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ENERGY INFORMATION CLASSROOM EXPERIMENT: A MEASURE OF STUDENT BELIEFS AND ATTITUDES

By

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ABSTRACT

ENERGY INFORMATION CLASSROOM EXPERIMENT:
A MEASURE OF STUDENT BELIEFS
AND ATTITUDES

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The purpose of this study was to assess the effectiveness of information, presented in a college classroom experience, in altering energy beliefs and attitudes. Specifically, it attempted to examine the energy beliefs and attitudes of selected juniors and seniors enrolled in either the second or third of three Core Courses in the College of Human Ecology, Michigan State University, during Spring Term, 1978. Those students enrolled in HEC 301, "Management and Decision-Making in the Family," were members of the control group; those enrolled in HEC 401, "Energy and the Designed Environment," were members of the experimental group.

Self-administered questionnaires, designed to measure energy beliefs (three questions) and attitudes (31 questions on three scales), were given to both groups on the first day of class (Time I). The experimental group then received energy information throughout their ten week

classroom experience, while the control group received no energy information through their classroom experience during the same period. At the end of the term, questionnaires, identical to the pretest, were again given to both groups (Time II).

Frequencies and t-tests of mean differences were used to test four null hypotheses at a significance level of .025.

At the beginning of the term (Time I) students in both groups were found not to be significantly different in either energy beliefs or on two attitude scales: Human Responsibility and Life Style Flexibility. Although there was a significant difference in the third attitude scale, EcoAwareness, it resulted from differences on only two of the 11 questions within the scale.

Using the pretests as a benchmark, the students in the control group, HEC 301, did not show a significant difference on any measure between the beginning and end of the 1978 Spring Term (Time I, Time II). The experimental group, HEC 401, however, did show a significant difference in their energy attitudes on the EcoAwareness Scale and a meaningful difference on the Life Style Flexibility Scale between the pre- and posttests (Time I, Time II). There was also a meaningful increase in belief in the energy crisis in the near future by the HEC 401 students.

At the end of the term (Time II), a significant difference was found between those who did receive energy information (experimental group, HEC 401) and those who did not (control group, HEC 301) on the EcoAwareness Scale. On the Human Responsibility Scale and the Life Style Flexibility Scale no significant difference was found in attitudes. The two groups did, however, move farther apart in their expressed attitudes with the experimental group expressing more positive attitudes on these two scales. There was no significant difference between groups in their energy beliefs.

Study conclusions suggest that an experimental classroom experience, structured from an ecosystem perspective, can be a useful method for altering college students' perceptions of and attitudes towards the energy situation.

To

Doris and Eggie

who taught me the

value of human energy.

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I wish to thank my committee members who have challenged and supported me throughout this endeavor. Both Dr. Joanne Keith and Dr. Barbara Ames have helped make this research project a valuable learning experience.

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INTRODUCTION

> Americans have suddenly awakened to find themselves in the midst of an "energy crisis"--a cliche term that generally oversimplifies the most important, hopeful, complex, and controversial environmental problem we face.
>
> Miller (1975, p. 215)

The Supply of Fossil Fuel Energy Forms

It is generally agreed, in both the private and public sectors, that world energy forms, especially petroleum based fossil fuel energy supplies, are rapidly decreasing. The supplies of petroleum and other fossil fuels are finite; they are, for all purposes, nonrenewable resources.

The geological time unit for their formation is one hundred million years; several of these time units are required to form today's fossil fuels resources. The mathematics of withdrawing these petroleum supplies from fixed resources is uniform exponential growth. Each time the rate of withdrawal doubles, the total amount taken from the beginning also doubles. It took mankind one hundred years to withdraw the first one hundred billion barrels from United States fossil fuel resources, on a growth rate of 4 percent increase per year. At this rate, it will take only eighteen years to withdraw another two hundred billion barrels (Dix, 1977).

The United States was the primary world supplier of petroleum for the first one hundred years of production. Its dominant position in supplying the world market continued through World War II, but this is no longer the case. Petroleum production in the United States has been decreasing since the early 1970s (M.S.U. Extension Bulletins E-1100 and E-1173; Dix, 1975). Consequently, dominance of production has shifted to other parts of the world, primarily the Middle East and Central and South America.

