

EVALUATION OF ATTITUDINAL CHANGE
RESULTING FROM AN
ENVIRONMENTAL STUDIES CURRICULUM
DEVELOPED THROUGH PROJECT CANADA WEST

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by
Clyde Alvin Watson
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CLYDE ALVIN WATSON

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ABSTRACT

The purpose of this study was to determine whether attitudinal change resulted from an Environmental Studies course developed under the aegis of Project Canada West. The course was developed for use with high school biology students. An Environmental Attitudinal Questionnaire was developed to evaluate whether attitude change occurred as a result of the Environmental Studies course.

This study was carried out from September to November, 1973, and two hundred and ninety three grade XII biology students from six different schools in Manitoba formed the experimental group. A total of one hundred and twenty eight students, seventy nine grade XII physics students and forty nine grade XI biology students from the same six schools in Manitoba, formed the control group.

The Environmental Attitudinal Questionnaire was initially used with two high school biology classes who piloted the Environmental Studies course. The questionnaire was then revised to twenty Likert scale questions. Content validity had been established prior to using the questionnaire. Reliability has been established through test-retest consistency.

The non-equivalent control group design was used in this study. The Environmental Attitudinal Questionnaire was administered to both experimental and control

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groups prior to beginning the Environmental Studies course with the experimental group. It was given again approximately ten weeks later to both groups, upon completion of the Environmental Studies course by the experimental group.

Analysis of the data revealed that experimental and control groups were initially the same in mean scores on the Environmental Attitudinal Questionnaire. However, the post test revealed a significant change in mean scores for the experimental group, while there was no change in mean scores for the control group. It was concluded that a change in attitude did result from the Environmental Studies course.

Analysis of the data from the grade XII physics and grade XI biology students revealed no differences in the pretest or the post test mean scores. It was concluded that they represented the same population.

Analysis of the data from the experimental group males and females showed no difference in the means of the pretest scores. On the post test mean scores, both males and females showed significant increases, but females increased a significantly larger amount than males, suggesting that females were more persuasible than males with reference to environmental issues.

The experimental and control groups from the six schools used in this study were compared and no significant

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differences were found in either experimental or control groups.

This study has demonstrated that programs of Environmental Studies of sufficient duration can affect the attitudes of high school students toward environmental issues. It has demonstrated that these attitudinal changes can be assessed through the use of appropriate measuring instruments.

CHAPTER I

INTRODUCTION

Teachers have always concerned themselves with student evaluation, but mainly in the cognitive domain. In recent years, the need for examination of the affective domain has become apparent but the task of evaluation is more difficult as suitable measuring instruments are not available. With respect to instruments for evaluating affective achievement, Simpson (1973) pointed out:

Several instruments of this type have been developed and have appeared in the literature. No single instrument, however, has gained widespread acceptance for use with secondary science students. At this point in time, it would be best for individual teachers to develop instruments relevant to their own course objectives and content. (p. 443)

In addition to the need for a suitable measuring instrument is the need for appropriate curriculum materials to assist in the development of attitudes conducive to environmental preservation. According to Knapp (1972):

In view of the present state of attitude research in environmental education, teachers should be encouraged to seek a variety of ways to influence attitudes about the environment. Teachers should experiment with some of the techniques for changing attitudes that have shown promise in past research. They should also try new techniques and evaluate their effectiveness. Attitudes and values in environmental education hold the key to the future of mankind and the quality of life on this planet. (p. 29)

PURPOSE OF THE STUDY

The purpose of this study is to determine whether attitudinal changes were brought about by an Environmental Studies curriculum developed under the aegis of Project Canada West. The curriculum was developed for use with high school biology students and included numerous techniques for generating discussion on matters relating to the affective domain. An environmental attitudinal questionnaire was developed to evaluate whether any attitudinal changes occurred in the students as a result of exposure to the Environmental Studies course.

RATIONALE

Mankind's failure to understand the environment threatens to destroy that environment, and the human species along with it. With air unfit to breathe, water unfit to drink, several hundred species of animals threatened with extinction and hundreds more already destroyed, and plant communities disrupted, at last mankind has come to face the inevitable fact: live by nature's laws, and break them at his peril.

Public school teachers have been called upon recently to increase their efforts in teaching about environmental problems and ecology. They have responded to this challenge with varying degrees of enthusiasm and competence.

Most changes in curriculum have involved revision and expansion of facts, concepts, and generalizations related to environmental pollution.

Curriculum developers should concern themselves not only with attainment of cognitive objectives, but also with the student's attitude. A student with low achievement may have developed a very positive attitude while a student with high achievement may have a negative attitude.

Few people would argue that students should not be aided in the development of their attitudes and values. Disagreement often arises, however, when methodology and prioritization of values is discussed. Values education has become a concern in the natural and social sciences, history, the arts, and literature. Students are bombarded by the media with questions and problems: the energy crisis, the population explosion, the food supply problem, and the myriad of bio-ethical questions which have become increasingly urgent with recent scientific advances. Answers to these questions and solutions to the problems remorselessly demand painful choices.

One reason for the lack of emphasis on teaching values in school is that the home and church traditionally have been the places where these were taught. Perhaps another reason for the neglect of affective goals has been the

emphasis by teachers on the cognitive aspects of education. Traditionally, courses of study have begun with a brief statement of objectives in which 'lip service' was given to the need for motivation and interest. Attitudes of students were often mentioned in such statements. The emphasis on the affective domain usually ended here. The remainder of such a course description dealt with concepts and principles to be taught, the facts to be learned, and the techniques for teaching them.

Perhaps one reason that teachers felt more comfortable when dealing with facts and principles is that this was the way in which they themselves were instructed. Outcomes of cognitive goals were easier to evaluate than were outcomes of affective goals. Perhaps this was because the cognitive goals were more traditional and have been more clearly defined. Also, values are delicate, personal, and controversial and teachers sometimes hesitate to deal with the issues. Whatever the reasons, the fact remains that little attention has been given to the attainment and evaluation of the outcomes of affective goals in education.

Probably a major factor in the failure to give adequate emphasis to affective goals was the difficulty of testing for their attainment. Most of the techniques of evaluation lent themselves to an evaluation of what an

individual knew. In the affective domain, what an individual knows may bear little relationship to what he does. This has led some educators to the conclusion that it is impossible to describe behaviors that would indicate the attainment of affective goals. Perhaps this is why so few attempts have been made to evaluate the attainment of goals in the affective domain or to structure learning activities intended to accomplish these goals.

Local departments of education, school divisions, and many school teachers have moved toward new academic pathways that allow for greater freedom of content and methodology in the classroom. This new found freedom has brought with it certain responsibilities for educators in that along with introducing new curriculum materials, evaluation must be adequate to determine if the stated objectives are being realized. In the past, innovations have been introduced into classrooms without proper prior evaluation. Content and methodology may not have been appropriate for the designated classes.

The Environmental Studies course that has been developed under the aegis of Project Canada West, and utilized in this study, has been field tested and revised. Content was not prescriptive and methodologies were appropriate for numerous grade levels, depending on what material was being used. The course was not designed to indoctrinate the student with a specific point of view,

but attempted to present all sides of issues. The major goal of the course was to create student awareness, interest, and motivation in the general area of environmental concerns. This major goal, it was assumed, would be achieved as the student became aware of alternate environmental actions and began to express attitudes favorable to the preservation of the natural environment as well as to act in a manner favorable to its preservation. High schools must graduate citizens who are concerned about the environment and ready to restore its ecological balance.

BACKGROUND TO THE STUDY

From December 1970 to June 1975, the author was a participating member of Project Canada West. Project Canada West encouraged curriculum development by teachers through participation in the development, trial, and revision of curriculum materials. The author was a member of one of fourteen curriculum development projects in Western Canada, the Canadian Environmental Concerns project, located in Winnipeg, Manitoba. Project Canada West, a five year project terminating in June, 1975, was based on the Johnson-Aoki (1970) Model for curriculum development and instructional planning. The Johnson-Aoki Model consists of five phases as outlined below:

Phase 1: Acquisition of knowledge.

Phase 2: Development of materials.

Phase 3: Design of teaching strategies and initiation of pilot programs.

Phase 4: Inservice training for teachers.

Phase 5: Publication of materials and project evaluation.

The Canadian Environmental Concerns project developed an Environmental Studies course and initiated numerous pilot programs in Manitoba and across Canada from spring of 1973 to the fall of 1974. The project also held several inservice programs with teachers during those years to gather information to evaluate and rewrite the project curriculum materials wherever revision appeared necessary. Evaluation of materials through actual use in the classroom was conducted prior to publication.

An Environmental Attitudinal Questionnaire was designed by members of the Canadian Environmental Concerns project to measure attitudinal changes. Testing and evaluation of this questionnaire occurred following the pilot programs. The intent of this present study was to utilize the questionnaire to determine if student attitudes had changed due to the Environmental Studies course.

QUESTIONS RELATING TO THIS STUDY

This study was designed to explore certain aspects of affective measurement. Four main questions were

considered.

As measured by the Environmental Attitudinal
Questionnaire:

1. Is the attitude toward the environment on the part of the students who have completed the Environmental Studies course different from that of the students who did not participate in the Environmental Studies course?
2. Is there any difference between the attitudes toward the environment on the part of the grade XI students and the grade XII students in the control group?
3. Is there any difference between the attitudes toward the environment on the part of the male students and the female students within the experimental group?
4. Are there any differences among the groups of students from the six different schools used in this study in attitude toward the environment?

SUMMARY

The youth in our high schools today will soon be assuming important roles as adult citizens in society. They will be confronted with the need to make decisions

that will affect not only the local environment in which they live, but also that of their fellow countrymen and of posterity. They will be asked to make social and economic decisions about recreation, transportation, beautification, water needs, and air and water pollution control, for these issues affect the total environment. Schools have a responsibility to assist our students in the acquisition of the knowledge, attitudes, and values necessary for making informed environmental decisions.

One of the most important challenges of education today is to develop an effective method of implementing environmental education into our school systems. If students are given the opportunity to investigate environmental matters, discuss these matters and come to reasonable conclusions, their attitudes may be altered. An evaluation of whether alteration of attitudes did or did not occur forms the basis of this thesis.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter surveys literature regarding environmental studies courses, attitudes, and environmental education curriculum where attitudinal measurement has taken place. The first portion of the chapter considers what existing environmental studies programs have been attempted, their justification, a definition of environmental education, and the goals of environmental education. The second portion of the chapter deals with attitudes, their definitions, and the modification of attitudes. The third part of this review considers environmental education surveys and courses and related attitudinal measurement studies that have been carried out by numerous educators.

ENVIRONMENTAL STUDIES PROGRAMS

INTRODUCTION

Environmental Concerns exist today in Canada and throughout the world. Urban areas are centers for air pollution and emphysema is on the increase as a cause of death. Insecticides that are dumped into the environment in vast quantities each year, are accumulating in human tissues. Lakes and rivers are constantly being

polluted by sewage and industrial effluents. Noise and overcrowded conditions aggravate psychological stresses and tensions. Landscapes filled with junk, disrupted ecological cycles, and wastes from radioactive sources are becoming even more common. Many species of wildlife have become extinct and many more species are on the verge of extinction. Man himself may be an endangered species according to a growing number of biologists. Only immediate action can prevent global disaster.

Why has man treated the Earth so badly? Unfavorable human behavior to a large extent is the result of a complex of widely held beliefs about man and his relationship to his environment. Some of these beliefs were rooted in religion and philosophy, and some from false assumptions. From whatever source we have acquired them, they color attitudes and dictate human actions. For us as a nation, it is necessary to learn that if we want our country to be livable for generations to come, we must embrace and solve all the problems connected with the ruination of the environment, both locally and globally.

According to Caldwell (1970), science placed in the hands of man knowledge and power that makes man responsible for his future. Science has not given man the moral compulsion to act responsibly. The substantive values that science and technology serve are articulated in the humanities, but are seldom amenable to scientific verification.

Here at this interface between science and the humanities, environmental policy is made. At this interface, education can contribute to resolving what some observers have called the environmental crisis.

Through the organization of new courses of study and the reorganization of older ones, education is better equipping the youth of today to perceive and to assess the meaning of environmental change. Only a beginning has been made and much more needs to be done. Especially important is the idea that basic environmental concepts be built into secondary education where they have generally been lacking in the past. Education is more than schooling, but it has been through formal, systematic mass education that the greatest single impact on attitudes, beliefs, and values has been made. Education alone has not solved our problems. There is no master blueprint equally applicable to all institutions or to all aspects of the educational task.

Men make politics; political institutions influence human behavior; human behavior is heavily influenced by attitudes, beliefs, and values. Purposeful shaping of the environment involves the purposeful shaping of outlooks on life. The quality of the future environment depends, therefore, upon the shaping of attitudes, beliefs, and values through present education.

JUSTIFICATION

Today, nations are faced with a new social need to which education must respond. It is the need to survive in the face of overpopulation, environmental pollution, and rapidly dwindling supplies of natural resources.

If the full scope of environmental education is to be incorporated into our educational system, major revisions of educational curricula would be involved, with resulting controversial moral, social, and spiritual implications. Justification for such revisions can be found in all the sources of authority in society: the scientific, historical, philosophical, religious, ethical, social, political, and legal sources. The sociological justification for environmental education is based primarily upon the needs of society. The social needs of stabilizing the population and eliminating ecologically unsound practices imply a major cultural reeducation. Technological and scientific means for the formation of a new environmental policy must be found. A more difficult task accompanies this new policy formation, that being discovering some means to change the attitudes of people and reorienting the priorities of various established social institutions.

The nature of a democratic society is such that the citizen must bear the ultimate responsibility for decisions and actions. Tanner (1969) stated:

People without beliefs, values, and convictions, cannot be depended upon in a society whose very survival depends on active, responsible, and trustworthy people. (p. 33)

Studebaker (1973) suggested that implementation must proceed at all levels of the social and educational system. In the end, environmental education must build respect for the environment into the basic assumptions and premises which guide the behavior of every individual regardless of whether or not he fully understands the underlying rationale for a harmonious relationship between man and nature. Studebaker recognized the subtle and powerfully profuse barriers to its implementation. The greatest barrier arose from the tradition of individual freedom especially in relation to economics and family size.

McInnis (1972) suggested that never before had a new subject of study been embraced by schools at all levels as rapidly as the most recent addition to the curriculum, environmental studies. In few schools was environmental studies considered an important subject for study in 1969. Yet now, only a few years later, what educator would dare to pronounce environmental studies an unimportant subject? Environmental curriculum have been produced at a geometric rate not unlike that of human beings. Environment is making it, educationally.

WHAT IS ENVIRONMENTAL EDUCATION?

