygen if we cut down our forests." A 16.3% drop in correct/preferred response was noted, more than for the aggregate percentile decline for that item.

Center D had five scores which improved in preferred score. There was a 13% improvement in the number of those agreeing with the statement that "Hunting deer helps to keep the deer herd from starving"; improvement of 23.3% in preferred score regarding the possible benefits to wildlife from forest fires; and a 22% decline in preferred score for the number of campers who formerly thought weeds were no good on the pretest. Two scores remained relatively unchanged and were generally answered in the preferred manner while two of the five reduced scores were noticeably larger than desirable. By a drop of over 19% from the preferred test score on the pretest, respondents disagreed with needing to keep land for food production on the posttest, and an exceptionally large score change of 23.5% (from 11.1% pretest to 34.6% posttest) indicated that over a third of the respondents now felt air pollution was acceptable in cities.

Center C experienced eight gains and four declines in preferred affective scores, none of them dramatic. Over-

all, their preferred scores were very high, in three cases rising to 100% agreement with statements where "Yes" in agreement was the preferred answer. No one thought air pollution was acceptable in cities on the posttest, nor did anyone accept the idea of draining wetlands for insect control. All agreed on the second survey that wildflowers should be left unpicked for the enjoyment of others. The class remained almost evenly split as to whether weeds were "good" or "no good" and whether or not snakes were slimy.

Center B had improvement in six preferred scores on the posttest, one remained the same and five declined. However, their overall scores were very good to start with and the changes were small and not viewed as critical. Their greatest improvement was a 14.5% loss in participants on the posttest who thought snakes were slimy. Almost a fourth of the youths felt that it would be a good idea to drain wetlands for insect control, a much higher figure than for any other center.

CHAPTER IV

DISCUSSION

Profile trends

Profile data suggests little or no interest in the nature centers' programs on the part of age groups other than the seven through nine year olds, based on percent participation by age level, but it is well to keep in mind that many other types of summer programs are available to different ages and this should not be considered a reflection on the day camp activity. That boys generally outnumber girls in participation may be attributed to a higher interest level in boys than in girls of the same age. Or, perhaps parental concern for a higher energy level as a disruptive force at home is responsible for the uneven representation. As the group in total is primarily from urban-suburban surroundings, it might be that having less access to outdoor recreation makes the outdoor-based summer nature day camp programs very appealing as a mean of responding to this anticipated behavioral pattern.

It is possible that so few apartment dwellers were represented among the day campers for two reasons: none of the four nature centers studied was located within walking distance of public transportation or near a major apartment

complex or metropolitan area, and home ownership patterns indicate that people with school-aged children prefer to buy houses. Along with the latter theme is the possibility that apartment residents with children are often somewhat transient and thus do not get involved as much outside their neighborhoods as the more traditionally "rooted" families.

That previous participants in nature day camps number almost the same as non-prior participants may be due to the ages. The upper end of the age scale may be represented by past participants who have "grown-up" in the program, while the lower age brackets may represent youngsters newly eligible to attend who will be repeat attenders as long as they are within the qualifying age structure.

Given the very young age of Center D's day campers it is not surprising that none of them listed books as a source of learning, or that they experienced more incorrect answering responses by percent of total participants than did any other center. These were beginning readers with very limited skills who may not have had the reading and interpretive capacity of the older children in other centers.

Nature Center B requires its participants' parents to be members of the center in order for the children to take part in this particular program. It is logical that these youngsters rated prior center visit with family and school groups as the most common mode of visit. This greater

potential involvement would also explain the inclination toward identifying the center as the prime information source for nature and conservation subjects.

The community from which the majority of the summer day camp participants for Center C are drawn has an active environmental education effort through its schools which utilize the center at times to supplement their programs. Also, though a rural environment, families in the area are mostly commuters to nearby major metropolitan businesses and are not recognized as having an agricultural lifestyle despite their rural residences. Income is probably above average, suggesting a different set of opportunities and influences regarding nature and conservation might be available to this clientele. The fact that this center's day campers had such high pre and posttest scores overall and that they attributed prior knowledge of conservation as coming from "on my own" and "family"; that previous participation in day camp averaged 68% of all this center's campers, which was the highest for any center; and that previous-visit scores to a nature center were very high for family and school groups, all suggest that, as Garry and Kingsley (1970) found, individual opportunities such as travel and access to special tools and experiences may dominate the learning experience. Center C may indeed be a well-used and appreciated resource, but it may simply be a part of a larger package of environmental learning opportunities rather than the major contributor.

The markedly lower objection to smokers around them for these youth as compared to the other centers' day campers was unusual. It would have been interesting to have determined the presence/absence of smokers in these youth's households as a possible factor in determining their tolerance. However, this center lost 26% of its already small respondent population between pre and posttesting, which could have accounted for the change if those who dropped out had been those who had objected to smoking on the pretest, leaving the non-objectors for the posttest response.