World supplies of petroleum based fossil fuels, however, are also rapidly decreasing. In about 60 years, almost 80 percent of the world's crude oil will be depleted, and using coal as an alternative energy form will force its world production level to peak sometime between 2100 and 2200 A.D. (M.S.U. Extension Bulletin E-1173). Clearly, the world is on the decline side of fossil fuel energy supplies.

The Demand for Fossil Fuel Energy Forms

While the stores of fossil fuel energy supplies are decreasing, the world demand for them is increasing. World energy consumption has increased nearly 600 percent between 1900 and 1965 and is projected to increase another 450 percent by the year 2000 (Miller, 1975). This is primarily due to both population growth and technological advances in both developed and undeveloped nations. Former Secretary of the Interior, Stewart L. Udall (Udall, 1973, p. 35) states:

> World oil consumption is now so enormous that during the decade between 1970 and 1980 the nations of the world are projected to consume as much oil as was used in the hundred years between 1870 and 1970.

Miller (1975, p. 216) adds:

> Coal has been mined for 800 years, but over one-half of it has been extracted in the past 37 years. Petroleum has been pumped out of the ground for about 100 years, but over one-half of it has been consumed during the past 18 years.

In other words, most of the world's consumption of energy from fossil fuels throughout all history has taken place during the past four decades.

The vast majority of this energy has been, and is, consumed by industrial nations which have only 30 percent of the world's people yet use 80 percent of the world's energy. The United States, with only about 6 percent of the world population accounts for over 30 percent of the world's annual consumption of energy forms. About 95 percent of all energy used in the United States is based on the fossil fuels: coal, oil and natural gas (Miller, 1975; Stein, 1977; M.S.U. Extension Bulletins E-1100 and E-1173).

Based upon current technologies, it appears that the epoch of readily available, inexpensive supplies of fossil fuels will probably be over in the world between 2015 and 2030 and in the United States by 1990 to 2015, if not sooner.

Educational Implications of the Energy Situation

The decreasing supply of fossil fuel energy forms coupled with the increasing demand for them has escalated energy costs at a staggering rate. Although this escalation is occurring on the world market, the greatest impact may be felt in the United States where the economy has historically been built on readily available, inexpensive energy supplies.

In spite of these rising costs, it has been estimated that over 50 percent of the energy used in the United States is wasted. Although some energy is naturally wasted, according to the second law of thermodynamics, there are estimates that this nation's energy waste could be reduced by 33 to 50 percent. This reduction could be accomplished without a loss in quality of life, through a national energy awareness and conservation effort based on existing technology (Anderson, 1977; Hirst and Moyers, 1973; Makhigani and Lichtenberg, 1972; Office of Emergency Preparedness, 1972).

Stein (1975) points out that we have become accustomed to the idea that we can do anything, that our resources can last forever, that it is simpler to discard something than to keep it in good operating condition--even desirable to throw it away as a stimulus to the national economy. He suggests further that:

> When we find that presupposed growth is not possible and would be destructive even if it were possible, we must then dismantle the ideology that justifies

> the conclusions and establish a set of attitudes and expectations that respond to the necessities of the real world.

As the United States moves from "finding the cause" phase to "finding a solution" phase in the energy situation, individuals, as citizens, must realize that they will have to make decisions as to personal energy beliefs and attitudes, and to a probable reallocation of personal resources to adapt to the reduction in inexpensive, available energy forms. Individuals, as professionals, must also be able to knowledgeably guide those with whom they interact towards energy conservative beliefs, attitudes and behavior patterns.

Education--information flow--is a factor in this process. Zuiches ("Household Energy Conservation," 1976) states that the primary factor in increased energy awareness and energy conservation is education. McKenna (1978) adds, "How the energy situation is perceived depends on the information available . . . ."

It is therefore necessary to evaluate the degree to which education can influence energy conserving beliefs and attitudes, and consequently energy conservative decision-making behavior patterns.

Ecological Implications of the Energy Situation

At this point, it is important to remember that the question of energy availability is not an isolated issue. World, and especially United States, dependence on a high rate of energy flow and energy waste raises multi-dimensional and interconnected questions on ecological, economic, political and moral planes. Energy seems to be a crisis of crises (Platt, 1969).

It is necessary, therefore, that an examination of the issue of energy include the interrelationships of Man and his environments. The natural, man-built and behavioral environments must be considered together as they stem from the same set of interconnected factors (Morrison, 1974; Stein, 1977).