A completely acceptable definition of environmental education has not yet been found, for environmental education is a relatively new activity still undergoing important developments in its practical application and theoretical foundation. Bogan (1973) utilized two working definitions that taken together, reflect the consensus established among many educators, ecologists, environmentalists, and other citizens concerning the basic aspects of environmental education. The first definition emphasized process and theory:

Environmental education is the process that fosters greater understanding of society's environmental problems and also the processes of environmental problem-solving and decision-making. This is accomplished by teaching the ecological relationships and principles that underlie these problems and showing the nature of the possible alternative approaches and solutions. (p. 1)

This definition suggested that environmental education is interdisciplinary and multidisciplinary. Environmental education utilizes at least four broad areas: the total environment and its problems; ecological principles, relationships, and concepts; the entire educational system; and most of the traditional disciplines, from chemistry, physics, and biology to sociology, economics, psychology, and the arts. Environmental education deals with problems that man needs to understand but that he can not fully understand through the approach of any single traditional discipline.

The second definition referred to by Bogan emphasized content and purposes:

The term environmental education means the educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment. (from the Environment Education Act of 1970) (p. 2)

The definition of environment is a most important concept in this definition of environmental education. Environmental education can no longer be assumed to imply only endangered species or walks in the wilderness; environmental education includes something far more encompassing. Environmental education is the process of inquiry into both specific and general environmental implications of human activities viewed from the perspective of social needs and values as they relate to general public policy.

GOALS OF ENVIRONMENTAL EDUCATION

Environmental education and related programs now attract more attention than ever before according to Hendee (1972). He suggested that environmental educators should rejoice at the new importance and recognition of their field and attempt to capitalize on their current popularity. But at the same time, Hendee suggested that a critical eye should be directed at the traditional approaches. The common goal of environmental education should be to

bring about informed environmental policies throughout society. According to Hendee, three program objectives to accomplish this were:

1. to transmit complete and factual knowledge to the public about the alternative environmental consequences of existing and proposed societal activity,
2. to encourage throughout society a perspective and attitude of informed awareness and concern about environmental degradation, and
3. to make informed, concerned persons aware of how they can constructively influence social environmental policy. (p. 20)

Environmental education programs, in other words, should aim first at transmitting knowledge and facts and, subordinate to that, at changing attitudes, values, and cultural perspectives toward the environment and stimulating social action. Hendee suggested that much of the literature in environmental education abounds with useless digressions in defining differences between specific programs, rather than seeking unification of their common objectives. Separate identities were jealously sought and preserved for the terms outdoor education, environmental education, conservation education, resource use education, natural science education, nature education, and camping education.

The placing of environmental facts and knowledge ahead of cultivating favorable environmental attitudes in Hendee's program objectives has merit. Personal freedom of opinion is of utmost importance and if environmental education

placed emphasis upon cultivating attitudes at the expense of full information about the alternative environmental consequences of alternate societal actions, then it would become a repressive influence. When dealing with population control, it is knowledge about birth control techniques, their feasibility, the alternate consequences to population impacts on the environment that must be provided and not programmed conditioning to cultivate a particular attitude toward the issue.

Students are willing and eager to attend to problems encountered in their environment as they engage in the process of identifying and understanding their relationship to the physical and social world. If curriculum development projects provide viable conceptual frameworks, are action-oriented, and focus on the development of inquiry and decision-making skills, they will serve as excellent catalysts for encouraging students to work toward the environmental quality necessary for a productive and satisfying life.

SUMMARY

In summary, education today is responsible for shaping individuals to respond to the needs of society in the future. A clean environment in which to live is one of these future needs. Environmental education programs must be incorporated into our educational system to help achieve the

attitudes, beliefs, and values necessary to promote this quality environment.

ATTITUDES

In order to provide answers to questions about attitude change, it is necessary to define attitude. This section of the literature review will clarify the definition of the term attitude and the closely related term value. Consideration will also be given to the modification of attitudes.

DEFINING ATTITUDES

The numerous definitions of attitude in the literature suggest that attitudes have at least two factors in common. To begin with, attitude is an inferred entity, something which is not measured directly but rather deduced from other observable data. Secondly, attitudes imply some sort of tendency to act toward the object toward which they are held. Together with external factors in the person's environment, they co-determine the manner in which the individual perceives and reacts toward the world.

Krech and Crutchfield (1948) viewed attitudes as:

An enduring organization of motivational, emotional, perceptual and cognitive processes with respect to some aspect of the individuals world. (p. 152)

Allport (1935) concluded in his review:

An attitude is a mental and neural state of readiness exerting a directive influence upon the individual's response to all subjects and situations with which it is related. (p. 810)

Attitudes connote neuropsychic states of readiness for mental and physical activity. In other words, an attitude is an acquired readiness directing responses to classes of objects. As such, it is inferred from certain consistencies in behavior patterns.

For purposes of this study, attitude is defined as individual mental processes which determine both the actual and potential responses of each person in the social world. Since the attitude is always directed toward an object, it is defined as a state of mind of the individual toward a value.

Values are usually social in nature, meaning that they are objects of common regard on the part of socialized men. Love of money, and desire for fame are two examples of typical attitudes. It follows that money and fame are values. A social value is defined as any datum having an empirical content accessible to the members of some social group and a meaning with regard to which it is or may be an object of activity. There are, to be sure, numerous attitudes corresponding to every social value. There are also numerous possible values for any single attitude. Social attitudes were created by the attitudes which were common to many men, but these attitudes themselves depended upon pre-existing social values. Social attitudes are

individual attitudes directed toward social objects. Collective attitudes are individual attitudes so strongly interconditioned by collective contact that they become highly standardized and uniform within any group. Public opinion is the highest form of collective attitudes.

The term value may refer to the things people hold to be of worth or it may refer to the standards by which people judge the worth of things. According to Coombs (1971), the phrase 'value judgements' was a better one to use than the term value. Value judgements were those judgements which rated things with respect to their worth. The following statement expressed a value judgement: Ecology is a good course. Ecology is considered as the value object. Almost any sort of thing could be a value object. Teachers have evaluated courses, people, events, physical objects, institutions, and actions. The word good is an evaluative term because it is commonly used to rate something with respect to its worth. Value judgements contain positive, negative, or neutral evaluations. Evaluation terms vary with respect to how much they tell us about the value object. Terms such as good or bad tell us nothing definite about the characteristics of the value object. Value objects have been assessed from different points of view, some of the most important being aesthetic, moral, or economic.

The following statement would represent a statement of attitude: I approve of the ecology course. To determine

acceptability of the value judgement, it would be necessary to gather information about the ecology course and its implications. Acceptance of the attitude statement is not decided in the same way. Rather, it would be necessary to assure ourselves that the speaker has not deceived us about his attitude or feeling toward the ecology course. Individuals have given reasons to justify attitudes. To justify approval of the ecology course, an individual gave as a reason the fact that it increased understanding of the interrelationships between man and nature. This reason was not meant merely to explain why he had the attitude, but to show that the attitude was acceptable. A clear distinction must be made between relevant justifying reasons and illegitimate attempts to persuade.

Value judgements are meant to express justifiable attitudes and they are meant to have legitimate authority over the conduct and attitude of others. When an individual states that ecology is a good course, it not only implies that he approves of the ecology course and that he wants others to approve of it, it also implies that there are compelling reasons for anyone adopting a positive attitude toward the ecology course.

A difficult and much debated question has dealt with aspects of the relationship between intergroup attitudes and actual intergroup behavior. Simply stated, the question asked to what extent behavior is determined by variables

within a person, of which attitudes were one example, and to what extent behavior was determined by the external factors in the individual's social and physical environments. Both factors were important. Lewin's (1935) classical formula: $B = f(P, E)$, suggested that Behavior was a function of the Person and the Environment, long since a truism in the behavioral sciences. It was merely a matter of the relative emphasis placed on the two factors.

Attitudes have served both personal and social functions. They have provided ready-made bases for evaluating and responding to environmental events. They have served a protective function. Socially, they insured a sufficient uniformity of group response necessary to a stable social order. Each group, each society, has set standards for its fellow members to follow. Each has taught what to value, whom to admire and emulate, and whom to dislike and avoid. These established prejudgements served as a basis for collective response.

SUMMARY

In attempting to define the word attitude, it may be assumed that there is a kind of feeling for the word while noting that its full meaning is not revealed until it is attached to the entity towards which the attitude is directed. Attitude toward the job, toward an ethnic group, or toward some movie star, all have fairly well understood

meanings even though one may have struggled to define the word attitude by itself. Attitudes are variables, that is, something on which people differ from one another, and therefore amenable to measurement.

MODIFICATION OF ATTITUDES

Once attitudes are acquired, the question arises as to the conditions which cause them to change. The attitude change process is a very important part of every human being's life. Every one of us, in some way, has attempted to influence someone's attitude or have been influenced by someone who was attempting to change our attitudes. In general, the influences operating are the social, group, and personality factors.

An attitude characteristically provokes behavior that is favorable or unfavorable toward an object or class of objects with which it is related. This double polarity in the direction of attitudes has often been regarded as their most distinctive feature. Thurstone (1932) defined attitude as being the effect for or against a psychological object. It had a central place in a definition by Bogardus (1931):

An attitude is a tendency to act toward or against some environmental factor which becomes thereby a positive or negative value. (p. 444)

Sarnoff and Katz (1954) pointed out that any attitude may be regarded as serving one or more of three major motivational determinants: reality testing, reward and

punishment, and ego defense. In considering the probable effectiveness of any technique of attitude change, it was necessary to know what particular motivational source was supporting the attitudes under investigation. It was apparent that attitudes serving the function of reality testing are most likely to be affected by informational approaches directed at cognitive reorganization, whereas those associated with motivations of reward and punishment were most likely to respond to social sanctions. On the other hand, in seeking to change attitudes which had an ego defensive function, emotional resistance was likely to be encountered, and the personality dynamics involved had to be taken into consideration.

Katz and Stotland (1959) summarized the significance of research for any program of attitude change as follows:

Our major thesis has been that since attitudes serve different needs and functions, they can be changed only through relating the change procedure to the appropriate motive pattern. This calls for separating subjects on the basis of their needs and values to begin with and making differential predictions for various change methods. Thus far the greater bulk of the research on attitude change has started with the attitude itself and has assumed a common motive pattern for all people. (p. 275)

Janis and Hovland (1959) suggested there were individual differences in susceptibility to attitude change. They suggested that there existed a factor of 'general persuasibility' described as a predispositional factor reflecting an individual's susceptibility to influence from the many different sources, on a wide variety of

topics, and irrespective of the media employed. Such a factor as general persuasibility probably exists, although there are certain limitations to its generality imposed by the experimental procedures employed. Persuasibility exists as a content free factor, that is, it exists independently of the subject matter or appeals presented in any particular communication.

Newcomb (1962) suggested that peer group effects were very important and had to be considered in studying attitude and value changes. Studies of the influence of social pressure on attitude change had also shown evidence for the importance of individual differences. Asch (1956) had shown in his studies on independence and conformity that individual differences played an important role.

According to Knowlton (1963), if a person was strongly in favor of something, it was likely, though far from inevitable, that that person possessed a good bit of knowledge about that something. If, on the other hand, he was strongly unfavorable, the prediction concerning the degree of knowledge was more doubtful. This was because there are at least two prominent opposed causes for negative attitudes, either of which may have caused the negative attitude. The recipient may have possessed a great deal of knowledge and in the light of this knowledge, judged the object of the attitude to have harmful consequences of some sort. This same attitude may also have been caused

by the lack of knowledge. This may have been due to fear of the unknown, or its reciprocal, the need for meaning.

For the respondent whose attitude is measured as being in the center of an attitudinal continuum (the neutral position), the first presumption is that he has no attitude toward the object under consideration. His view, being neither negative nor positive, would be regarded as a belief, but not an attitude. If it is known that such a neutral respondent had considerable knowledge of the attitude object, it would be safe to assume that he deemed the object to be of little personal consequence. If this respondent lacks knowledge of the object, this object, while of little importance at the time, is of potential importance, and increased knowledge may actualize this potential.

In general, as one's knowledge of an object increases, attitudes toward that object should become more positive if the object is perceived as having a reward associated with it, and more negative if the object is perceived as having a punishment associated with it. Attitude should remain unchanged if the object is perceived as irrelevant to the person's needs, or if it is perceived to have both positive and negative consequences.

Although factors on individual differences and personality traits are extremely important, educators must consider the influence of the group upon attitude change.

The individual cannot be considered in a vacuum, apart from the social influences of his environment. Classical studies on the influence of the group situation upon the formation and change of attitudes and norms were carried out by Sherif (1937). Under the individual experimental conditions, the subject tended to establish a standard or norm which was peculiar to the individual. Under the group situation, whereby the individual heard the orally given judgements of the other members of the group, a group norm tended to become established within a short period of time, to which the individual members of the group conformed in their judgements.

The work of Asch (1951), (1952), provided compelling evidence for the influence of the group upon the individuals attitude. Experimental results suggested that a large percentage of individuals yielded to the pressure of the unanimous majority even though this majority was very clearly in error. In other words, the pressure of majority opinion was so great that the individual responded with judgements contrary to that which he felt to be correct.

If the effect of such experimentally created groups, i.e. persons who were unknown to the subject previously and who were of no particular significance to him, upon the norms and attitude of the individual was so compelling, how much more compelling must the effect on the individual be of groups who have very definite emotional and practical

significance for him? Logically, it might be expected that the effect of such reference groups upon the individual will be even greater.

Parents, older siblings, and friends not only provide models, but possess the added power of authority. Behavior in early childhood and the acquisition of attitudes is dominated by parental action. In a survey of 3000 children in New York, Martin (1952) found that favorable attitudes in children were associated with parents who accepted children, helped them, participated with them in some activities, and exhibited cooperative attitudes with each other. Rejection, deprivation, overprotection, and exploitation contributed to negative attitudes.

In the American culture, the impact of the nuclear family on developing attitudes is heightened by the intensity of the emotional relationships existing within the small family group. Groups play a key role in mediating the reciprocal needs of society and individuals. The more ambiguous the situation, the younger the subject, the less crucial the issue, and the greater the consensus of opinion, the greater the willingness of individuals to ignore their own perceptions and conform to the group judgement. The closer the issue to deep seated beliefs or the presence of some support, the more individuals stand by their judgement.

The most widely used methods for the modification of attitudes have been films, group discussions, visitations,

lectures, reading materials, or any combination of these. The effectiveness of instruction in modifying attitudes is a function of the effort put forth by the instructor to modify attitudes in a given direction. Longstreet (1935) conducted experiments where a special effort was made by teachers to modify attitudes and significant changes were obtained.

The teaching of attitudes necessitates a concern for the affective correlates of learning. Identification with the teacher or other persons as a favored model has facilitated the acquisition of attitudes held by that person and conversely, a rejection of a person has been accompanied by a rejection of his attitudes according to Rosekrans (1967).

Nunnally (1968) suggested that pleasant consequences in the form of rewards has lead to favorable attitudes whereas unpleasant consequences, in the form of annoyances or punishments, has lead to unfavorable attitudes.

According to Bossart and Di Vesta (1966), perhaps the most potent of techniques for influencing attitudes has been that of verbal communication. The use of one adjective over another to describe an attitude object (person or group), has made the difference between the pupil's liking or disliking that object.

Garry and Kingsley (1970) suggested that teacher influence was greater with younger children, but with adolescents, the influence of adults, including that of teachers, waned relative to the power of the peer group in shaping values.