There is no discussion of Center A profile data different from the aggregate, as this center represents the bulk of the total population. Essentially, what applies to the aggregate applies to Nature Center A.

Item Analysis

While the general statements evaluated neither added to nor subtracted values from the conceptually designed statements, resonses to two of them will be included as they relate to the environmental education concept areas.

The statement regarding conservation as a "save" rather than a "wise-use" philosopy was agreed upon by an average of 86.9% of all respondents. That acceptance of the "save" definition was so widespread may also be reflected in the scores for some of the conceptual statements dealing with conservation of natural resources: very few respondents agreed that "Mice and grasshoppers eat grass and are eaten by foxes." This may be an indication of a "good-bad" judgment of the animals in question (or predators in general) or subscription to popular misconceptions about foxes relying on the henhouse for survival.

The score for the item "Snapping turtles eat ducks and fish" improved dramatically, which could be a function of correct interpretation of a statement about food chains which would impact positively on the Interdependence concept or a function of availability on the part of the statement components. Centers A, B and C all have extensive wetland ecosystems available for close inspection by their day campers. Turtles, ducks and fish are all present and may have offered a "teachable moment" about predator-prey relationships which could account for the correct score improvement on the posttest. Thus a possible correlation

exists between Center B and Center C score improvement for this statement.

A lack of understnding about resource use was apparent in the responses to the statement "We will run out of oxygen if we cut down our forests", which more than two-thirds of the day campers agreed with on the posttest. Antihunting sentiment and/or lack of understanding of basic wildlife management and population biology were evident in the low correct scores for the statement "Hunting deer helps to keep the deer herd from starving," although there was a small percent improvement in the numbers of day campers who supported this item on the posttest.

Inability to see soil as a resource or understanding the concept of erosion left over half of the youngsters convinced that "Erosion is good for the soil." A similarly poor showing was made for the item "Forest fires can be good for wildlife."

The identification of what an ecosystem is had a very large number of respondents who correctly scored on this general statement with 58.9% on the pretest and 75.1% on the posttest. If the term is as well understood as the scores indicate, it may explain the generally favorable scores for four environmental education concept-related statements: "Living things depend on each other and their environment" increased from 86.2% to 90.1% of the students who agreed with the item; "Many creatures live in a drop of pond water" went from 69.6% on the pretest to 77.0% on the

posttest for those in favor of the statement; "I am a part of nature" increased from 84.9% to 88.5% of the day campers agreeing with the statement; "We should drain swamps and marshes to get rid of insects", with 12.9% support on the pretest, lost support on the posttest to 12.1% of the population voting "Yes" on a statement where "No" was preferred.

Some exceptions by center were noted to the above. Center D's scores did improve on the definition of conservation, dropping from 87.9% to 69% of those who thought it meant "save" instead of "wise-use". They also improved, though very little, on the statements that "Mice and grasshoppers eat grass and are eaten by foxes" and "We will run out of oxygen if we cut down our forests." There was substantial improvement on "Hunting deer helps to keep the deer herd from starving" and "Forest fires can be good for wildlife." In the ecosystem area, "Living things depend on each other and their environment" lost slightly on the posttest but was overall a high score anyway of those who agreed with the item. The item "Many tiny creatures live in a drop of pond water" showed a gain in preferred score on the posttest and the statement "We should drain swamps and marshes to get rid of insects" maintained a preferably low percent of respondents who chose "Yes" for an answer, "No" being the preferred choice. However, the statement "I am a part of nature" received the lowest percent preferred answer at Center D, perhaps reflecting the difficulty of

the youngest age group in perceiving themselves in such a sophisticated concept, the tendency being for younger children to be more egocentric (Smith, 1975).

As expected, because of its large share of the audience Center A had scores essentially the same as the aggregate. The apparently unclear distinciton by youth between conservation as wise-use versus saving and the identification of on-site ecosystems as part of the field program may explain their performance on related statement responses. The conservation definition statement remained at a fairly low percentage on the posttest of those who realized that "save" was an incorrect answer, while the ecosystem identification response improved in correct answer.

Center C had a smaller percent than the whole of respondents who appeared to understand the ecosystem term, but they did the best of all the centers on the item "Living things depend on each other and their environment", scoring 100% agreement with the statement on the posttest. They followed this up by being high scorers as well on other ecosystem-related statements and had a perfect preferred score of "zero" posttest who agreed that draining swamps and marshes was an acceptable form of insect control. Their percent correct score for erosion as being beneficial to the soil improved but remained at about half the campers in agreement when a disagree score indication was the preferred choice.

Center B had a disappointingly low score which sank still lower on the posttest for the statement suggesting the benefits of deer hunting. Ecosystem-related statements improved and were very high in most cases. An exception was the large number of youngsters in favor of draining wetlands for insect control.