Conceptual Framework

Concepts are working tools, embodying the important ideas of a field of study. They are mental images of what is known, thought, and felt about an idea. Conant (in Compton, 1972) defines a science as "an interconnected series of concepts and conceptual schemes." It is from such a body of relationships among variables that theories are built. Kerlinger (in Compton, 1972) defines a theory as "a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting the phenomena."

In the development of this research, several major theories were deemed to be particularly relevant. The first is structured on the human ecological or ecosystems perspective which emphasized the relationships among Man, other species, and their physical or natural environment. Because Man is also a social and cultural being, this theory also seeks to integrate the scientific, behavioral, sociological, political, economic, and ethical factors as they relate to Man and his environment. Within this arbitrary, definitional boundary, then, Man's life is supported by the input and output flows of energy and materials (Deevey, in Miller, 1975).

A second important concept looks at environmental Man as a learning being. What distinguishes him from other living species are both his unique biobehavioral properties and his unusual capacity to learn, in other words, his ability to modify his behavior in response to a changing environment. Although all complex organisms learn to some degree, the nature and level of Man's learning capacity sets him apart from other animal species. His ability to learn, coupled with other cognitive processes, has helped him to build his own environment. Each new environment he creates evokes new responses, new interactions, and new problems, which then lead him to build other, more complicated, if not more advanced, environments (Ittelson et al., 1974).

The final concept upon which this study is based involved the integration theory of learning. Anderson (1970) points out that learning is a function of receiving new information and integrating it with present knowledge.

He further states that the conditions under which new information is received and processed (how a person combines messages to form an overall impression) will affect the formation of any new attitudes.

Given this conceptual framework, the questions are formulated: Can Man, through acquisition of new information, form new attitudes that will lead towards a more energy efficient ecosystem? Can he, as a learning species, alter his energy consumption behavior patterns to adapt to a more energy restrictive environment? It is towards the first of these two questions that this research is directed.

Research Problem

Problem Statement

In the years since the 1973-74 Oil Embargo, studies have been initiated on a variety of energy related issues. Very few of these studies, however, have been directed towards developing effective methods of delivering energy information to college students working towards professional degrees. It can be rationalized that this information would be assimilated and incorporated into their future professional, as well as private lives and thus have a multiplier effect upon energy conservation beliefs and attitudes.

Research is vital in this area. It must be directed not only towards changing the private, personal energy beliefs and attitudes of the professional student, but more importantly, in developing a whole new professional awareness for incorporating energy conservation in daily professional practices--reaching beyond self--toward an energy conserving value in American society. This research is within this frame of reference.

Research Objective

The purpose of this research was to assess the effectiveness of energy information presented in a college classroom experience, in altering attitudes and beliefs about the energy situation. Specifically, the researcher examined the beliefs and attitudes of Michigan State University students enrolled in HEC 401, "Energy and the Designed Environment," as the experimental group, and those enrolled in HEC 301, "Management and Decision-Making in the Family," as the control group during Spring Term, 1978. Their attitudes and beliefs were expressed in questionnaires which were administered at Time I (prior to the delivery of course content) and Time II (immediately after the delivery of course content).

Definitions

Discursive Definitions

The following definitions are relevant to this study.

Energy Conservation--technology and behavior patterns which save energy as well as maintain a quality way of life.

Energy Information--information on various facets of the energy situation presented to the college students through their classroom experience during the Spring Term, 1978.

Classroom Experience--participatory activities of the college students including listening to lecture presentations, reading of assigned materials, development of an energy project, and completion of three synthesis examination papers.

Fossil Fuel Energy--energy derived from world supplies of coal, oil, and natural gas.

Operational Definitions

Energy Belief Items--three items that measure personal belief in a national energy problem at three points in time: (1) when the questionnaire was administered; (2) within the following five years; (3) the distant future (1985-2000).

Energy Attitude Scales*

Eco-Awareness--a measure containing 11 items that taps three principle dimensions: (1) the

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*A set of four scales, which measure attitudes related to energy, was developed by Peter M. Gladhart at Michigan State University (Gladhart, 1978). This study employs three of these scales. They appear in their seriousness of the energy problem compared to crime, inflation and unemployment; (2) the finiteness of fossil resources; and (3) the interrelatedness of the economic system and the energy based human support system.