In addition to the social influences in the formation of attitudes, a variety of kinds of individual experience and personal events have served as predisposing or formative conditions in the development of or changing of attitudes. Individuals engage in a continuous stream of experiences, some of which have had the potential for initiating or changing attitudes.

The sex of an individual, his ordinal position in the family, and personality characteristics have related to certain attitudes. Scheidel (1963) and Arrowood and Amoroso (1965) pointed out that both first born children and women tend to conform to group opinion or be more persuasible than their opposites. In a small sample of college students, Stock (1949) found those holding negative feelings toward themselves inclined to hold negative feelings toward others, and the feelings towards others grew positive as the student's self-concept improved. Thus, attitude formation was not entirely the absorption of social prescription, but the interaction of personality with environmental events. Attitudes were often traceable to some strong emotional experience or to incidents or associations of a definitely pleasant or unpleasant nature.

There is difficulty in applying standards when evaluating in the affective domain. While there may be only one right type of answer or achievement in the cognitive domain, there may be many behaviors equally correct in

achieving an objective in the affective domain. Stanley and Hopkins (1972) concluded:

The correct answer to an affective question depends on the person queried; the correct answer to a cognitive question is the same for all respondents. (p. 284)

With some affective objectives, the right answer can be judged only in terms of the criteria which the student sets for himself.

A problem that is general to most affective measures is that one can usually fake in either direction. If the assessment is to be valid, it must be obtained in such a way that there was no incentive to be untruthful. Anonymity is the key to valid attitude assessment of feeling in any situation in which the subject was to be rewarded or punished for his responses. When the identity of the subject was necessary, an honest sharing of one's values, attitudes and feelings can be expected only when a deep level of rapport and trust has been established between the individual and the examiner. This was graphically illustrated in a study by Cronbach (1970).

The giving of socially desirable responses on a self-report inventory does not necessarily indicate deliberate deception by the respondent, but may be an unconscious tendency to put up a good front. A common adjustment phenomenon in human behavior is the tendency to want to like what we see when we look at ourselves. Human defense mechanisms have cushioned failures, minimized faults, and

maximized virtues so the individual can maintain a sense of personal worth. When asked questions about oneself, the validity of the responses are vulnerable to the distortion of self-deception.

Where direct observation of behavior was possible, educators have preferred that method of study. Because of the almost impossible task of observing numerous classes of students on their environmental behavior, educators have turned to other measurements as indicators of their attitude. La Piere (1934) demonstrated empirically that attitudes and behavior need not be in accordance with one another, indeed, that they may even be widely disparate.

Even though a student possessed the ability within the cognitive and psychomotor domains to do some task, his willingness to do a given task comes from the affective domain. Ramsey and Howe (1969) summarized current research in instructional procedures in secondary science as follows:

A student's attitude toward science may well be more important than his understandings of science since his attitudes determine how he will use his knowledge. For this reason, the development of attitudes as a part of science instruction is an area requiring increasing research. (p. 62)

Mager (1968) indicated that a major objective in any educational situation was that of having the student leave a teacher's influence with as favorable an attitude toward the subject as possible. Mager suggested that a favorable

attitude helped maximize the possibility that the student willingly learnt more about what he had been taught.

SUMMARY

Because attitudes influence the future behavior of the pupil, society has been particularly concerned with certain of them in the acculturation process. Of particular importance were the attitudes and values related to the maintenance of health, interpersonal relationships, democratic institutions, spare time interests, and attitudes toward self. Many different, even contradictory attitudes, have existed side by side. This present study is particularly interested in examining student attitudes toward the environment and problems relating to the environment.

Humans have adopted only those attitudes and values which help achieve desired ends and which have been normally sanctioned by the community. In addition, the degree and extent to which attitudes and values were modifiable depended upon the nature of the experience, the type of contact, the personality makeup of the individual, the group's approval of new attitudes, and the subject's perception of the outcome. The many experimental findings which related to the theory of attitude change cannot be discussed under any one of the above topics, since they deal primarily with the manner in which these various factors are inter-related.

ENVIRONMENTAL EDUCATION
AND RELATED ATTITUDINAL MEASUREMENT

Thus far, this review of the literature has considered environmental education and some of the pertinent happenings during the past few years. Consideration has also been given to attitudes, what they are, and how they may be modified. It is fitting that this review of the literature be completed with a look at specific attempts by educators to evaluate attitude change after having completed some form of environmental education.

INTRODUCTION

Unless the schools shape favorable attitudes, especially in young people, it may be that the current talk about the environment and educators efforts toward new curriculum in environmental education will all be meaningless. The shaping of favorable attitudes into an environmental ethic might well be the greatest value of the new environmental education. Unless people have the proper understanding and appreciation for the environment, the will to protect and use wisely cannot be created and those concerned stand to lose the very things they hope to maintain.

After an exhaustive review of the pertinent literature, Gillenwater (1969) concluded that almost no meaningful research existed in the area of education and the environment.

According to Abram and Rosinger (1972), little has been done to assess the impact of the deteriorating quality of the physical environment on human attitudes and behaviors. Since that time however, numerous articles have appeared on a wide variety of educational environmental interests, including outcomes of camping experiences, outcomes of numerous environmental courses of study, water and air pollution opinion polls, and some on wildlife conservation. James and others (1967) on conservation concepts, Stronck (1971) on population problems, and Swan (1971) on attitudes, knowledge and life style, represented some of the early studies relating to affective objectives. These studies, like many other more recent ones, were restricted to the study of specific types of environmental concerns. None of these studies obtained responses over a broad range of environmental concerns, nor was there a concerted effort to describe specifically the kind of response.

Numerous incentive programs have been employed to motivate ecological activity and this activity was quite popular and fashionable. Citizen groups, Boy Scouts, and classes of school children around the country took up the battle against environmental pollution. All this activity was of value and it indicated the acceptance of what knowledgeable environmentalists have told us over the years. Ecological activity helped soothe the guilty conscience and promised ecological salvation.

Herrscher (1973) seemed concerned that this activity was superficial. Changes in daily habits were beneficial for the present, but in the long run, mankind needed a basic change of attitude in his relationship to the environment. To most of mankind, these new attitudes were quite contrary to the ingrained way of viewing himself and the world he lived in, and these attitudes, therefore, seemed unacceptable, if not preposterous.

Shaver (1972) suggested that in a free society, a basic premise was that ideas and interests must be allowed to compete. To be consistent, schooling for such a society must involve the opportunity to confront alternatives, to weigh them rationally, and to carry out decisions. The task of the teacher concerned with environmental education in a citizenship education context was to provide the intellectual orientations and skills and the open atmosphere which allowed for intelligent, as well as heated and loud, confrontation. In this way, the experiences of schooling merged into the realities of political decision making, rather than standing delineated as a fragment of life which called for the patient marking of time until one became an adult, a person deserving of commitment and action.

Tichenor and others (1971) expressed the apprehension that if environmental concerns follow the pattern of other public issues, then it might well be possible that the current, and apparent, consensus about the importance of

the issue may give way to some social conflicts of a type which have not been widely experienced in the past. American public opinion has rarely been characterized by widespread acceptance of any particular ideology.

EVALUATION OF ENVIRONMENTAL ATTITUDES

This section examines numerous surveys, questionnaires, and environmental education course evaluations that have been completed.

The results of a survey carried out by Simon (1971) to determine how interested, knowledgeable, and concerned the American public was concerning pollution and population problems, suggested an interesting concept. People thought air and water problems existed, but that these problems were not related to the increasing population nor did they believe that 'people' were the prime source of pollution.

Another survey conducted by Murch (1971) was designed to discover how aware people were about environmental problems, who or what they felt was responsible for them, and how they might be solved. The sample surveyed felt that environmental problems existed, but thought that the problems were more severe the further they were from the individual's neighbourhood. Most respondents believed that solutions could be found to the existing environmental problems but were undecided or vague as to what specifically the solution would be.

Conclusions from both of the above studies pointed to a need for proposals that properly informed the citizen and showed him just how he could become engaged in the solution of environmental problems in the community.

A task that faced educators in the area of producing attitude change was the determination of the relationships among positive ecological attitudes. Is the attitude of favoring large water pollution penalties a prerequisite for, a sufficient condition for, or independent of the attitude of prohibiting garbage burning? If this question could be answered, it would help educators decide upon which attitudes should be produced first, which attitudes second, and so on. Effective planning would then precede any program of attitude modification designed for the student.

A study by Bart (1972) revealed the hierarchical order among a set of environmentally related attitudes regarding animals. Bart (1972) in a later study, demonstrated a hierarchy among attitudes toward the environment. Bart's results indicated that sequencing aids cognitive learning and attitude development.

In an attempt to remedy a deficiency of early attitudinal surveys, that being a restriction to one environmental concern, Doran, Guerin and Sarnowski (1974) chose as a frame of reference for their study, the following: air, water, noise, and land pollution, and a miscellaneous

category (such things as over-population). Rather than describing environmental problems via verbal statements, their study presented twenty scenes via 35 mm slides from the local environment. The junior high school age was chosen for this study. Results indicated that some difficulty on the part of the students in understanding the significance of the scenes used was encountered. The authors concluded that selection of scenes that more explicitly portray the intended environmental situation be used. They also suggested that slides have more relevance when they are from the student's community. Subjective comments from the students suggested that as individuals, they could not do much. They were too young.

These student responses were quite in order. The high school age appears to be a much better age to come to grips with problems relating to environmental matters where the student is that much closer to being able to do something individually as well as realizing that he is not too young to start being heard, and thus influence other people.

Two aspects of environmental education were evaluated in a study completed by Hounshell and Liggett (1973). These were knowledge about the environment and man's relationships to it, and attitude toward the environment. Sixth grade students were utilized as the sample. Sixty-five items comprised the instrument of evaluation with thirty five measuring knowledge and thirty items measuring attitudes. On the attitude scale, the higher the score, the

more positive or constructive the student's attitudes were judged to be toward the environment. Results revealed that the girls scored significantly higher than the boys (at the .001 level) on the attitude subtest whereas there was no significant differences between the sexes on the knowledge subtest. No explanations were offered for this difference in attitudes, although it was implied that more work was needed to motivate the males to become environmentally involved. The study also concluded that the correlation between the individual's knowledge and his positive attitude was extremely high. Hounshell and Liggett also found no significant difference in the attitude toward the environment between urban and rural students, but a significant difference did appear on the knowledge subtest with urban students being more knowledgeable.

Cohen and Hollingsworth (1973) in a study that dealt with environmental beliefs and educational ability, grouped individual high school students according to how well they did on an environmental knowledge test. This served as the basis for what they termed high environmental content and low environmental content groups. The attitudes of these two groups were then compared. Of interest at this point was the fact that in their high environmental content group, there was significantly more males (50 out of 84) and in the low environmental content group, there was a significantly larger number of females (69 out of 116).

Data from this study indicated a relationship between environmental information and environmental attitude.

The two studies mentioned above suggest that there was a difference between male and female when it came to attitude change. As part of this present study, this difference will be examined.

A study comparing the effect of an outdoor environmental education program to one that was conducted completely indoors was carried out by Howie (1974). Pretests were administered in the fall of 1971 to a sample of fifth grade students. Post test was an instrument developed specifically for the study since there were not any previously developed instruments available. It was administered in the spring of 1972, and was entitled 'The Environmental Resource Concepts and Applications Survey'.

Results of this survey indicated that in every case, the students who received one of the environmental education treatment activities scored significantly higher than the control group that received no environmental education treatment. The fact that a significant difference did occur between treatment and control groups indicated that environmental education did lend itself to ready application. According to Howie, one only needed to plant the seed of opportunity and the students appeared to sprout into involved learners.

A project was designed by Howell and Warmbrod (1974)

to evaluate the student manual 'Introduction to Environmental Protection' by Howell and Farrington (1972) in terms of its effectiveness in developing students' attitudes toward the protection of the environment. The student manual was developed as a part of the instructional materials to be used in training eleventh and twelfth grade high school students for employment in the areas of water treatment, wastewater treatment, and air pollution control. The manual was designed to provide students with knowledge of some of the existing environmental problems and their possible solutions as well as the impact that an individual could have on the environment. The manual could be used separately in other high school courses. It included the following topics: Our Complicated Environment, Our Lakes and Rivers, Our Refuse Problem, Population, Chemicals in Our Environment, Air and Water Pollution, Vanishing Wildlife, and Minerals -How Limited Are They?.

The experimental group consisted of classes using the student manual while the control group were classes not using the student manual for a unit in environmental protection. A six week time period was utilized in teaching the unit. An attitude inventory developed by Howell (1972) was used to measure the attitudes of students toward protection of the environment.

The results of Howell's and Warmbrod's study showed that the use of the student manual did not result in

significant differences in student attitudes when students using the manual were compared with students taught environmental protection without the use of the manual. Students in science classes using the student manual achieved higher attitude scores than students in vocational agriculture classes using the student manual.

Howell and Warmbrod investigated relationships between selected assigned independent variables and the post test attitude inventory scores. They found a positive relationship between the number of professional environmental education courses completed by the instructor and the students post test scores on the attitude inventory. There was no relationship between the other aspects they considered.

In an attempt to explain why students in science classes achieved higher attitude scores than did students in vocational agriculture classes when both groups used the student manual, Howell and Warmbrod suggested that the student manual was not used as it was designed to be used with the vocational agriculture classes. Somehow, the background of the science teachers or their interest in environmental protection allowed them to make fuller use of the student manual.

In another research project, an instrument to measure attitude change was developed by Hamilton and Asche (1974). The test instrument referred to as 'A Scale for Measuring Attitudes Toward Environmental Education', was designed to

discover whether a significant change in high school students attitudes, following an intensive environmental education unit, did actually occur. The environmental unit was taught for seven days. Teachers cooperating in the study were given an in-service workshop prior to the experimental study.

Experimental classes received the environmental unit while control classes did not study the unit. Hamilton and Asche found no significant relationships between any of their control or experimental classes. They found, however, that when comparing the experimental group with the control group, there was an effect in the positive direction for the experimental group.

One main recommendation from this experiment was that the positive effect found indicated the need for a longer experimental trial. After a period of seven days, any introductory unit in environmental education has barely begun consideration of value-laden issues. There was simply insufficient time for the student to examine his own attitudes, think about them, and change in any desired direction.

Two reports, one by Cohen (1973) and one by Cohen and Hollingsworth (1973), discussed a study that compared the environmental attitudes of two groups of high school students who had different amounts of environmental information. One difference between the high and low environment

content groups in their attitudinal responses was the type of response chosen. The high group selected 'strongly agree or strongly disagree' or 'agree or disagree' more often than the low group. The low group frequently selected 'no comment'.

Interpretation of the data provided interesting ideas with respect to the question of whether the choice a person made was a value which served as a guiding force that affected the choices he made in everyday life or simply an attitude, feeling, or belief which was no more than his favorable or unfavorable expression toward a class of objects or events. The group with more information was more willing to express their attitude. It is possible that the willingness to express an attitude was the more important difference between the two groups. It may be related to their attitude formation. Future studies need to approach some attitudes to examine the reason for their formation. Future studies must be designed to consider the processing ability of students. Only in this manner can environmental education courses be designed which can help students understand the information about, and comprehend the range and complexity of our environment.