It is important to consider center emphasis and opportunities when evaluating these scores. Center D, while having the youngest and a very small group had overall scores which were generally favorable and continued to improve on the posttest. Even though the major thrust of their program was on the youngsters' enjoying themselves and adopting a positive attitude regarding the outdoors, some knowledge of nature and natural systems also appears to have been transferred. One might question the program's major goal of "challenging youth to explore, discover, think, wonder and develop values which can influence future decisions" in light of a low correct score on the pretest which declined still further on the posttest for youngsters who failed to see themselves as part of nature, and for the 12.6% drop in preferred score for those who said they like to be in the outdoors (although the score was quite high even with the drop). The high participant dropout rate between pre and posttest, nearly 20%, may have been partly resonsible for these scores, the pessimists having been left behind! Another possible influence could have been the scheduling of classes. Meeting twice a week for only a

half day over a four week period may not offer sufficient continuity and reinforcement opportunities to sustain program enthusiasm and impact.

Center A's brochure lists pollution and pond life as two general topics to be emphasized in their summer programs. That these goals may have been at least partially met is suggested by the high score for those correctly identifying smog as a form of air pollution and the small population indicating approval for dumping waste in rivers to save money or for accepting air pollution in cities. A similarly small percent, declining further on the posttest, felt that "Cities smell good." (After a visit to the metropolitan area nearest to this center, the latter reaction is understandable!)

A substantial number of those surveyed affirmed that they do indeed pick up litter left by others, although there was a small decline in this score on the posttest. Even with its well-stated land use concerns Nature Center A's youngsters signified that erosion is acceptable. On the positive side, the statements "Snapping turtles eat ducks and fish", "Many tiny creatures live in a drop of pond water", and "We should drain swamps and marshes to get rid of insects" all showed a high percent of correct or preferred scores, perhaps a reflection of the intended pond life emphasis.

Center A's location near a town historically troubled by severe air and water pollution may carry over into many

of their participants' environmental concerns, even though much has been done to alleviate the more grievous offenses. This could have had some influence on the commendable performance on the part of their campers on statements relevant to pollution. The Center's vigorous efforts past and present on behalf of local environmental quality may have contributed as much or more to environmental awareness of pollution as the summer program alone.

Other reasons for the apparently superior performance on the part of Center A's day campers may be the time structure. Two weeks of day-long, every day participation is conducive to a highly organized presentation having plentiful opportunities for the reinforcement recessary to affect change of a lasting nature (Gagne, 1977). The long-standing program has certainly presented ample opportunity for revision and upgrading of the activities offered and the development of a smooth operation with unique supporting benefits, such as the awarding of scholarships and provisions of a city-wide bus pickup service. However, while Center staff who operate summer day camp programs are undoubtably well qualified, they appear to represent a very diverse collection of backgrounds and abilities, making it rather difficult to assess what sorts of input they may personally make to the program.

As Center A represents the majority of all students sampled, a drop in score on the affective side of the Energy concept might be viewed with concern as to

interpretation of results. With further investigation impossible, the audience having since dispersed, it can only be said that whatever was done during the day camp program, attitudes and opinions about energy were imparted which differed from those underlying the sample statements developed for the survey instrument.

Nature Center C's program was planned to include items about wind and solar energy and pioneer farming concepts. Four high scores in the Energy concept area support the apparent attainment of at least a part of that effort. However, while fairly high, the score declined on the posttest for the statement that "The land must be saved to grow food." Scores in the Cycle concept area, including the response to soil as derived from rocks and erosion as being good for the soil, were not very high for correct responses. Scores in the Adaptation concept area showed only small improvements by statement, except for the statement about owls being able to see to hunt at night, which went from 97.4% to 100% correct answer, somewhat of a natural for this center with its historical emphasis on things ornithological. The pretest indicated that a very low percentage of the population thought cities smelled good, not surprising given their probable biases toward their rural environment. However, a noticeable change occurred on the posttest with nearly a fourth of the respondents adopting a more tolerant approach and agreeing that cities do smell good. Also, the low score of those

who felt we would run out of fossil fuels one day does not fit the planned energy emphasis.

An extraordinary jump in score of those who agreed with the item "Snapping turtles eat ducks and fish" may be explained by the opportunity available to address this relationship, Center C having a setting on a lake where these creatures are plentiful. The same may be true in explaining the high preferred score for life existing in a drop of water and the "zero" score, or agreement, for those wanting to drain wetlands for insect control.

Center B's classes had the opportunity to be exposed to pond, prairie, forest, and marsh ecosystems on the site. While overall they had more scores which declined in percent correct response than rose, the declines were generally quite small. Declines noted were more apt to be in the affective realm than in the cognitive. Many scores were very high to start with so a small decline in correct answer was not viewed as meaningful. An interesting response was noted to the statement that rain falling on the schoolyard came from the ocean. While very few youngsters agreed with this on either pre or posttest (31.4% and 37.3% respectively), Center B's director pointed out that with this Center located near Lake Michigan these youngsters are aware of the weather influence caused by the Great Lakes and view Lake Michigan as supplying their rain rather than the ocean, indicating that they do understand the hydrologic cycle but do not agree with the statement's

perception of it.