Human Responsibility--a scale containing six items reflecting the degree of personal responsibility that individuals feel for helping to solve the energy problem.

Life Style Flexibility--a measure which contains 14 items reflecting the willingness of the respondent to adapt his/her lifestyle to new circumstances. It is a continuum which suggests willingness to pay for retrofitting to solar energy at one end, to the desire to pay more in order to maintain the temperature beyond 68° in the wintertime, at the other end (Gladhart, 1978).

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entirety in Appendix C. A fourth energy scale, Ease of Cutting Back, was not used in this research.

CHAPTER II

REVIEW OF LITERATURE

In the six years since the beginning of the Oil Embargo, studies have been initiated on a variety of energy related issues. Primarily, these studies have surveyed people about their energy beliefs, attitudes, or perceptions, and they have attempted, experimentally, to alter people's energy behavior. Few studies have examined the impact of education on energy beliefs and attitudes, although researchers have suggested that energy education is an important factor in changing consumption practices.

In this chapter, the discussion will focus on the following:

1. Energy Attitude Surveys
2. Experimental Studies on Educational Information Methods of Changing Attitudes
3. Experiments in Energy Behavior: Cognitive Methods
4. Energy Education in the Schools
5. Experimental Attitudes Studies Relating to Behaviors

Energy Attitude Surveys

Surveys are often used as an index of Americans' beliefs and attitudes on specific issues. They are data-gathering tools to furnish descriptions of specific attitudes.

Just prior to the Oil Embargo, in the Summer of 1973, the National Research Center found that only about 25 percent of those polled believed energy was the number one problem facing Americans at that time. Most did consider it an important problem, however. Those who expressed a belief in the importance of the energy problem also reported more changes in lifestyles and a reduction in driving than those who did not express a belief in the problem (Murray, 1974).

In a 1974 survey of students at Michigan State University, nearly 50 percent identified energy as a "problem," and 22 percent identified it as a "shortage." Only 13 percent of the students thought of energy as a "crisis," however (Bugge, 1974).

A 1974 Michigan State University Family Energy Project[1] study of 216 families indicates that about 50 percent of those surveyed believed there was an energy problem. Fifty percent also indicated that they did not believe it was an immediate crisis, although 30 percent of

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[1]The study is entitled, "Functioning of a Family Ecosystem in a World of Changing Energy Availability," AES Project #3152.

the latter group did expect it to be a critical issue in the following five or ten years (Zuiches, "Acceptability of Energy Policies," 1976).

The following year, 1975, Cunningham (1977) found that 97 percent of those surveyed either strongly agreed or agreed with the statement, "The United States currently has an energy problem" (42 percent strongly agreed; 45 percent agreed). When asked if they thought there would be a serious energy problem in the next five years, almost 90 percent of the sample replied affirmatively. When asked about the existence of an energy problem in the next 20 years, 75 percent of those surveyed replied they thought there would be an energy problem.

In 1976, a second Michigan State University Family Energy Project study was completed which was designed to restudy as many of the 216 families mentioned in the 1974 Zuiches study as possible (Morrison et al., 1978). The 1976 study included 129 reinterviewed families (59 percent of the 1974 families) and 130 new families (total of 259 families). When the data from these two studies was compared, it was found that:

> Although overall belief in the reality of the energy problem declined slightly from 1974 to 1976, approximately 50 percent of the sample for both 1974 and 1976 reported a belief in the energy problem.

Like Cunningham, the Morrison et al. study also measured speculative belief in the energy problem in the near future (next five years) and distant future (1985-2000).

Belief in the energy problem increased with time when defined from the time of the study to the future. About two-thirds of the respondents believed that there would be an energy problem in the future.

A study by Brunner (1977) found that energy attitudes did not change significantly between 1974 and 1975. In 1974, 62 percent of the sample either "strongly agreed or agreed" that there was an energy problem; that figure increased slightly to 65 percent in 1975.

In a baseline survey for a two year longitudinal study at Grand Valley State College, 63 percent of those interviewed strongly believed that the United States does have an energy problem and 66 percent strongly believed there will be an energy problem in the future (Thompson and MacTavish, 1976).

Olsen and Goodnight (1977) conclude from survey findings that a majority of Americans have a general understanding of the basic energy situation. At least half believe the energy problem is real, now or in the future. Findings vary, depending on the wording of the questions and the time of the survey but, in general, surveys indicate that anywhere between 38 percent and 64 percent believe that the country faces a long-term energy problem (Leedom, 1978).