In response to the expressed need for assessment techniques, Bowman (1974) undertook the task of developing an instrument that reliably assessed attitudes toward environmental decision making; more specifically, an instrument

which assessed attitudes of college students as to whether the individual or society should be responsible for environmental decision making. An instrument was developed and was used in a pilot study with college students during the spring of 1972. An item analysis yielded statistics which indicated that the instrument was measuring on the proposed dimensions.

Bowman then utilized a pretest-post test control group design to conduct the experiment. The control group consisted of two sections of an educational methods course and the experimental group consisted of nine sections of an introductory environmental management course. The pretest was given the day classes began and the post test was part of their final examination at the end of their ten week quarter.

The results indicated that attitudes of students toward determinants of environmental issues, as measured by the instrument developed for the study, did change significantly as a result of an introductory environmental management course. No significant difference existed on the mean scores of the pretest among any of the sections included in either the experimental group or the control group. A significant difference existed on post test mean scores between the experimental and the control group. Further analysis of the data indicated that the attitudes toward determinants of environmental issues held by the

students in the experimental group moved toward favoring society as the determinant of environmental issues.

One implication set forth from Bowman's study was the possibility that the nature of environmental education placed certain restrictions on the number of attitudes feasibly assessed on any one instrument. This suggestion of restriction implied that experimentation in the environmental attitudinal realm needed to be extended beyond a single study.

To demonstrate that an environmental education program results in positive changes in what students do, not only in what they wrote on tests, was the aim of a study carried out by Asch and Shore (1975). Elementary students who had experienced an educational program in environmental conservation could demonstrate actual behavior in the field which was helpful to the environment and which was absent in students who were not exposed to the program in environmental conservation. Acts that showed that care was being practiced, not harming healthy and valuable trees, indicated that the individual was practicing conservation. The purpose of the study was to offer environmental educators an evaluation procedure which did not rely on measures of attitude and abstract knowledge. A criticism raised by Asch and Shore, which related to the numerous articles on environmental and outdoor education, particularly ones that concerned the measuring of attitudes,

was that they depended on paper and pencil criterion tests. A key point in this study was that the subjects were actually placed in a natural setting and their behavior observed and recorded.

Asch and Shore concluded that children exposed to a formal program of environmental education demonstrated, in a natural setting, more conservation behavior than a control group, and less destructive behavior as well. Methodology in this study demonstrated that it was not necessary to rely only on attitude questionnaires to demonstrate the contribution that was made by an environmental education program. Measuring of actual behavior that environmental education programs were intended to influence was one important contribution of this particular study.

SUMMARY

Numerous attempts have been made to measure in the affective domain after some type of environmental studies or conservation education program, and these attempts have been made at all levels in the educational system. Most attitude scales were designed by the authors to fit a specific program or unit of experimental study.

SUMMARY

This chapter has dealt with environmental studies curriculum, attitudes, and the efforts of many individuals

to relate the aspects of attitudinal change after having completed environmentally oriented curriculum.

Attitudes were defined as the organization of several beliefs focused on a specific object or situation, pre-disposing one to respond in some preferential manner. Values had to do with specific modes of conduct that were personally and socially preferable to alternative modes of conduct. A value was a standard or criterion for guiding action, for developing and maintaining attitudes toward relevant objects and situations, for justifying one's own and other actions and attitudes, for morally judging self and others, and for comparing self with others.

Numerous environmental studies programs have appeared in the schools and colleges and with these programs many attempts to evaluate changes in attitude resulting from particular programs. The majority of these programs have dealt with a limited aspect of environmental studies and in most cases, the time allotment has been questioned as far as being sufficient time for change in attitude to actually occur. The majority of attitudinal scales that have been designed and tested are useful only for specific units of study and lack universal applicability to environmental studies courses.

CHAPTER III

THE STUDY

The purpose of this chapter is to outline the design and methods employed in this experimental study. Included will be definitions of terms used in the study, an outline of the Environmental Studies course, discussion of the Environmental Attitudinal Questionnaire used in the study, the experimental design employed in the study, the null hypotheses, and the statistical analysis applied to the scores obtained on the Environmental Attitudinal Questionnaire.

DEFINITIONS

Several terms require clarification in meaning as they apply to this study.

Environmental Studies course: a course designed under the aegis of Project Canada West, by the Canadian Environmental Concerns team of which the author was a member. Further description of this course appears later in this chapter.

Environmental Attitudinal Questionnaire: a Likert type attitude measuring scale consisting of twenty questions related to environmental matters, designed by the author and members of the curriculum development team. This questionnaire has undergone some revision which will

be described later in this chapter. A facsimile is in Appendix B.

Treatment Group: intact classes of grade XII biology students who participated in the pilot classes for the Environmental Studies course. Classes were selected from six schools in Manitoba.

Control Group: intact classes of grade XII physics students who were not involved in the Environmental Studies course but were from the same six schools as the treatment group. Grade XI biology classes were chosen as a control group at one school used in this study.

Attitude: a mental readiness or implicit predisposition which exerts some general and consistent influence on a fairly large class of evaluative responses.

LIMITATIONS

Limitations of this study were the result of numerous factors. These included the Hawthorne Effect, comparability of intervals on the Likert scale, teacher influence on student responses, factors external to the class activities, representativeness of the samples used, teacher values, and possible bias in the selection of the teachers.

The same attitudinal questionnaire was used in the pretest and post test, and due to a possible practice effect, may have imposed a limitation on this study.

The Likert type response scale used by the Environmental

Attitudinal Questionnaire may also be a limitation to this study. It was not possible to assume equal intervals between the scale values. The difference between uncertain and agree may be much more than the difference between agree and strongly agree. A Likert scale provides information on the ordering of the students attitudes on a continuum, but it does not indicate quantitatively how close or how far apart different attitudes might be.

Certain students, being aware that the instructor was evaluating attitudes toward the environment, and being aware that an attempt had been made to influence attitudes (treatment group), may have reacted in different ways. Students may have given the instructor what they thought he wanted to find, regardless of their true attitude. Prior to administration of the pretest and post test, it was pointed out to the students that their responses did not relate to the grade they would obtain in that course and that they should answer honestly.

On the other extreme, certain students may have resisted being 'guinea pigs' for some trial pilot materials and may have resisted any change in the desired direction. Their responses on the questionnaire may be completely opposite to their true attitudes concerning the environment.

Factors outside the school may have affected student learning about the environment. Television, printed materials, and family and friends influence environmental

attitudes. However, even though forces outside the school do influence attitudes about the environment, public schools can be the most important and effective instrument in the shaping of desirable convictions that the student will carry out in the world outside the school.

Subjects used in this study consisted of students in grade XI and XII in the province of Manitoba. A major limitation of this study may be the restricted use of generalizations to larger populations based on the sample of this study.

A further limitation may be imposed by the fact that the comparison is made between grade XII biology students (experimental) and grade XII physics students (control). Some grade XI biology students were also utilized as a control class.

Limitations may have resulted from uncontrolled variables related to the teachers selected for this study. Personal philosophy of education represents primarily an affective variable which may have tended to alter the curriculum. Few means exist which provide reliable data for evaluation or assessment of affective variables.

Another limitation may have been that the teachers selected to participate in this pilot study were from a group of volunteers who had responded to a province wide appeal by the author's curriculum development team to establish pilot programs in Environmental Studies as

developed through Project Canada West. A bias may be introduced here in that the willingness to accept an experimental pilot class may reflect a greater degree of teacher imagination, initiative, dedication, and/or flexibility.

ENVIRONMENTAL STUDIES COURSE

The Environmental Studies course, as developed by the Project Canada West curriculum development team, has three major sections: Ecology, Environmental Problems, and Environmental Management. A major objective of this course is to develop in the student a recognition of his interdependence with all of life and a recognition of his responsibility to maintain the environment in a manner fit for life and for living. This means an environment of beauty and bounty in which man lives in harmony with nature.

The Ecology unit, the first part of the Environmental Studies course, was designed to help the student understand how man fits into the biosphere. The student would become knowledgeable about the interrelated biophysical and socio-cultural environments of which man is a part. An understanding of basic chemistry, geology, physics and biology of the environment is essential.

The second unit in the Environmental Studies course, Environmental Problems, presents information in five major

areas: Air Pollution, Water Pollution, Solid Waste, Noise Pollution, and Urban Resources. A major objective of this unit was to develop in students an awareness and understanding of environmental problems and of possible solutions to these problems. In actual fact, the students were being prepared to make enlightened choices about activities affecting the environment that sustained them.

The third unit in the Environmental Studies course was Environmental Management. This unit had as a major objective the development of students who were knowledgeable of the various means by which they could play an effective role in maintaining or developing a quality environment and in achieving solutions to environmental problems. It was in this unit that the student became aware of the interdisciplinary nature of the Environmental Studies course. This unit strove for ecological, economic, social and political awareness. It involved problem solving skills and individual responsibility to prepare the student for responsible action and leadership in dealing with environmental problems now and in the future. This unit helped prepare the student for survival - survival of the human species.

ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

An initial survey of available questionnaires designed to measure attitudes in the area of environmental studies revealed no scales appropriate for the purpose of this

study. Numerous attitudinal instruments were available to measure student and adult values in relation to a variety of concepts, including attitudes toward wildlife, and attitudes toward the church. Some attitudinal scales were used to determine attitudes toward specific aspects of the environment such as water pollution, solid waste, population growth, and conservation of natural resources. The majority of the studies carried out used scales of opinion or belief and their major aims were to find out what the general public knew and what were its concerns regarding specific environmental issues.

An extensive collection of attitude scales constructed for a variety of purposes was assembled by Shaw and Wright (1967). This book provided a valuable source of items and scales for the research worker. Scale values, scoring procedures, reliability, and other technical information about each scale were also included. Few scales, however, were ready for use, especially for individual assessment. Although most of the scales were moderately reliable, little information about their validity had been accumulated. Normative data were also meager. Most attitude scales had to be regarded as experimental instruments.

Since the objective of this present study was to measure attitude change due to the Environmental Studies course designed by Project Canada West participants, and no existing instrument appeared to be appropriate, a special instrument was needed.

DESIGN OF ATTITUDINAL QUESTIONNAIRE

An attitudinal questionnaire, using the Likert method of summated ratings, was designed by members of the Project Canada West curriculum development team in March, 1973. Twenty eight items were initially developed and were based on the content of the Environmental Studies course which is located in a manual entitled 'Environmental Studies Teacher Resource Manual' by Watson and Phillips (1975), members of the curriculum development team. The manual outlines environmental studies content, teaching strategies, evaluation techniques, and numerous related environmental activities to help the teacher in a presentation of an Environmental Studies unit to students. The manual is not prescriptive in that the teacher must follow every activity but rather it leaves the choice of what activities the teacher chooses up to the individual teacher. For this reason, some classes may spend more time on ecological activities than pollution problems or resource management. Other classes may tend to spend more class time on controversial issues. This would, in part, depend on the teachers own interests and capabilities in the classroom.

Table I which follows suggests relationships between the original attitudinal questionnaire items and the pages in the Environmental Studies Teacher Resource Manual where content related to the questions is to be found. The initial Environmental Attitudinal Questionnaire is presented in Appendix A.

TABLE I

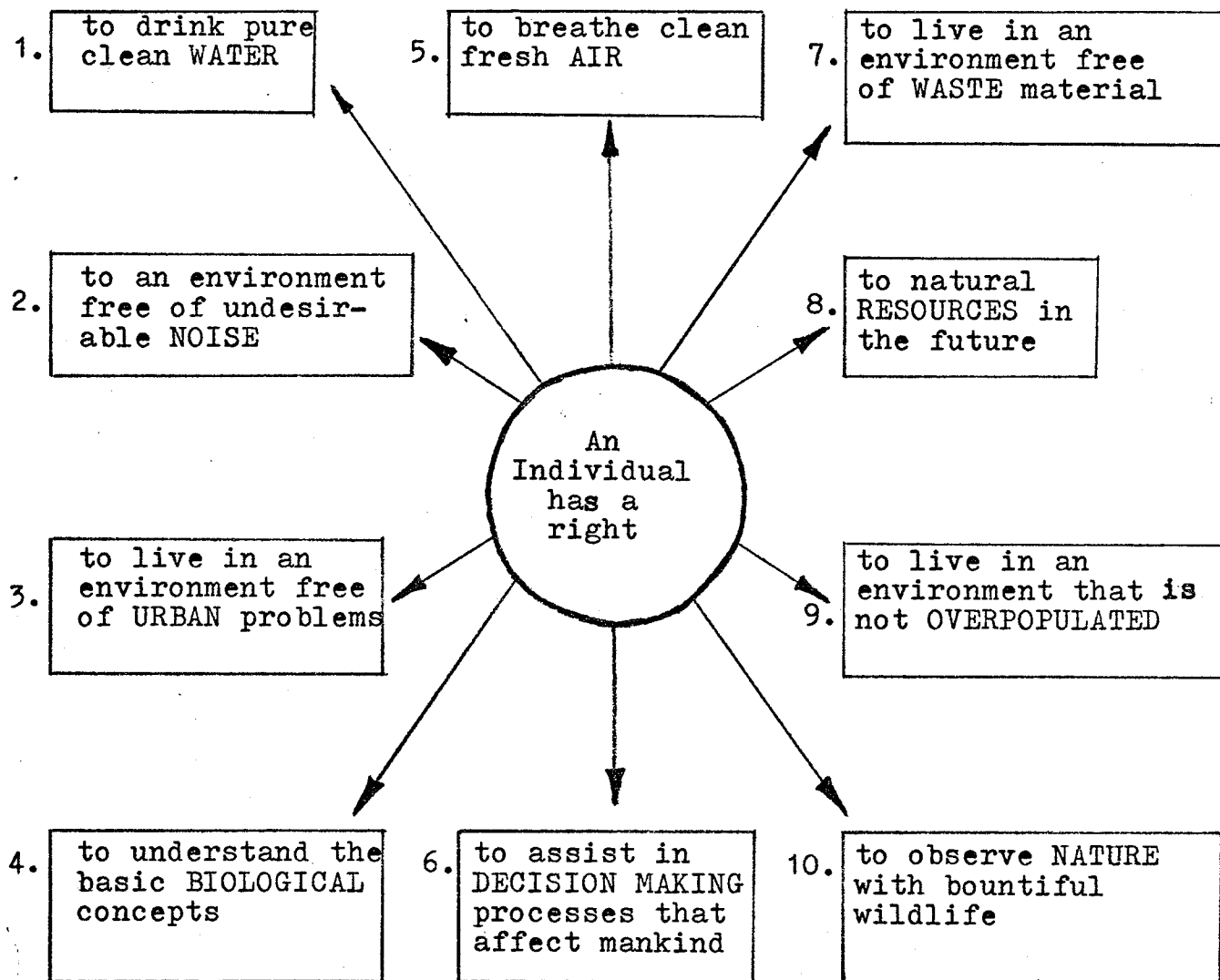
RELATIONSHIPS OF THE ENVIRONMENTAL STUDIES
COURSE CONTENT AND INDIVIDUAL RIGHTS TO THE
ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE ITEMS

Area of Environmental Concern	Questionnaire Items	Page Reference in Environmental Studies Manual	Relationship to Individual Rights (Figure I)
Ecology	4, 10, 16, 19, 28	7 - 36	4
Air Pollution	1, 8, 12, 15	39 - 68	5
Water Pollution	11, 14	70 - 101	1
Solid Waste	21, 24, 25, 26	104 - 126	7
Population	7	104 - 105	9
Urban Resources	23, 27	139 - 150	3
Management	2, 3, 5, 6, 9, 17, 18	153 - 157	6, 8, 10
General	13, 20, 22	-	2

Figure I, which follows, outlines the assumed rights that an individual has with respect to environmental concerns. These rights were discussed at different phases of the Environmental Studies course. It was an objective of the course to have the student realize that not only was it their right to these features, but it was their responsibility to ensure that society maintained these qualities in the environment to be shared by all.