It is interesting to speculate on the reason that almost a fourth of the campers agreed to draining marshes and swamps as a means of insect control. As Center B overlooks an extensive wetland area and the mosquito population may have been uncomfortably noticeable during the summer sessions, it is conceivable that this basically urban-suburban group of people saw such action as perfectly acceptable for dealing with a situation causing much personal discomfort.

Overall, where percents of "Yes" scores were preferred as answers, Center B's youths did well. Possibly being located in an area which recognizes the value of a clean, attractive environment, both personally and as it impacts on the tourism vital to the area, influenced the commendably few numbers of campers who found air pollution in cities and waste disposal in rivers acceptable. As for being able to assess whether or not Center goals for their students - ie, to teach natural history to enhance knowledge and attitudes about the natural world - were met, the indications are not conclusive. The question remains as to whether a half-day program lasting only a single week is sufficient time to have had a measurable impact on the young audience.

Learning Trends

In cross-comparing scores of each nature center's respondents to their previous experience at a nature day camp and their interest in learning about nature and conservation, it was noted that overall, correct or preferred scores for all concept areas combined improved for those who had had previous experience at day camp and who had indicated an interest in learning about nature and conservation. Center D was the exception, with those having no previous experience at day camp having correct or preferred scores as high as those with past contact and interest in learning.

In the Energy concept area, Center C campers declined in correct and preferred scores among those with previous experience and those eager to learn. They experienced the same trends in the Cycle concept.

In many cases posttest scores for those without previous day camp experience and those not expressing an interest in a learning experience also rose, and were often higher than the more experienced and willing learners. Only in the aggregate concepts for all centers did the correct and preferred scores improve on the posttest and rank higher on both the pre and posttest, and only for those expressing an interest in additional learning.

While trends may be an important area to consider when developing nature center day camp programs, they were not the main thrust of this investigation. However, in refer-

ence to the trends noted, it is apparent that in general those students who expressed an interest in learning did learn, as indicated by improved correct scores, and those who had been to nature day camp before also improved their scores, but in many cases so did those who had not been to the summer sessions before.

CHAPTER V

SUMMARY AND CONCLUSIONS

In an investigation to determine the impact on the cognitive and affective domains of four basic environmental education conceptual areas, a descriptive study was conducted during the summer of 1977 at four selected southwestern Michigan nature centers. To add meaning to the results of each center's scores and as an aid in future program planning, profile data of day camp participants were also gathered. No attempt was made to grade the performance of or rank the scores of the nature centers in comparison to each other since they are all different in organizational structure, purpose, scope and audience profile.

Information was collected by means of a questionnaire using a statement format. Eleven profile characteristics were established for each center, and collectively. Summary tables suggest that the typical nature center day camper in this survey is an eight year old boy who lives in a house in a city with a pet for which he cares. He is interested in learning about nature and conservation and credits many sources with his current knowledge about the environment, but most especially nature centers. He may or may not have been to day camp before but has most likely

visited a nature center, probably with his family which is not a member of a nature center. He is not apt to have a scholarship to attend the summer nature day camp. There are some important deviations from this profile by some of the centers sampled which likely impact on the scores computed for that center and the ability of the participants to correctly respond to the survey form.

Information identified with environmental knowledge and attitudes was collected by designing statements around the broad environmental education concept areas of Energy, Interdependence, Adaptation and Cycles. These areas are considered by environmental educators to be fundamental to the understanding of the natural environment. Each set of statements by concept area contained four knowledge-based and three attitude-based statements. While the cognitive or knowledge-based statements had right and wrong response choices, the affective or attitude-based statements essentially measured preferred responses, many of which were neither right nor wrong. Statements were designed to bracket as widely as possible the various contemporary dimensions of the four basic environmental education concepts, with full recognition of the difficulty in constructing statements which would be communicative, relevant, and measurable for four dissimilar nature center programs.

A comparison of collective pre and posttest scores for the four programs studied indicates that it is difficult to

positively and significantly impact the attitudes of youthful participants in environmental education concept areas. Indeed, the impact may be negative. When comparing aggregate scores for the purpse of determining these programs' influence on environmental knowledge gained, it appears that there can be an influence, but that influence is too minimal to support recognition of the four day camp programs as effective change agents.

On an individual basis, Center A would seem to be more effective in environmental education through its day camp programs than the other participating centers. The differences at Center A are not dramatic, however. Furthermore, the small sample size represented by the populations surveyed at the other centers may be too small to permit reliable interpretations of score measurement. In addition, measurements used are total measurements and therefore if pretest scores are determined to be high to start with, as at Center C, the environmental education objectives should be quite different than if the scores were low or average.

There is no way to estimate the quality of information delivered, ie, whether or not it presumed minimal entry level knowledge and offered simplistic information, or if a more comprehensive approach was used when the recipients were thought to be more knowledgeable to begin with. Either way, errors in judgment could have been made: an unprepared audience exposed to sophisticated learning

situations may experience no growth; a knowledgeable group of youth having previous experience would gain little or nothing from a "watered down" presentation. Therefore, programs which incorrectly interpret participant interest and ability can suffer negative growth ratings if they are mistakenly pitched either above or below those entry levels. The importance of knowing audience needs and capabilities before preparing and presenting a program should be well acknowledged by program planners if a positive change in attitudes and/or knowledge about the environment is to be accomplished.

It is unrealistic to expect accurate comparison of the four centers' day camp experience, given that their differences far exceed their commonality, even though their basic philosophies are in general agreement. Each center's overall objectives as well as program goals differ. None has established concrete educational goals for the day camp program which correspond directly with the environmental education concept areas tested. Some emphasize one or more areas, some have no special concentration and no group emphasizes all four areas tested. Some are geared to the philosophy of "teachable moments" while others have a more structured program not as receptive to interruption. The time frame for each program varies widely, some programs offering substantially more contact hours than others and over a more concentrated time period.

The pilot instrument developed for this study may have

in itself presented some problems which could have impacted on the survey results. Due to the informality of the program setting and the "school's out" excitement which created disciplinary problems, some participants may not have given the survey effort their full attention. Youngsters were observed copying each other's answers, discussing answers with one another and displaying many modes of inattentiveness. Many reacted negatively to taking part in the survey, protesting the "test", and a few deliberately sabotaged their scores by rapidly and randomly marking answers before the statements were even read. In addition, many of the very young campers who were just learning to read and write had difficulty tracking statements from the left to the answers on the right as the statements were read to them. Many dual and incomplete answers were due to this inability to match responses to corresponding numbered statements. A few youngsters could not draw circles around the answer selected and chose their own often undecipherable means of response. Given that in young children motor development proceeds distally (Gates, et al, 1948), this mechanical problem was not surprising.

As sessions at the four centers often overlapped so that the author could not be present for the administration of each questionnaire, the consistency and reliability of substitute presenters can not be guaranteed or accounted for, even though they were carefully instructed as to proper methods earlier. In addition, an answer bias may

have occured from counselors inadvertantly teaching to the test. There is no way to substantiate this possibility.

Insufficient demographic data prior to program development prevents standardized learning efforts which lend themselves to more comprehensive testing, measurement and evaluation. This absence of formalized, consistent and continuous nature day camp programs sets up barriers to performance improvement in both environmental education knowledge and attitudes. Designing instruments to successfully measure and/or evaluate such nebulous programs is concluded to be of little merit, especially for ocmparing programs over whose multi-variables there is little control. Further study of this kind should be on a center-by-center basis with a survey of participant backgrounds prior to program planning, for more conclusive results. However, it may be more reasonable to suggest that deliberate environmental education efforts be kept within other nature center programs, letting the summer nature day camps fill their special and obviously popular role of providing informal recreational contacts with nature under enthusiastic guidance.

Despite the difficulties in obtaining valid responses to the survey instrument designed for this pilot study and the less-than-dramatic changes in correct and preferred scores in the environmental education concept areas, thhe overall outcome of this initial effort to measure effectiveness of summer nature day camp programs and to provide

base-line demographic data for four southwestern Michigan nature centers was rewarding. The stage has been set for redesign and implementation of further measurement and evaluative instruments, keeping in mind that nature centers as a rule offer many other types of programs, some of which are aimed directly at the concept areas addressed in this document. Because of this, evaluation following measurement should proceed on an individual center basis, recognizing that while nature centers have much in common, there are no standardized programs. Therefore, the use of a standardized survey for comparative purposes is not advisable.

Recommendations

If the purpose of a nature summer day camp program is to impart increased knowledge of and develop positive attitudes toward nature and conservation, as might be exemplified by the four basic environmental education concepts used in the pilot survey instrument, then it would seem that a two-phase program should be initiated. This could take place in the following order:

Program Assessment

1. Prepare a set of goal statements and objectives for the program which are well understood and accepted by the staff and its supporters.
2. Recognize profile data of program participants when conceptualizing the program--it must "fit" the audience.
3. Organize a program around the goal statements, considering the user group needs.
4. Train counselors in consistent program presentation.
5. Design a survey instrument specific to the program's planned or expected outcomes, of the type best suited to measure the outcomes.
6. Allow for exceptions presented by audience composition and unplanned program inputs likely to occur.
7. Provide for continual objective modification of programs when necessary.

In planning a survey form for use in assessing the

outcomes of a summer nature day camp program the specific goals and program content must be recognized. In considering the participants' limitations in responding to a questionnaire mode, certain format and presentation methods are suggested:

Instrument Design

1. Adopt the simple statement format with single "yes-no" responses only.
2. Keep statements well spaced or print on lined paper so item and appropriate response can be more easily paired.
3. One side of a page may be sufficient, unless more profile data needs to be solicited; 15 to 20 minutes completion time is about maximum for youthful audience acceptability.
4. Read the statements aloud to small groups in a quiet, non-distracting environment.
5. If the effects of demographic attributes on scores and changes in scores are to be considered, be sure to use paired responses in the pre and posttest procedure.
6. Caution counselors against teaching to the questionnaire; emphasize the positive values of participating in the survey so that youngsters do not regard it as a test.
7. Recognize the variety of environmental education influences at work, which suggests a long-term measurement and evaluation effort for each center desiring to

assess their contributions to the total input process.