Two basic assumptions were made concerning the design of the Environmental Attitudinal Questionnaire. It was

FIGURE I



assumed that subjective attitudes could be measured by a quantitative technique, and that each student's attitude could be represented by some numerical score. It was also assumed that a particular test item had the same meaning for all students and that a given response scored identically for every student making it. According to Zimbardo

and Ebbesen (1970), these assumptions may not be justified but as yet no measurement technique has been developed which does not include them.

The attitude of the student was measured when he indicated, on a five point scale, the extent of his agreement or disagreement with each item on the questionnaire. The sum of the individual ratings for all of the attitudinal items on the questionnaire was the attitude score for that student. An example of a single statement was as follows:

Industry alone should be responsible for the cost of pollution cleanup.

- | | |
|-----------------------|----------|
| (a) strongly disagree | Value: 5 |
| (b) disagree | Value: 4 |
| (c) uncertain | Value: 3 |
| (d) agree | Value: 2 |
| (e) strongly agree | Value: 1 |

A reverse rating statement would be as follows:

Non-returnable containers should be banned from the market.

- | | |
|-----------------------|----------|
| (a) strongly disagree | Value: 1 |
| (b) disagree | Value: 2 |
| (c) uncertain | Value: 3 |
| (d) agree | Value: 4 |
| (e) strongly agree | Value: 5 |

VALIDITY OF THE ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

An instrument has been said to be valid to the extent that it measured what it was supposed to measure.

In evaluating any test or instrument, validity is the most important single attribute. Nothing is to be gained by testing unless the test had some validity for

the use to be made of it. A questionnaire which had high validity for one purpose may have negligible or moderate validity for another.

The degree of validity that a test possesses for a specific purpose may be determined in a number of different ways, but all of these ways involve the use of some external criterion for what it is the test is supposed to measure.

A definition of what content the test was supposed to cover is sometimes used as the external criterion. The validity of the test, when this criterion was used, depended upon the degree to which the items of the test conformed to this definition of the content that the test was supposed to cover. The estimate of the validity of a test, that used a definition such as the external criterion, was based on careful analysis of the items of the test. If the items did not conform to this definition, the test was said to lack content validity. If the items did conform to this definition, the test was said to possess content validity. The Environmental Attitudinal Questionnaire possesses content validity as the items on the questionnaire conformed to the content of the Environmental Studies course.

Although, under certain conditions, the appearance of the items on the test may give a misleading picture of what it was the test was measuring, this type of validity is very basic for certain types of tests. Achievement tests, for

instance, were frequently evaluated on the basis of the degree to which they possessed content validity. The objectives of instruction for an area of curriculum which a test is intended provided the definition of what the test was supposed to measure. The content validity of the test, then, was a function of the degree to which the test items conformed to these objectives of instruction in the area involved.

Content validity is impermanent. The items or tasks in the test reflect social events, job descriptions, accepted beliefs about the world, decisions about what the curriculum should cover, and so on. These change with the passage of time, so that sooner or later the test would become unrepresentative. The prospective user must be satisfied that a second team following the specified procedure today would arrive at a test reasonably like the original.

Teachers cannot hope to perfect items to the point where a hypercritical reviewer cannot quibble over conceivable ambiguities or exceptions. Statements that dealt with complex subject matter were invariably open to some misinterpretation. Test items were especially difficult to write because they had to be so brief. Technical errors and ambiguities were not likely to impair test validity seriously unless they were sufficiently numerous to make a difference of several points in a person's score or unless items were to be interpreted one at a time.

If a test is to measure the attainment of certain goals of instruction, it is crucial that the items on the test require responses directly related to those goals. Although such rational means of establishing validity are appropriate for certain types of tests, the validity of many tests cannot be established in this fashion. Many tests must be validated using, as the external criterion, something other than a definition of what they are to measure. The reason for this is that the use to be made of the test determines the external criterion that should be used to determine its validity.

Face validity is one method to consider test or questionnaire validity. This means that the test looks as if it should be valid. A test has face validity when it appears to measure whatever the author has in mind, namely, what he thinks he is measuring. Good face validity helps to keep motivation high, for students are likely to try harder or answer honestly when the test seems reasonable. The Likert type scale for responding gives the most valid response as it is likely to be the respondent's snap answer, his first immediate reaction to the question, giving what is uppermost in his mind rather than a carefully considered written response. The first quick response is less subject to defensive bias and face-saving.

Rating scales for various hypothesized traits, neurotic inventories, attitude scales, and even intelligence

tests often claim little more than face validity. Judgments of face validity are very useful in helping an author decide whether the test items are relevant to some specific situation, for example, in environmental studies. Face validity is necessary too, when a decision as to what items are suitable for children and which are acceptable to adults has to be made. Face validity, however, should never be more than a first step in testing an item; it should not be the final word.

Teachers validate, not a test, but an interpretation of data that has arisen from a specific procedure. Since each application is based on a different interpretation, the evidence that justifies one application may have little relevance to the next. Because every interpretation has its own degree of validity, the simple conclusion that a particular test is valid can never be reached.

The casual phrase test validation seems to imply that the score one interprets comes from a naked instrument. The instrument, however, is only one element in a procedure, and a validation study examines the procedure as a whole. Every aspect of a setting in which a test is given and every detail of the procedure may have an influence on performance, and hence, on what is measured. Are the examiner's sex, status, and ethnic group the same as those of the examinee? Does the examiner put the examinee at ease? Does he suggest that the test will affect the examinee's

future, or did he explain that he was merely checking out the effectiveness of the instrument or of the method of instruction?

When observations at the end of instruction are used to determine how successful some educational activity has been, the interpretation embodies value judgements. If the values are not acceptable, the conclusion is not acceptable. The conclusion that the post test performance is satisfactory (or unsatisfactory) is warranted only if there is a match between the test content and educational aims. Hence, the validity of an evaluative conclusion depends on the value question: Did the questionnaire appraise the qualities I considered most important to teach? This question may elicit a positive answer from one educator and a negative one from another looking at the same tests.

The chief difficulty in assessing the validity of an attitudinal questionnaire is the lack of criteria. What is needed are groups of people with known attitude characteristics (criterion groups) so that educators can determine whether or not the questions discriminate between them. Occasionally such groups may be found, but unfortunately, people join the groups for many different motives, and there is no reason to suppose that group membership as a reflection of an inner attitude is any more valid than a set of attitude questions. At best, there will be a rough correspondence between the two indicators. Educators cannot

necessarily predict behavior from attitudes; nor are attitudes readily inferred from behavior with any validity, nor is behavior necessarily a more valid expression of an attitude than a verbal statement.

The validation of attitude scales is very difficult because of their abstract and indirect nature and because of the absence of suitable criteria. The literature contains but a small number of attempts at direct validation against a criterion, and whether the measures employed as criteria were themselves valid must be questioned. Such attempts included the use of essay type questions, experts judgements, membership in groups with known policies or interests, pictorial material, interviews and case studies, judgements by friends and co-workers, self ratings, political votes, and such overt behavior as church attendance. New scales are often correlated with older, well known scales which, however, may themselves be of questionable validity.

The Environmental Attitudinal Questionnaire utilizes a Likert type response. According to Anastasi (1968), the Likert procedure does not require the classification of items by a group of judges. According to Oppenheim (1966), Likert wanted to eliminate the need for judges by getting subjects in a trial sample to place themselves on an attitude continuum for each statement. Items are selected solely on the basis of the response of subjects to whom

they are administered in the course of developing the test. Internal consistency is often the only criterion for item selection, although external criterion may be employed when available.

With respect to Likert scale instruments for evaluating affective achievement, Mouly (1970) stated that:

Since validity is specific to a given situation, the legitimacy of the use that is made of a test cannot be considered apart from the purpose for which it is being used. (p. 117)

According to Oppenheim (1966):

At present, there is no way of making sure that an attitude scale is valid. (p. 133)

Validity, then, is not an either or proposition but rather a matter of amount or degree. The statement that 'Test A is a valid test' has little meaning. It has little meaning because no mention is made of the degree or amount of validity Test A has. In addition, no mention is made of the purpose for which the test is valid. A test, then, is not either valid or invalid, it is valid to some degree for some purpose.

Educational surveys are particularly versatile and practical in that they identify present conditions and point to present needs. They do not make decisions, but they provide the instructor with information on which to base sound decisions. Surveys are of the present, and if used simply for the purpose of seeing what has been attained to date, are of limited value. However, by providing the

basis for plans for improvement, they can be decidedly forward looking and practical.

INITIAL USE OF QUESTIONNAIRE

The Environmental Attitudinal Questionnaire was first used in April, 1973, with two high school biology classes in Manitoba that were using the pilot Environmental Studies course. The course was given over a period of ten weeks. The questionnaire was administered before and after the unit on Environmental Studies to the biology classes that completed the course (experimental group) and also to another biology class that did not participate in the Environmental Studies course (control group). The hypothesis that there would be an improvement in attitudes toward the environment in the experimental group was tested by determining whether any significant difference in pretest and post test scores had occurred. Attitude change was described in terms of positive or negative change in overall score on the Environmental Attitudinal Questionnaire.

TABLE II

COMPARISON OF PRETEST MEANS,

UNADJUSTED AND ADJUSTED POST TEST MEANS

Student Group	Number	Pretest Mean	Post Test Unadjusted Mean	Post Test Adjusted Mean	t Value
Experimental	25	87.92	95.24	96.04	4.01*
Control	26	90.46	90.15	89.39	

$P \leq .01$

Analysis of covariance was carried out on the student scores as pretest scores of the experimental and control groups were quite different. Post test scores for treatment students showed a major shift compared to almost no change for the student control group. Analysis of covariance yielded an F ratio significant at the .01 level of probability. Comparison of the adjusted means of the results of the questionnaire yielded a t test value of 4.01, significant at the .01 level of probability, which permitted the inference that the experimental student group rated higher on the Environmental Attitudinal Questionnaire than did the student control group.

The Environmental Attitudinal Questionnaire was also utilized for a course given at the Faculty of Education, University of Manitoba (81:518 Environmental Education in the School Curriculum) in the spring of 1973. This course was designed for teachers who would be dealing with environmental curriculum in their classrooms. Topics relating to Ecology, Environmental Problems, and Environmental Management, all found in the Environmental Studies course developed by Project Canada West participants, were included in this course. Much time was spent on controversial issues relating to the environment. Teachers in course 81: 518 constituted the experimental group while teachers enrolled in 59:501 Introduction to Educational Administration, were selected as a control group. The questionnaire

was administered at the beginning and at the end of the respective five week courses.

Pretest scores indicated that the experimental group of teachers were initially more knowledgeable about environmental issues, held stronger and more positive attitudes toward environmental problems than the control group of teachers. Post test scores showed a major shift in attitude for the teacher experimental group compared to a slight change for the teacher control group. Analysis of covariance yielded an F ratio significant at the .01 level of probability. Comparison of the adjusted means of the results of the attitudinal questionnaire yielded a t test value of 6.71, significant at the .01 level of probability which permitted the inference that the teacher experimental group rated higher on the Environmental Attitudinal Questionnaire than did the teacher control group.

TABLE III

COMPARISON OF PRETEST MEANS,

UNADJUSTED AND ADJUSTED POST TEST MEANS

Teacher Group	Number	Pretest Mean	Post Test Unadjusted Mean	Post Test Adjusted Mean	t value
Experimental	40	108.13	115.30	113.64	6.71*
Control	23	101.83	100.17	103.07	

$P \leq .01$

RELIABILITY OF THE ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

A measuring instrument is said to be reliable to the extent that it gives similar readings under similar conditions. A questionnaire cannot measure anything well unless it measures something consistently. A major dimension of reliability of a test is stability over time. By giving the same test to the same group at two different times, and by correlating scores made on first and second testings, a reliability coefficient is obtained. The numerical value of the reliability coefficient of a test corresponds exactly to the proportion of the variance in test scores that is due to true differences within that population of individuals tested.

An examination of the pretest and post test scores of the student control group showed a correlation coefficient of .690 and a further comparison of the pretest and post test scores for the teacher control group showed a correlation coefficient of .811.

An item analysis was utilized to decide which were the best statements for the revised questionnaire. Ideally, the item analysis should correlate each item with some reliable outside criterion of the attitude that it is supposed to measure and only the items with the highest correlations would be retained. Such external criteria are, however, almost never available. The best available measure of the

attitude concerned is the total item pool. The items would be consistent and homogeneous in that they would all be measuring the same thing. Through the calculation of correlation coefficients for each item with the total score, only those with the highest correlations would be retained.

An examination of the Environmental Attitudinal Questionnaire items was a requisite to instrument evaluation and revision. A check on the internal consistency of the questionnaire involved an analysis of test-retest responses. Correlation coefficients were calculated for each of the questionnaire items completed by the control group of teachers. Table IV presents these correlations. Correlation values that exceeded the significant level ($r=.404$) were considered to be reliable questionnaire items in the questionnaire and served as the questions for the revised questionnaire used in the present study. Question 3 was included by the curriculum development team as a suitable question to make up the revised 20 item questionnaire as it dealt with an important concept covered in the Environmental Studies course. Areas of environmental concern that had questions eliminated included Ecology (16, 19, 28), Air Pollution (15), Solid Waste (21), Management (5, 9), and General (22).

EXPERIMENTAL DESIGN

The Nonequivalent Control Group design outlined by

TABLE IV
CORRELATION COEFFICIENTS
OF PRETEST AND POST TEST RESPONSES
ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

<u>Item Number</u>	<u>Correlation Coefficients</u>	<u>Item Number</u>	<u>Correlation Coefficients</u>
1	0.5482591*	15	0.3112826
2	0.4125261*	16	0.1847447
3	0.3731378	17	0.7028435*
4	0.5252128*	18	0.5903106*
5	0.0240070	19	0.4001417
6	0.5780849*	20	0.6095784*
7	0.4072896*	21	0.1344172
8	0.5708113*	22	0.3209223
9	-0.0419145	23	0.4523456*
10	0.5465148*	24	0.5971747*
11	0.7303334*	25	0.4842290*
12	0.4423595*	26	0.5629226*
13	0.6231529*	27	0.5015076*
14	0.7321554*	28	0.2617019

*Significant level $r = .404$

Campbell and Stanley (1963) was utilized in this present study. It involved an experimental and a control group both being given a pretest and a post test, but the control group and the experimental group did not have equivalence in pre-experimental sampling. The groups constituted naturally assembled collectives, (intact classrooms of

students) as similar as availability permitted. In this study, the experimental group consisted of fourteen grade XII biology classes with two hundred and ninety three students. Eight different teachers participated in the presentation of the Environmental Studies course. Six different schools were involved in this study.