If, however, the summer nature day camp program is regarded as a pot-pourri of fun-type experiences in a natural setting, the more formal measurement and subsequent evaluative judgment effort does not apply. It will be up to each nature center's director, staff and sponsors to determine whether their programs recommend the extensive program assessment and instrument design procedures as proposed above.

LITERATURE CITED

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Ahmann, J. S. 1962. Testing Student Achievement and Aptitudes. Washington, D.C.: Center for Applied Research on Education, Inc.

_____, M. D. Glock and H. L. Wardeburg. 1960. Evaluating Elementary School Pupils. Boston, Mass.: Allyn and Bacon, Inc.

Allport, G. W. 1935. Attitudes, in Handbook of Social Psychology. Edited by C. Murchison. Worcester, Mass.: Clark University Press.

Ausubel, D. P. 1968. Educational Psychology - A Cognitive View. New York: Holt, Rinehart and Winston, Inc.

Carlson, M. K. 1972. A Study of the Influence of a Resident Outdoor Education Experience in Intermediate Level Children's Perceptions of Peers and Perceptions of the Out-Of-Doors. Unpublished PhD thesis, Syracuse University.

Cureton, E. E. 1951. Validity, in Educational Measurement. Edited by E. F. Lindquist. Washington, D. C.: American Council on Education.

Dasmann, R. F. 1972. Environmental Conservation, third edition. New York: John Wiley and Sons, Inc.

Ebel, R. L. 1951. Writing the Test Item, in Educational Measurement. Edited by E. F. Linquist. Washington, D. c.: American Council on Education.

Gagne, R. M. 1977. The Conditions of Learning, third edition. New York: Holt, Rinehart and Winston, Inc.

Garry, R. L. and H. L. Kingsley. 1970. The Nature and Condition of Learning, third edition. Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Gates, A. I., A. T. Jersild, T. R. McConnell, and R. C. Challman. 1949. Educational Psychology, third edition. New York: The MacMillan Company.

Gronlund, N. E. 1978. Constructing Achievement Tests. Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Gross, M. P. 1977. An Analysis of Attitudes, Knowledge, and Perceptions of Elementary School Students Following Participation in a Special Environmental Education Program. Unpublished PhD thesis, the University of Iowa.

Jones, V. A. 1976. A Comparative Study of Environmental Education Compentencies of Third Grade Students and Their Teachers. Unpublished PhD thesis, Michigan State University.

Kirkpatrick, W. H. 1951. Philosophy of Education. New York: The MacMillan Company.

Kostka, M. L. M. 1975. The Impact of Selected Nature Center Programs on Sixth Grade Pupils. Unpublished PhD thesis, the University of Minnesota.

_____. 1976. Nature Center Program Impact. The Journal of Environmental Education. 8 (1): 52-64.

Leopold, A. 1949. A Sand County Almanac, seventh printing. New York: Oxford University Press.

Lien, A. J. 1971. Measurement and Evaluation of Learning, second edition. Dubuque, Iowa: Wm. C. Brown Company.

Lindemann, R. H. and P. F. Merenda. 1979. Educational Measurement, second edition. Glenview, Ill.: Scott, Foresman and Company.

Michigan Department of Education. 1974. Minimal Performance Objectives for Science Education in Michigan. Lansing, Michigan.

_____. 1976. Revisions of Minimal Performance Objectives for Science Education in Michigan (mimeographed material) Lansing, Michigan.

_____. 1977. Second Draft, Revisions of Minimal Performance Objectives for Science Education in Michigan. (mimeographed material) Lansing, Michigan.

Smith, J. W., R. E. Carlson, G. W. Donaldson and H. B. Masters. 1963. Outdoor Education. Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Smith, M. D. 1975. Learning and its Classroom Applications. Abridged edition of Educational Psychology and its Classroom Applications. Boston, Mass.: Allyn and Bacon, Inc.

Stapp, W. B. 1971. Environmental Education: Approaches to Curriculum Development (K-12), in Processes for a Quality Environment. Edited by R. S. Cook and G. T. O'Hearn. Green Bay, Wisc.: The University of Wisconsin Press.

Stodolsky, S. S. 1975. Summative Testing, in Testing and Evaluation. Edited by M. D. Cohen. Wash., D. C.: Association for Childhood Education, International.

Wileman, J. L. 1976. The Extent and Nature of Affective and Cognitive Changes in Teachers and Students as the Result of Participation in an Environmental Education Program. Unpublished Ed.D. thesis, Virginia Polytechnic Institute and State University.

Wood, D. A. 1961. Test Construction. Columbus, Ohio: Chas. E. Merril Books, Inc.

GENERAL REFERENCES

GENERAL REFERENCES

Broda, H. W. 1977. Selection Criteria Used in the Development of Resident Outdoor Education Curricula for Middle Grade Students. Unpublished PhD thesis, Kent State University.

Cohen, M. D. editor, and V. Perrone, Coordinator. 1975. Testing and Evaluation: New Views. Wash., D. C.: Association for Childhood, International.

Cunningham, R., A. Elzi, J. A. Hall, M. Farrel, and M. Roberts. 1951. Understanding Group Behavior of Boys and Girls, second edition. Teacher's College, Columbia University, N. Y.: Bureau Publications.

Dockeray, M. J. 1972. The Planning and Development of the Blandford Nature Center of the Grand Rapids, Michigan, Public Museum. Unpublished PhD thesis, Michigan State University.

Governor's Environmental Education Task Force. 1973. Michigan's Environmental Future, first edition. Lansing, Michigan.

Karlson, A. L. and S. S. Stodolsky. 1973. Predicting Social Outcomes from Observations of Child Behavior in Classrooms. Presented to the American Educational Research Association annual meeting, New Orleans, Louisiana.

McCay, R. E., D. A. Gansner, and J. J. Padalino. 1978. Measuring the Attitudes and Awareness of Environmental Education Camp Users. Forest Service Research Paper NE-426. Broomall, Pa.: USDA Forest Service, N. E. Forest Experiment Station.

APPENDICES

APPENDIX A

Dolch Basic Word List

APPENDIX A

DOLCH BASIC WORD LIST

PRE-PRIMER	PRIMER	FIRST GRADE	SECOND GRADE	THIRD GRADE
1. a	1. all	1. after	1. always	1. about
2. and	2. am	2. again	2. around	2. better
3. away	3. are	3. an	3. because	3. bring
4. big	4. at	4. any	4. been	4. carry
5. blue	5. ate	5. as	5. before	5. clean
6. can	6. be	6. ask	6. best	6. cut
7. come	7. black	7. by	7. both	7. done
8. down	8. brown	8. could	8. buy	8. draw
9. find	9. but	9. every	9. call	9. drink
10. for	10. came	10. fly	10. cold	10. eight
11. funny	11. did	11. from	11. does	11. fall
12. so	12. do	12. give	12. don't	12. far
13. help	13. eat	13. going	13. fast	13. full
14. here	14. four	14. had	14. first	14. got
15. I	15. get	15. has	15. has	15. grow
16. in	16. good	16. her	16. found	16. hold
17. is	17. have	17. him	17. gave	17. hot
18. it	18. he	18. his	18. goes	18. hurt
19. jump	19. into	19. how	19. green	19. if
20. little	20. like	20. just	20. its	20. keep
21. look	21. must	21. know	21. made	21. kind
22. make	22. new	22. let	22. many	22. laught
23. me	23. no	23. live	23. off	23. light
24. my	24. now	24. may	24. or	24. long
25. not	25. on	25. of	25. pull	25. much

APPENDIX A (cont'd.).

26.	one	26.	our	26.	old	26.	read	26.	myself
27.	play	27.	out	27.	once	27.	right	27.	never
28.	red	28.	please	28.	open	28.	sing	28.	only
29.	run	29.	over	29.	pretty	29.	sit	29.	own
30.	said	30.	ran	30.	put	30.	sleep	30.	pick
31.	see	31.	ride	31.	round	31.	tell	31.	seven
32.	the	32.	saw	32.	some	32.	their	32.	shall
33.	three	33.	say	33.	stop	33.	these	33.	show
34.	to	34.	she	34.	take	34.	those	34.	six
35.	two	35.	so	35.	thank	35.	upon	35.	small
36.	up	36.	soon	36.	them	36.	us	36.	start
37.	we	37.	that	37.	than	37.	use	37.	ten
38.	where	38.	there	38.	think	38.	very	38.	today
39.	yellow	39.	they	39.	walk	39.	wash	39.	together
40.	you	40.	this	40.	were	40.	which	40.	try
		41.	too	41.	when	41.	why	41.	warm
		42.	under			42.	wish		
		43.	want			43.	work		
		44.	was			44.	would		
		45.	well			45.	write		
		46.	went			46.	your		
		47.	what						
		48.	white						
		49.	who						
		50.	will						
		51.	with						
		52.	yes						

APPENDIX B

Trial Questionnaire

APPENDIX B

Trial Questionnaire

May 31, 1977

Sandra E. Marlatt, Michigan State University

Circle the answer which you agree with the most.

1. How old are you? 7 8 9 10 11 12
2. Are you a boy or a girl?
3. Where do you live?

   city suburb small town

   farm country, not a farm
4. What do you live in?

   house apartment mobile home
5. Do you have any pets you care for? Yes No
6. Are you interested in learning about nature and conservation? Yes No
7. Where have you learned the most about nature and conservation?

   school family activities

   TV summer camp

   scout group nature center
8. Have you ever been to a Nature Day Camp before?