The control group consisted of one hundred and twenty eight students who did not participate in the Environmental Studies course. Of the total of seven control classes, two were grade XI biology classes at John Taylor Collegiate where the author taught, while the other five were grade XII physics classes at the other five participating schools.

FIGURE II

NONEQUIVALENT CONTROL GROUP DESIGN

	Pretest		Post Test
Experimental Group	0 - - - - -	X - - - - -	0
Control Group	0 - - - - -	- - - - -	0

X = treatment given (Environmental Studies course)

A revised twenty item Environmental Attitudinal Questionnaire was utilized for pretest and post test for this present study. A facsimile of this revised questionnaire is located in Appendix B.

Because of its failure to randomize, this design

does not guarantee the equivalence of the experimental and control groups in initial status on all factors that may affect the dependent variable. The preformed groups likely differed in intelligence, motivation, interest, and other factors. It would be possible to adjust for certain differences through analysis of covariance but it would never be known what other factors were operating in the situation which had not been included in the pretesting.

This present study began with school opening in September, 1973, when the biology classes commenced the Environmental Studies unit. Control groups were selected from the same schools where the Environmental Studies unit was conducted. The control groups were not biology classes in five of the six schools, but the author thought it desirable to keep experimental and control classes within the same schools rather than to introduce six new control classes from six different schools into the design. All grade XII biology classes within the six schools involved participated in the experimental group. According to Campbell and Stanley, the more similar the experimental and control groups were in their recruitment, and the more this similarity was confirmed by the scores of the pretest, the more effective the control became.

The Canadian Environmental Concerns team, in cooperation with the Manitoba Teachers' Society, asked for volunteers to pilot the materials that had been developed by

the team. Several teachers replied to this request and then attended a workshop held by Canadian Environmental Concerns team members. The intent of the workshop was to familiarize the proposed pilot teachers with the content and the methodology that could be used by the teachers when they piloted the materials. On completion of the pilot programs, in a follow-up in-service with these teachers, it was confirmed that all had attempted the areas in the resource manual that were suggested.

INTERNAL VALIDITY OF EXPERIMENTAL DESIGN

Internal validity is crucial in any experiment to help clarify the question of whether the independent variable did indeed produce the effect noted in the dependent variable. It is necessary to eliminate the possibility that some uncontrolled factor, either alone or in combination with other variables, did not contribute in some degree to producing the effect in question. Relevant to internal validity, Campbell and Stanley outlined numerous extraneous variables that, if not controlled in the experimental design, may produce effects confounded with the effect of the environmental stimulus. A number of these variables appeared earlier in this chapter under limitations.

One variable outlined by Campbell and Stanley was the process of maturation between pretest and post test. The students, both experimental and control, may have performed

better or worse because they are older and more intellectually mature.

Changing in the calibration of the measuring instrument constituted another variable. In this study, the same test was utilized in the pretest and post test and the scoring method of each item was the same for pretest and post test analysis.

Statistical regression toward the mean is yet another variable possible in experimental analysis. All students who completed a pretest and a post test were selected for this study. Groups were not selected on the basis of their scores on the questionnaire. Those who scored high and those who scored low were all included in the final analysis along with those who scored in the middle range.

Initial differences in performance on pretest, between the experimental and control groups, likely continued to operate in the post test. A bias may have resulted from differential selection of students for the comparison groups and this constitutes another variable. Initial differences will be examined and every effort will be taken to equalize the two groups if differences are apparent.

Differential loss of subjects from the experimental and control groups may tend to bias the results of the experiment. A number of students enrolling in the course at the beginning of September dropped out or transferred

out for a variety of reasons. They may not have been motivated to continue in the course, or even in school, and they may have chosen to transfer to another class or another school. In this study, any student who did not complete a pretest and a post test was not included, as a comparison of pretest and post test scores was necessary. As well as students who did not complete the experimental study, there were some who started the Environmental Studies course late, but did complete a post test. These were not included in the analysis as no pretest score was available.

The final variable outlined by Campbell and Stanley deals with an interaction of selection and maturation which may have been responsible for any differences in scores found in the post test. Even if the experimental and control groups have equivalent pretest scores, or initial differences are taken into account, other differences in personality or motivation may have predisposed one group to react better to the experimental factor. Volunteers are invariably suspect as experimental subjects. In this study, grade XII biology students acted as the experimental group and part of the intent of the experimental course on the environment was to motivate them to become aware of environmental problems and to begin thinking of ways to help solve these areas of concern. It would therefore be a desirable occurrence if the experimental group became motivated toward environmental matters whereas the control group,

not having been involved in the course of study, would lack this motivation. Personality factors may have been important in selecting available courses at the high school level, for example, physics or biology. If the initial scores on the attitudinal questionnaire were similar, it may be inferred that personality had little to do with test results. Students involved in this study did not volunteer for the study. Students in grade XII biology accepted the Environmental Studies unit as a part of their grade XII biology course and the physics students did not know that they were serving as a basis for comparison, or a control group, for the environmental experimental group. There were no students involved in this study that were taking grade XII biology and grade XII physics simultaneously.

EXTERNAL VALIDITY OF EXPERIMENTAL DESIGN

External validity asks the question, according to Campbell and Stanley, of generalizability: to what populations, settings, treatment variables, and measurement variables can this effect be generalized? External validity considers factors which jeopardize the representativeness or the ability to generalize.

Specifically, what meanings do the findings in this thesis have concerning the effects of treatment X beyond the confines of this particular experiment? Do the results have validity for all males and females, for all grade XII

students, or only for biology students enrolled in a course where environmental studies was taught according to a given curriculum?

The particular characteristics of an experimental group, its intellectual level, its academic orientation, and other features of their background, may have made this group more or less responsive than average to the experimental factor. The fact that the experimental groups consisted of intact classrooms of students who selected biology whereas the control group consisted of intact classrooms of students who selected physics may be a pertinent factor in responsiveness to an environmental studies course. It is possible that the physics students, had they been in contact with the treatment, the Environmental Studies course, would not have reacted at all in a similar fashion to those biologically oriented students. To consider this possible problem, the experiment utilized a set of control students who had chosen biology but were not subjected to this Environmental Studies course. This group was two intact classrooms of grade XI biology students at the author's school. To introduce six more schools into the design with six grade XII biology classes for the control was a difficult matter. The majority of grade XII biology classes began their studies with a unit on ecology and related environmental problems. Other variables may also have been introduced with six new schools.

The effect of a treatment on a subject previously exposed to other treatments of a similar nature cannot be generalized to other subjects who had not undergone the same sequence of treatments. The effect of the repeated treatment on the same subject would probably be cumulative. Students who chose grade XII biology generally had completed grade XI biology whereas grade XII physics students generally had no biology. This however, did not represent previous exposure to environmental studies, the course in question, as the grade XI course deals with general biology, and in most, if not all classes, little was done regarding the attitudes of students toward environmental matters as it does have a place in the grade XII curriculum. If any cumulative effect was present, it would quite possibly be picked up in a comparison of the pretest scores of the experimental and the control groups.

METHODS OF DATA ANALYSIS

NULL HYPOTHESES

Further to the questions posed in chapter I of this study, the following null hypotheses are to be tested. All pretest and post test scores referred to in the null hypotheses represent cumulated scores achieved on the Environmental Attitudinal Questionnaire designed for this study.

Null hypotheses 1 through 4 are related to the first question of this study: Is the attitude toward the environment on the part of the students who have completed the Environmental Studies course different from that of the students who did not participate in the Environmental Studies course?

$$Ho_1: \theta_1 = \theta_2$$

where θ_1 = mean of pretest scores achieved by the untreated population

and θ_2 = mean of pretest scores achieved by the treated population

$$Ho_2: \theta_2 = \theta_3$$

where θ_3 = mean of post test scores achieved by the treated population

$$Ho_3: \theta_1 = \theta_4$$

where θ_4 = mean of post test scores achieved by the untreated population

$$Ho_4: \theta_3 = \theta_4$$

Null hypotheses 5 and 6 are related to the second question of this study: Is there any difference between the attitudes toward the environment on the part of the grade XI students and the grade XII students in the control group?

$$Ho_5: \theta_{XI} = \theta_{XII}$$

where θ_{XI} = mean of pretest scores achieved by the grade XI students in the untreated population

and θ_{XII} = mean of pretest scores achieved by the grade XII students in the untreated population

$$Ho_6: \theta_{XIP} = \theta_{XIIP}$$

where θ_{XIP} = the difference between the mean of pretest and post test scores achieved by the grade XI students in the untreated population

and θ_{XIIP} = the difference between the mean of pretest and post test scores achieved by the grade XII students in the untreated population

Null hypotheses 7 and 8 are related to the third question of this study: Is there any difference between the attitudes toward the environment on the part of the male students and the female students within the experimental group?

$$Ho_7: \theta_M = \theta_F$$

where θ_M = mean of pretest scores achieved by the male students in the treated population

and θ_F = mean of pretest scores achieved by the female students in the treated population

$$Ho_8: \theta_{MP} = \theta_{FP}$$

where θ_{MP} = the difference between the mean of pretest and post test scores achieved by the male students in the treated population

and θ_{FP} = the difference between the mean of pretest and post test scores achieved by the female students in the treated population

Null hypotheses 9 through 12 are related to the fourth question of this study: Are there any differences among the groups of students from the six different schools used in this study in attitude toward the environment?

$$Ho_9: \theta_{TA} = \theta_{TB} = \theta_{TC} = \theta_{TD} = \theta_{TE} = \theta_{TF}$$

where θ_{TA} = mean of pretest scores achieved by treated population at school A

and θ_{TB} = mean of pretest scores achieved by treated population at school B

and θ_{TC} = mean of pretest scores achieved by treated population at school C

and θ_{TD} = mean of pretest scores achieved by treated population at school D

and θ_{TE} = mean of pretest scores achieved by treated population at school E

and θ_{TF} = mean of pretest scores achieved by treated population at school F

$$Ho_{10}: \theta_{TG} = \theta_{TH} = \theta_{TI} = \theta_{TJ} = \theta_{TK} = \theta_{TL}$$

where θ_{TG} = the difference between the pretest and post test mean scores achieved by treated population at school A

and θ_{TH} = the difference between the pretest and post test mean scores achieved by treated population at school B

and θ_{TI} = the difference between the pretest and post test mean scores achieved by treated population at school C

and θ_{TJ} = the difference between the pretest and post test mean scores achieved by treated population at school D

and θ_{TK} = the difference between the pretest and post test mean scores achieved by treated population at school E

and θ_{TL} = the difference between the pretest and post test mean scores achieved by treated population at school F

Ho₁₁: $\theta_{CA} = \theta_{CB} = \theta_{CC} = \theta_{CD} = \theta_{CE} = \theta_{CF}$

where θ_{CA} = mean of pretest scores achieved by untreated population at school A

and θ_{CB} = mean of pretest scores achieved by untreated population at school B

and θ_{CC} = mean of pretest scores achieved by untreated population at school C

and θ_{CD} = mean of pretest scores achieved by untreated population at school D

and θ_{CE} = mean of pretest scores achieved by untreated population at school E

and θ_{CF} = mean of pretest scores achieved by untreated population at school F

Ho₁₂: $\theta_{CG} = \theta_{CH} = \theta_{CI} = \theta_{CJ} = \theta_{CK} = \theta_{CL}$

where θ_{CG} = the difference between the pretest and post test mean scores achieved by untreated population at school A

and θ_{CH} = the difference between the pretest and post test mean scores achieved by untreated population at school B

and θ_{CI} = the difference between the pretest and post test mean scores achieved by untreated population at school C

and θ_{CJ} = the difference between the pretest and post test mean scores achieved by untreated population at school D

and θ_{CK} = the difference between the pretest and post test mean scores achieved by untreated population at school E

and θ_{CL} = the difference between the pretest and post test mean scores achieved by untreated population at school F

STATISTICAL ANALYSIS PROCEDURE

To state that there is no difference between the population mean of A and the population mean of B is to state a null hypothesis. Such statements have just been completed for this study. The level of significance at which these hypotheses will be tested is .05.

Null hypotheses 1 through 8 will be examined and the means, standard deviations, standard errors, variance, and F and t tests will be determined.

A general hypothesis of no difference among the means of the different schools is considered in null hypotheses 9 through 12, and will be examined by analysis of variance. The performance of these six schools was considered to represent results of the treatment by an independent variable whose possible relationship to a dependent variable is being studied.

SUMMARY

This chapter has dealt with numerous aspects of the design of this study. The Environmental Studies course and the Environmental Attitudinal Questionnaire used in this study have been outlined. Relationships between the course and the questionnaire have been presented. Null hypotheses have been stated and the statistical analysis procedure outlined. Chapter IV will present data obtained from this analysis.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this chapter is to present detailed results of the study described in the preceeding chapter. The four main questions which this study seeks to answer will be examined by means of the null hypotheses derived from the questions. These null hypotheses will be either rejected or not rejected on the basis of statistical analysis of the experimental data.

The four main questions with their related null hypotheses will be considered individually. Results of the Environmental Attitudinal Questionnaire constitute the data for all the null hypotheses.

Question 1: Is the attitude toward the environment on the part of the students who have completed the Environmental Studies course different from that of students who did not participate in the Environmental Studies course?

Null hypotheses 1, 2, 3, and 4 are related to this question.

Null hypothesis 1: $\theta_1 = \theta_2$

The mean of the pretest scores of the control group was compared with the mean of the pretest scores of the experimental group to determine if initial differences existed.

TABLE V

COMPARISON OF PRETEST SCORES OF
CONTROL AND EXPERIMENTAL GROUPS

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Control Pretest	128	65.9219	4.871	0.431	-0.18	0.856
Experimental Pretest	293	66.0171	5.097	0.298		

Since the t value obtained (Table V) was less than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 1 was not rejected.

Null hypothesis 2: $\theta_2 = \theta_3$

The mean of the pretest scores of the experimental group was compared with the mean of the post test scores of the experimental group to determine if any significant change may have occurred as a result of the Environmental Studies course.

TABLE VI

COMPARISON OF EXPERIMENTAL GROUP
PRETEST AND POST TEST SCORES

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Pretest	293	66.0171	5.097	0.298	-7.83*	0.000
Post Test	293	68.9761	6.085	0.355		

* $P \leq .05$

Since the t value obtained (Table VI) was greater than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 2 was rejected.

Null hypothesis 3: $\theta_1 = \theta_4$

The mean of the pretest scores of the control group was compared with the mean of the post test scores of the control group to determine whether any significant change may have occurred without the group having taken the Environmental Studies course.

TABLE VII

COMPARISON OF CONTROL GROUP
PRETEST AND POST TEST SCORES

<u>Variable</u>	<u>Number</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Standard Error</u>	<u>t Value</u>	<u>2-tail Prob.</u>
Pretest	128	65.9219	4.871	0.431	0.37	0.715
Post Test	128	65.7422	5.437	0.481		

Since the t value obtained (Table VII) was less than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 3 was not rejected.

Null hypothesis 4: $\theta_3 = \theta_4$

The mean of the post test scores of the experimental group was compared with the mean of the post test scores

of the control group to determine whether any significant difference was present.

TABLE VIII

COMPARISON OF POST TEST SCORES OF
EXPERIMENTAL AND CONTROL GROUPS

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Experimental Post Test	293	68.9761	6.085	0.355	-5.41*	0.000
Control Post Test	128	65.7422	5.437	0.481		

* $P \leq .05$

Since the t value obtained (Table VIII) was greater than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 4 was rejected.

Question 2: Is there any difference between the attitudes toward the environment on the part of the grade XI students and the grade XII students in the control group?

Null hypotheses 5 and 6 are related to this question.

Null hypothesis 5: $\theta_{XI} = \theta_{XII}$

The mean of the pretest scores of the grade XI control group was compared with the mean of the pretest scores of the grade XII control group to determine whether any significant initial difference was present.

TABLE IX

COMPARISON OF PRETEST SCORES OF
GRADE XI AND GRADE XII CONTROL GROUPS

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Grade XII	79	65.6582	4.841	0.545	-0.77	0.442
Grade XI	49	66.3469	4.939	0.706		

Since the t value obtained (Table IX) was less than the critical t value of 2.00 (2-tailed probability, $P \leq .05$), null hypothesis 5 was not rejected.

Null hypothesis 6: $\theta_{XIP} = \theta_{XIIP}$

The mean of the post test scores of the grade XI control group was compared with the mean of the post test scores of the grade XII control group to determine whether any significant difference was present.

TABLE X

COMPARISON OF POST TEST SCORES OF
GRADE XI AND GRADE XII CONTROL GROUPS

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Grade XII	79	65.9873	5.672	0.638	0.66	0.508
Grade XI	49	65.3469	5.068	0.724		

Since the t value obtained (Table X) was less than the critical t value of 2.00 (2-tailed probability, $P \leq .05$),

null hypothesis 6 was not rejected.

Question 3: Is there any difference in the attitude toward the environment on the part of the male students and the female students within the experimental group?

Null hypotheses 7 and 8 are related to this question.

Null hypothesis 7: $\theta_M = \theta_F$

The mean of the pretest scores of the males of the experimental group was compared with the mean of the pretest scores of the females of the experimental group to determine whether any significant difference existed.

TABLE XI

COMPARISON OF MALE AND FEMALE

PRETEST SCORES IN EXPERIMENTAL GROUP

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Female	151	66.2450	5.040	0.410	0.79	0.431
Male	142	65.7746	5.163	0.433		

Since the t value obtained (Table XI) was less than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 7 was not rejected.

A one-way analysis of variance was also carried out regarding null hypothesis 7 to further test the equality of male and female experimental groups.

TABLE XII

ONE-WAY ANALYSIS OF VARIANCEOF PRETEST SCORES OF FEMALESAND MALES IN THE EXPERIMENTAL GROUP

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	1	17.00	17.00	0.654	0.425
Within Groups	291	7569.00	26.01		
Total	292	7586.00			

Since the F ratio obtained (Table XII) was less than the critical F value of 3.87 (2-tailed probability, $P \leq .05$), null hypothesis 7 was not rejected.

Null hypothesis 8: $\theta_{MP} = \theta_{FP}$

The mean of the post test scores of the males in the experimental group was compared with the mean of the post test scores of the females in the experimental group to determine whether any significant difference existed.

TABLE XIII

COMPARISON OF MALE AND FEMALEPOST TEST SCORES IN EXPERIMENTAL GROUP

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Female	151	70.1126	5.964	0.485	3.35*	0.001
Male	142	67.7676	5.998	0.503		

* $P \leq .05$

Since the t value obtained (Table XIII) was greater than the critical t value of 1.96 (2-tailed probability, $P \leq .05$), null hypothesis 8 was rejected.

A one-way analysis of variance was also carried out regarding null hypothesis 8 to further test the equality of male and female experimental groups.

TABLE XIV

ONE-WAY ANALYSIS OF VARIANCE
OF POST TEST SCORES OF FEMALES
AND MALES IN THE EXPERIMENTAL GROUP

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	2-tail Prob.
Between Groups	1	402.00	402.00	11.239*	0.001
Within Groups	291	10409.00	35.76		
Total	292	10811.00			

* $P \leq .05$

Since the F value obtained (Table XIV) was greater than the critical F value of 3.87 (2-tailed probability, $P \leq .05$), null hypothesis was rejected.

The rejection of null hypotheses 2 and 8 suggested that a significant difference between pretest and post test scores of males and females respectively in the experimental group might be found. Accordingly, data comparing the mean of the pretest and post test scores of females and of males was analyzed.

TABLE XV

COMPARISON OF FEMALE EXPERIMENTAL GROUPPRETEST AND POST TEST SCORES

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Pretest	151	66.2450	5.040	0.410	-6.09*	0.000
Post Test	151	70.1126	5.964	0.485		

* $P \leq .05$

TABLE XVI

COMPARISON OF MALE EXPERIMENTAL GROUPPRETEST AND POST TEST SCORES

Variable	Number	Mean	Standard Deviation	Standard Error	t Value	2-tail Prob.
Pretest	142	65.7746	5.163	0.433	-3.01*	0.005
Post Test	142	67.7676	5.998	0.503		

* $P \leq .05$

Since the t value obtained for the females (Table XV) and for the males (Table XVI) both exceeded the critical t value of 1.96 (2-tailed probability, $P \leq .05$), it was confirmed that both male and female segments of the experimental group did show significant increases in attitude scores.

Question 4: Are there any differences among the groups of students from the six different schools used in this study in attitude toward the environment?

Null hypotheses 9, 10, 11, and 12 are related to this question.

Null hypothesis 9: $\theta_{TA} = \theta_{TB} = \theta_{TC} = \theta_{TD} = \theta_{TE} = \theta_{TF}$

The means of the pretest scores of the experimental groups from the six different schools used in this study were compared to determine whether any significant differences were present.

TABLE XVII

ANALYSIS OF VARIANCE OF PRETEST SCORES
OF EXPERIMENTAL GROUPS FROM SIX DIFFERENT SCHOOLS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	110.00	22.00	0.845	0.520
Within Groups	287	7476.00	26.04		
Total	292	7586.00			

Since the F value obtained (Table XVII) was less than the critical F value of 2.25 (2-tailed probability, $P \leq .05$), null hypothesis 9 was not rejected.

Null hypothesis 10: $\theta_{TG} = \theta_{TH} = \theta_{TI} = \theta_{TJ} = \theta_{TK} = \theta_{TL}$

The means of the post test scores of the experimental groups from the six different schools used in this study were compared to determine whether any significant

differences were present.

TABLE XVIII

ANALYSIS OF VARIANCE OF POST TEST SCORES
OF EXPERIMENTAL GROUPS FROM SIX DIFFERENT SCHOOLS

<u>Source of Variation</u>	<u>Degrees of Freedom</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F Ratio</u>	<u>F Prob.</u>
Between Groups	5	392.00	74.40	2.045	0.072
Within Groups	287	10439.00	36.37		
Total	292	10811.00			

Since the F value obtained (Table XVIII) was less than the critical F value of 2.25 (2-tailed probability, $P \leq .05$), null hypothesis 10 was not rejected.

Null hypothesis 11: $\theta_{CA} = \theta_{CB} = \theta_{CC} = \theta_{CD} = \theta_{CE} = \theta_{CF}$

The means of the pretest scores of the control groups from the six different schools used in this study were compared to determine whether any significant differences were present.

Since the F value obtained (Table XIX) was less than the critical F value of 2.29 (2-tailed probability, $P \leq .05$), null hypothesis 11 was not rejected.

TABLE XIX

ANALYSIS OF VARIANCE OF PRETEST SCORES
OF CONTROL GROUPS FROM SIX DIFFERENT SCHOOLS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	183.00	36.60	1.578	0.170
Within Groups	122	2830.25	23.19		
Total	127	3013.25			

Null hypothesis 12: $\theta_{CG} = \theta_{CH} = \theta_{CI} = \theta_{CJ} = \theta_{CK} = \theta_{CL}$

The means of the post test scores of the control groups from the six different schools used in this study were compared to determine whether any significant differences were present.

TABLE XX

ANALYSIS OF VARIANCE OF POST TEST SCORES
OF CONTROL GROUPS FROM SIX DIFFERENT SCHOOLS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	5	274.81	54.96	1.927	0.094
Within Groups	122	3479.68	28.52		
Total	127	3754.50			

Since the F value obtained (Table XX) was less than

the critical F value of 2.29 (2-tailed probability, $P \leq .05$), null hypothesis 12 was not rejected.

SUMMARY

This chapter has presented the statistical analysis of the experimental data derived from this study.

Null hypothesis 1, which compared the means of the pretest scores of the control and experimental groups, was not rejected.

Null hypothesis 2, which compared the means of the pretest and post test scores of the experimental group, was rejected.

Null hypothesis 3, which compared the means of the pretest and post test scores of the control group, was not rejected.

Null hypothesis 4, which compared the means of the post test scores of the control and experimental groups, was rejected.

Null hypothesis 5, which compared the means of the pretest scores of the grade XI and XII control groups, was not rejected.

Null hypothesis 6, which compared the means of the post test scores of the grade XI and XII control groups, was not rejected.

Null hypothesis 7, which compared the means of the pretest scores of the males and females of the experimental

group, was not rejected.

Null hypothesis 8, which compared the means of the post test scores of the males and females of the experimental group, was rejected.

Null hypothesis 9, which compared the means of the pretest scores of the experimental groups from the six different schools used in this study, was not rejected.

Null hypothesis 10, which compared the means of the post test scores of the experimental groups from the six different schools used in this study, was not rejected.

Null hypothesis 11, which compared the means of the pretest scores of the control groups from the six different schools used in this study, was not rejected.

Null hypothesis 12, which compared the means of the post test scores of the control groups from the six different schools used in this study, was not rejected.

Chapter V will consider an interpretation and discussion of the 12 null hypotheses along with conclusions and recommendations from this study.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

This study began in September, 1973, with the administration of the evaluative instrument, the Environmental Attitudinal Questionnaire, to groups of grade XII high school students who were about to take a course in Environmental Studies that was designed under the aegis of Project Canada West. The Environmental Attitudinal Questionnaire was also administered to a group of grade XI and XII high school students who were not going to be involved with the Environmental Studies course. The Environmental Studies course was presented over a period of approximately ten weeks. The Environmental Attitudinal Questionnaire was then administered again to both groups. The results of the questionnaire were then statistically analyzed.

The purpose of this study was to determine whether the attitudes of students would be changed as a result of the Environmental Studies course. The Environmental Attitudinal Questionnaire was the instrument developed to evaluate change that may have occurred.

To support the study, a review of the literature

examined the following areas of research: existing environmental studies programs and their justification, a definition of environmental education, the goals of environmental education, attitudes, a definition of attitudes, modifications of attitude, and environmental education surveys and courses with related studies of attitudinal measurement that have been completed.

The Environmental Studies course, developed under the aegis of Project Canada West, was examined and the original design of the Environmental Attitudinal Questionnaire was related to the content of this course. Validity and reliability of this questionnaire were established and the method by which the questionnaire was revised was outlined. The design of the study was discussed and the null hypotheses, designed to answer the four main questions which this study sought to answer, were stated.

DISCUSSION

This section will include a restatement of the four main questions that this study sought to answer and relate the statistical findings of this study to their answers. All data from the study were gathered from the responses on the Environmental Attitudinal Questionnaire.

Question 1: Is the attitude toward the environment on the part of students who have completed the Environmental Studies course different from that of students who did not participate in the Environmental Studies course?

Null hypothesis 1, which compared the means of the pretest scores of control and experimental groups, was not rejected, and it was concluded that the control and experimental groups were drawn from the same population.

Null hypothesis 2, which compared the means of the pretest and post test scores of the experimental group, was rejected, and it was concluded that change in attitude did occur in the group exposed to the Environmental Studies course.

Null hypothesis 3, which compared the means of the pretest and post test scores of the control group, was not rejected, and it was concluded that change in attitude did not occur in the absence of the Environmental Studies course.

Null hypothesis 4, which compared the means of the post test scores of control and experimental groups, was rejected, and it was concluded that the change in attitude that occurred was a result of the Environmental Studies course.

Previously conducted studies on attitude change by Hounshell and Liggett (1973) with sixth grade students, Cohen and Hollingsworth (1973) with high school students, Howie (1974) with fifth grade students, and Bowman (1974) with university students, have all demonstrated that attitude change can occur while studying environmentally related courses, and that this change can be measured.

Howell and Warmbrod (1974) found no significant change in attitude of high school students after completing a six week unit on the study of the environment.

Hamilton and Asche (1974) also indicated no change in attitude of high school students after completing a one week intensive study of the environment.

The present study suggests that exposure to an Environmental Studies course for a period of ten to twelve weeks will effect a change in attitude of the student to the environment, and that this change can be measured by an instrument designed for that purpose.

The fact that Howell and Warmbrod, and Hamilton and Asche found no change may have been due to the time factor. One week, or even six weeks, may not have been sufficient time for attitude change processes to occur. An opportunity to discuss, evaluate, and think about varying opinions may not have been given during the time allotted. Studies like Bowman's allotted ten weeks, as did this present study, and this appears to be sufficient opportunity to involve the majority of students in the attitude change process.

Question 2: Is there any difference between the attitudes toward the environment on the part of the grade XI and grade XII students in the control group?

Null hypothesis 5, which compared the means of the pretest scores of the grade XI and grade XII control group students, and null hypothesis 6, which compared

the means of the post test scores of the grade XI and XII control group students, were both not rejected. It was concluded that there was no difference in attitudes of the grade XI or XII students chosen as the control group. The grade XI biology and grade XII physics students showed no significant difference between the means of either the pretest or the post test scores and it was concluded that they were representative of the same population. Grade XII students who had chosen physics instead of biology and grade XI students who had chosen biology, both served equally as well as the control group for this study.

Question 3: Is there any difference in the attitudes toward the environment on the part of the male students and the female students within the experimental group?

Null hypothesis 7, which compared the means of the pretest scores of males and of females in the experimental group, was not rejected, and it was concluded that there were no initial differences present in attitudes toward the environment in males and females of the experimental group.

Null hypothesis 8, which compared the means of the post test scores of males and of females in the experimental group, was rejected, and it was concluded that after completion of the Environmental Studies course, the females changed to a greater degree than the males.