   Yes No

9. Have you visited a Nature Center before?

Yes No

10. If you have visited a Nature Center, who was it with?

family school group

friends others

11. Are you or your family a member of a Nature Center? Yes No

12. The state bird of Michigan is the cardinal.

Yes No

13. Conservation of natural resources means to save them. Yes No

14. A forest or marsh is a kind of ecosystem.

Yes No

15. Animals cry tears when unhappy. Yes No

16. I like to be in the out-of-doors. Yes No

17. My family should use returnable bottles.

Yes No

18. I try to not waste natural resources.

Yes No

19. I pick up other people's litter. Yes No

20. I don't like it when people smoke around me.

Yes No

21. Foxes eat mice and grasshoppers, which eat grass. Yes No

22. Plants produce oxygen for animals to breathe.

Yes No

23. The wind is a source of energy. Yes No

24. The soil gives us solar energy. Yes No

25. The land must be saved to grow food. Yes No

26. We will run out of oxygen if we cut down forests. Yes No

27. Hunting helps to keep deer from starving. Yes No

28. Erosion is good for the soil. Yes No

29. Smog is a kind of air pollution. Yes No

30. Nature changes rocks into soil. Yes No

31. Rain which falls on your school yard came from the ocean. Yes No

32. Forest fires are bad. Yes No

33. Air pollution is okay in cities. Yes No

34. We should dump waste in our rivers if it saves us money. Yes No

35. Baby rabbits look like their mother and father. Yes No

36. Moles, which live underground, have good eyesight. Yes No

37. Fish have lungs to breathe with. Yes No

38. Owls can see to hunt at night. Yes No

39. Cities smell good. Yes No

40. Plants which are weeds are no good. Yes No

41. Snakes are slimy. Yes No

42. Living things depend on each other and their environment. Yes No

43. One day we will run out of oil, coal and gas. Yes No

44. Snapping turtles eat ducks and fish. Yes No

45. Many tiny creatures live in a drop of water. Yes No

46. I am part of nature. Yes No

47. Wildflowers should be left unpicked for others to enjoy. Yes No

48. We should drain swamps and marshes to get rid of insects. Yes No

APPENDIX C

NATURE DAY CAMP SURVEY

APPENDIX C

NATURE DAY CAMP SURVEY

for

Michigan State University

Circle the answer which you agree with the most:

1. My age is: 6 7 8 9 10 11 12 13
2. I am a: boy girl
3. I live:

   on a farm — country, not a farm
   in a city — in a suburb
   in a small town
4. I live in a:

   house apartment mobile home
5. I have a pet or pets which I care for. Yes No
6. I am interested in learning about nature and conservation. Yes No
7. I have learned the most about nature and conservation from:

   school — a scout group — family activities
   TV — a nature center — summer camp
   books — on my own — other
8. I have been to a Nature Day Camp before. Yes No

9. I received a scholarship to come to Nature Day Camp. Yes No

10. I have been to a Nature Center before. Yes No

11. My family is a member of a Nature Center. Yes No

12. The state bird of Michigan is the cardinal. Yes No

13. Conservation of natural resources means to save them. Yes No

14. A forest or a marsh is a kind of ecosystem. Yes No

15. Animals cry tears when unhappy. Yes No

16. I like to be in the out-of-doors. Yes No

17. My family should use returnable bottles. Yes No

18. I try to not waste natural resources. Yes No

19. I pick up other people's litter. Yes No

20. I object when people smoke around me. Yes No

21. Mice and grasshoppers eat grass and are eaten by foxes. Yes No

22. Plants produce oxygen for animals to breathe. Yes No

23. The wind is a source of energy. Yes No

24. The soil gives us solar energy. Yes No

25. The land must be saved to grow food. Yes No

26. We will run out of oxygen if we cut down our forests. Yes No

27. Hunting deer helps to keep the deer herd from starving. Yes No
28. Erosion is good for the soil. Yes No
29. Smog is a kind of air pollution. Yes No
30. Nature changes rocks into soil. Yes No
31. Rain which falls on your school yard came from the ocean. Yes No
32. Forest fires can be good for wildlife. Yes No
33. Air pollution is okay in cities. Yes No
34. We should dump waste in our rivers if it saves us money. Yes No
35. Baby rabbits look like their mother and father. Yes No
36. Moles, which live underground, have good eyesight. Yes No
37. Fish have lungs for breathing. Yes No
38. Owls can see to hunt at night. Yes No
39. I think cities smell good. Yes No
40. Plants which are weeds are no good. Yes No
41. Snakes are slimy. Yes No
42. Living things depend on each other and their environment. Yes No
43. One day we will run out of oil, coal and gas. Yes No
44. Snapping turtles eat ducks and fish. Yes No
45. Many tiny creatures live in a drop of pond water. Yes No

46. I am a part of nature. Yes No

47. Wildflowers should be left unpicked for others to enjoy. Yes No

48. We should drain swamps and marshes to get rid of insects. Yes No