Whereas the mean scores of the male students increased by

2.00 from pretest to post test, the mean scores of the females increased by 3.87 from pretest to post test. Although both were significant increases, it was concluded that the female experimental group responded much more than the male experimental group to the intended objectives of the Environmental Studies course.

This observation is in agreement with the findings of Hounshell and Liggett (1973) where girls scored significantly higher than boys on an environmental attitude test. These findings are consistent with the observations of Scheidel (1963) and Arrowood and Amoroso (1965) that women tend to be more 'persuasible' than men. Janis and Hovland (1959) suggested that there exists a factor of 'general persuasibility' regarding attitudes that is influenced by many sources. This present study indicates that this factor of 'general persuasibility' is greater in females than in males when environmental issues are concerned.

Question 4: Are there any differences among the groups of students from the six different schools used in this study in attitude toward the environment?

Null hypothesis 9, which compared the means of the pretest scores from the experimental groups of the six different schools used in this study, and null hypothesis 10, which compared the means of the post test scores from the experimental groups of the six different schools used

in this study, were both not rejected, and it was concluded that differences were not present in the experimental groups within the six schools used in this study. It was also concluded that all six schools in this study were drawn from the same population.

Null hypothesis 11, which compared the means of the pretest scores from the control groups of the six different schools used in this study, and null hypothesis 12, which compared the means of the post test scores from the control groups of the six different schools used in this study, were both not rejected, and it was concluded that differences were not present in the control groups within the six schools used in this study regarding attitude toward the environment. It was also concluded that all six schools in this study were drawn from the same population.

CONCLUSIONS

A number of conclusions may be drawn concerning this study. Some relate to the results of the data analysis, some to the experimental procedures, and some to the limitations expressed in an earlier chapter.

On the basis of statistical evaluation, it may be concluded that the Environmental Studies course did change the attitude of students toward the environment. Ten weeks of treatment appeared to be sufficient to allow for the

attitude change processes to occur.

This study has established population norms for the Environmental Attitudinal Questionnaire. Subjects used in this study consisted of grade XI and XII students in the Province of Manitoba. Generalizations to larger and different populations may or may not be possible. Future studies of a similar design would have to be conducted before generalizability could be assumed.

On the basis of this study, it may be concluded that attitudes of female students exposed to the Environmental Studies course changed more than did those of male students exposed to the same course. Greater persuasibility and motivation are two factors that may help to explain why females were affected more than males.

It may be concluded that some teachers are capable of designing curricular materials effective in changing attitudes toward the environment. The Environmental Studies course was designed by high school biology teachers.

On three separate occasions, the Environmental Attitudinal Questionnaire has demonstrated consistency in scores for the control groups chosen. On the same three occasions, it has demonstrated its consistency in measuring attitude change within the experimental groups.

Reliability of the Environmental Attitudinal Questionnaire was supported by the test-retest method. As the

same questionnaire was used in pretest and post test, a possible practice effect may have influenced the results of this study. However, because the control groups did not attain higher scores upon their second exposure to the instrument, it was concluded that no such effect was present.

Statistical analysis of the data did not reveal the presence of an uncontrolled variable resulting from the use of grade XII physics students or grade XI biology students for the control groups. Maturation, grade XI or XII level, or type of course chosen (physics or biology) did not appear to be relevant variables affecting the control groups.

The fact that all teachers volunteered for this study suggested a willingness on the part of these teachers to become involved with students in attempting numerous activities suggested by the Environmental Studies course. As all groups in the schools used in this study showed similar changes in student attitude, it may be concluded that teacher selection was not a limitation to this study.

RECOMMENDATIONS

1. More classroom teachers should be given the opportunity to develop classroom materials and evaluative techniques and should be supported in their efforts both financially and with release time. Teachers should be selected from various levels in the educational system to

participate in an on-going process of development of environmentally related curriculum. Basic ecological issues and concepts should be of first concern at the elementary levels. These should be built upon in the junior high and aspects of environmental problems and management at the local level should be examined. The high schools should consider basic value-laden issues that apply not only locally, but globally as well. An inter-disciplinary approach should be considered seriously at the high school level.

Teachers should develop the total program, including cognitive and affective evaluative instruments to assist in the assessment of goal achievement. Costs should be born by provincial departments of education and local school boards. Release time for teachers is absolutely necessary to allow for appropriate training, information gathering, writing, and inservice experience for the teacher who will perform pilot tests of materials developed. Publication of materials is possible at the local level initially as trial programs are established. Once the materials have been field tested and revised, Canadian publishers should be informed and invited to assist in further publication.

2. Alternative programs dealing with environmental studies using a variety of techniques and approaches to instruction should be attempted. Comparisons should then be made with the techniques and approaches to instruction outlined in the Environmental Studies Teacher Resource

Manual utilized in this study. The comparisons would yield useful information as to the effectiveness of the techniques employed in changing the attitudes of the student.

3. The Environmental Attitudinal Questionnaire should be revised with relevant questions regarding environmental issues of today. As course content changes and educational goals of specific programs vary, so must the instruments of evaluation regarding this content and these goals.

4. Revised Environmental Attitudinal Questionnaires should be designed and utilized at different educational levels. Because content and methodology varies with each school level, these questionnaires could be utilized to determine at what level certain teaching strategies were most effective and where they were least effective.

5. More teacher inservices should be held to educate prospective teachers of value-laden issues and appropriate methods of dealing with these issues in the classroom.

6. This study suggested that females responded more than males to the Environmental Studies course. Further studies should be designed to examine this difference in attitude response and should attempt to determine what factors may be responsible for the differences.

In conclusion, this study has demonstrated that programs of environmental studies of sufficient duration can affect attitudes of high school students, and that these changes in attitude can be assessed through the use of appropriate measuring instruments.

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APPENDICES

APPENDIX A

INITIAL ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

Name _____

State the extent of your agreement with each item by circling the appropriate letter on the right side of the page according to the following criteria:

Strongly Disagree	a
Disagree	b
Uncertain	c
Agree	d
Strongly Agree	e

Rating

- | | | | | | |
|---|---|---|---|---|---|
| 1. To use the atmosphere as a sink for waste products of combustion is an inexcusable act. | a | b | c | d | e |
| 2. Industry alone should be responsible for the cost of pollution clean up. | a | b | c | d | e |
| 3. There is very little that I myself can do to help the pollution problem in my area. | a | b | c | d | e |
| 4. Plant succession is related to the theory of evolution. | a | b | c | d | e |
| 5. Scientific technology will solve our pollution problems for us. | a | b | c | d | e |
| 6. The solution to pollution is dilution. | a | b | c | d | e |
| 7. Too many people is the real reason for our pollution problems. | a | b | c | d | e |
| 8. More than one car per family should not be permitted. | a | b | c | d | e |
| 9. Pollution control is an issue of the 1970's and will be replaced by a more pressing issue in the 1980's. | a | b | c | d | e |
| 10. The dissolved oxygen level of a lily pond would be greater than a newly formed man-made lake. | a | b | c | d | e |
| 11. All bodies of fresh water should be free at all times from any substances that will adversely affect aquatic life or waterfowl. | a | b | c | d | e |

12. Motor vehicles should be considered the worst single offender with reference to air pollution. a b c d e
13. Pollution, Ecology and Environmental management are topics overplayed by the media. a b c d e
14. The Canadian water supply should be sufficient for many generations to come. a b c d e
15. We should be forced to give up some of our imagined freedoms, such as the right to drive a car anywhere at any time, to help solve the global air pollution problem. a b c d e
16. Man should have a mutualistic relationship with his environment rather than a commensalistic one. a b c d e
17. Ecological considerations should be of first importance in implementing large scale projects such as the flooding of South Indian Lake in Manitoba. a b c d e
18. Farmers require fertilizers to get better crop yields and therefore they should not be held responsible for whatever chemical pollution may occur from the use of these fertilizers. a b c d e
19. Projected power needs for generations to come should be of prime importance in considering the development of Northern Manitoba. a b c d e
20. Environmental studies should be a required course program for all high school students. a b c d e
21. Recycling projects carried out by high school students should not even be attempted because of the small amount of good that they might do. a b c d e
22. Snowmobiles should be banned because of the damage they do to the environment. a b c d e
23. Overcrowding and deteriorating conditions should be reason enough for families to move out of busy urban regions. a b c d e
24. The cost of disposing of a car should be included in the original purchase price of that car. a b c d e

25. Industry should be considered responsible for all the 'throw-away' containers that can be found littering our environment. a b c d e
26. Non-returnable containers should be banned from the market. a b c d e
27. Billboards should be removed from the landscape because of the visual pollution that they contribute. a b c d e
28. A well established pond will remain as a pond indefinitely. a b c d e
- *29. Canada should set forth legislation limiting the number of children per family. a b c d e
- *30. Classroom teachers are capable of developing environmental studies curriculum. a b c d e
- *31. Canadians should willingly aid the U.S.A. in their energy crisis. a b c d e
- *32. The interdisciplinary approach should be used to teach environmental courses. a b c d e

*These items were not used in the 'students' questionnaire but were added to the 'teachers' questionnaire only.

APPENDIX B

REVISED ENVIRONMENTAL ATTITUDINAL QUESTIONNAIRE

Student Name: _____

School: _____

State the extent of your agreement with each statement by circling the appropriate letter on the right side of the page according to the following criteria:

Strongly disagree	a
Disagree	b
Uncertain	c
Agree	d
Strongly agree	e

Rating

- | | | | | | |
|--|---|---|---|---|---|
| 1. To use the atmosphere as a sink for waste products of combustion is an inexcusable act. | a | b | c | d | e |
| 2. Industry alone should be responsible for the cost of pollution clean up. | a | b | c | d | e |
| 3. There is very little that I myself can do to help the pollution problem in my area. | a | b | c | d | e |
| 4. Plant succession is related to the theory of evolution. | a | b | c | d | e |
| 5. The solution to pollution is dilution. | a | b | c | d | e |
| 6. Too many people is the real reason for our pollution problems. | a | b | c | d | e |
| 7. More than one car per family should not be permitted. | a | b | c | d | e |
| 8. The dissolved oxygen level of a lily pond would be greater than a newly formed man-made lake. | a | b | c | d | e |
| 9. All bodies of fresh water should be free at all times from any substances that will adversely affect aquatic life or waterfowl. | a | b | c | d | e |
| 10. Motor vehicles should be considered the worst single offender with reference to air pollution. | a | b | c | d | e |

11. Pollution, Ecology and Environmental Management are topics overplayed by the media. a b c d e
12. The Canadian water supply should be sufficient for many generations to come. a b c d e
13. Ecological considerations should be of first importance in implementing large scale projects such as the flooding of South Indian Lake in Manitoba. a b c d e
14. Farmers require fertilizers to get better crop yields and therefore they should not be held responsible for whatever chemical pollution may occur from the use of these fertilizers. a b c d e
15. Environmental studies should be a required course program for all high school students. a b c d e
16. Overcrowding and deteriorating conditions should be reason enough for families to move out of busy urban regions. a b c d e
17. The cost of disposing of a car should be included in the original purchase price of that car. a b c d e
18. Industry should be considered responsible for all the 'throw-away' containers that can be found littering our environment. a b c d e
19. Non-returnable containers should be banned from the market. a b c d e
20. Billboards should be removed entirely from the landscape because of the visual pollution that they contribute. a b c d e

APPENDIX C

DISTRIBUTION OF EXPERIMENTAL GROUPPRETEST AND POST TEST SCORES

<u>Score</u>	<u>Pretest Absolute Frequency</u>	<u>Pretest Frequency Percent</u>	<u>Score</u>	<u>Post Test Absolute Frequency</u>	<u>Post Test Frequency Percent</u>
53	3	1.0	49	2	0.7
54	3	1.0	52	2	0.7
55	4	1.4	54	2	0.7
56	1	0.3	55	1	0.3
57	4	1.4	57	4	1.4
58	11	3.8	58	2	0.7
59	7	2.4	59	7	2.4
60	7	2.4	60	7	2.4
61	11	3.8	61	3	1.0
62	19	6.5	62	4	1.4
63	19	6.5	63	12	4.1
64	13	4.4	64	13	4.4
65	22	7.5	65	15	5.1
66	31	10.6	66	22	7.5
67	22	7.5	67	23	7.8
68	25	8.5	68	24	8.2
69	14	4.8	69	14	4.8
70	27	9.2	70	19	6.5
71	16	5.5	71	13	4.4
72	9	3.1	72	14	4.8
73	5	1.7	73	23	7.8
74	6	2.0	74	15	5.1
75	7	2.4	75	9	3.1
76	3	1.0	76	11	3.8
77	1	0.3	77	10	3.4
79	2	0.7	78	8	2.7
82	1	0.3	79	4	1.4
	-----	-----	80	4	1.4
Total	293	100.0	81	4	1.4
			83	1	0.3
			85	1	0.3
				-----	-----
			Total	293	100.0

APPENDIX D

DISTRIBUTION OF CONTROL GROUPPRETEST AND POST TEST SCORES

<u>Score</u>	<u>Pretest Absolute Frequency</u>	<u>Pretest Frequency Percent</u>
49	1	0.8
55	1	0.8
56	1	0.8
57	1	0.8
58	3	2.3
59	7	5.5
60	6	4.7
61	7	5.5
62	4	3.1
63	7	5.5
64	4	3.1
65	12	9.4
66	16	12.5
67	11	8.6
68	9	7.0
69	7	5.5
70	6	4.7
71	10	7.8
72	4	3.1
73	1	0.8
74	8	6.3
75	1	0.8
76	1	0.8
Total	128	100.0

<u>Score</u>	<u>Post Test Absolute Frequency</u>	<u>Post Test Frequency Percent</u>
51	1	0.8
52	1	0.8
54	1	0.8
55	1	0.8
56	4	3.1
57	2	1.6
58	4	3.1
59	4	3.1
60	4	3.1
61	3	2.3
62	9	7.0
63	6	4.7
64	4	3.1
65	13	10.2
66	11	8.6
67	19	14.8
68	3	2.3
69	8	6.3
70	6	4.7
71	5	3.9
72	4	3.1
73	5	3.9
74	3	2.3
75	4	3.1
76	1	0.8
78	2	1.6
Total	128	100.0

APPENDIX E

COMPARISON OF STATISTICAL MEASURES
FOR PRETEST AND POST TEST SCORES
EXPERIMENTAL AND CONTROL GROUPS

	TREATMENT (N = 293)		NO TREATMENT (N = 128)	
	EXPERIMENTAL PRETEST	EXPERIMENTAL POST TEST	CONTROL PRETEST	CONTROL POST TEST
Mean	66.017	68.976	65.922	65.742
Median	66.226	68.750	66.125	66.136
Mode	66.000	68.000	66.000	67.000
Standard Deviation	5.097	6.085	4.871	5.437
Standard Error	0.298	0.355	0.431	0.481
Variance	25.976	37.023	23.726	29.563
Kurtosis	0.083	0.343	0.097	-0.117
Skewness	-0.134	-0.327	-0.336	-0.216
Minimum*	53.000	49.000	49.000	51.000
Maximum*	82.000	85.000	76.000	78.000
Range	29.000	36.000	27.000	27.000

*Total possible score = 100