Peoples' perceptions about an energy problem shift through time. It is important to keep in mind that a factor in this shift is that energy is an integral part of the

American lifestyle. It is totally interrelated and inseparable from other areas of life. Therefore, peoples' expressed beliefs or attitudes about energy will be influenced by energy costs, national economic conditions, national and international political situations, and their past socializations and future expectations. The variability of the various survey results is thus understandable.

Education Level and Energy Beliefs

Studies have found a positive relationship between the level of education of the respondents and the belief in an energy problem. In a study of energy beliefs of Michigan families, Morrison et al. (1978) found that 60 percent of those in the higher education group (more than high school) believed there was an energy problem in comparison to 34 percent for the lower educated group (high school or less). The Zuiches Study ("Acceptability of Energy Policies," 1976) separated the respondents by sex as well as education level. Eighty percent of the female college graduates believed there was an energy crisis and 76 percent of the male college graduates believed the same. In comparison with those who had completed only 11 or fewer years of school, only 51 percent of the females and 33 percent of the males acknowledged there was an energy problem.

In Brunner's study (1977), the proportion of respondents that expressed "concern" about the energy situation rose with the education level, from 43 percent of those with eighth grade or less education to 82 percent of those who were college graduates.

Thompson and MacTavish (1976), in their baseline survey designed to assess the impact of public education on energy related concerns, found that the percentage responding "yes, there is an energy problem," generally increased with increasing educational level and conversely, the percentage responding "no, there is not an energy problem" declined with increasing educational level. Stearns (1975) also reports that better-educated households consider the energy problem as more important.

Cunningham (1975, p. 20) summarizes the interrelationships between education level and perceptions of the energy situation when he states:

> The issue of education then leads to more specific concerns: knowledge of energy matters as agents of change as well as the use of information sources.

Experimental Studies on Educational Information Methods of Changing Attitudes

Heitzman (1976) believes that educators are becoming increasingly aware of and concerned with the dimensions of affective learning; that is, with the effect of lessons on the attitudes, beliefs and value of students. Megar (1976) supports this belief and further states that it is the universal objective of teachers to send students away from instruction with at least as favorable an attitude toward the subject as they had when they first arrived.

Educational awareness is an important concept in any efforts to present energy information to the public, in general, and students, in particular. The following studies indicate that information, presented in an educational experience, can be a factor in changing students' attitudes and behaviors.

Fisher (1968) looked at the influence of information (reading and discussion) on attitudes of fifth grade students toward American Indians. Students were given an attitude pretest to determine whether, and to what extent, they were prejudiced towards American Indians. They were then assigned by classrooms to one of three treatment conditions over a three week period: (1) readings favorable to American Indians only; (2) favorable readings and discussions; (3) neither readings or discussions. At the end of the study, the three groups were given the same attitude test as a posttest. Significant reductions in prejudice were found in both experimental treatment groups suggesting the information presented was influential in altering students' attitudes. The group with reading and discussion showed more change in attitude than the group doing reading alone.

A similar study on attitude change was conducted by Litcher and Johnson (1969) using multiethnic readers over four months. They manipulated two groups of students: an experimental group which used multiethnic readers containing positive information about Black Americans and a control group which used regular readers. Their experimental procedure required students to be given identical attitude pretests and posttests. Based on the findings, the researchers concluded that students in the experimental group responded more favorably to minorities than the control group. That is, the information favorable to minorities was a factor in attitude change and a potential instrument to reduce racial prejudice.

Howie (1974) extended the process of information presentation to an outdoor classroom experience. He randomly assigned students to one of four groups. Three of the groups received information about the natural environment in various combinations of classroom and outdoor treatments. The fourth group received no environmental education. The posttest instrument consisted of 30 attitude questions drawn from concepts basic to environmental education. In every item, students who received one of the three treatments scored significantly higher than those in the control group.

Another study of the impact of environmental education (Asch, 1975, p. 32) concluded that:

> . . . children exposed to a formal program of environmental education can demonstrate, in a natural setting, more conservational behavior than a control group, and less destructive behavior.

Although the broad question of change in attitudes has not been extensively researched in education (Bloom et al., 1971; Kahn and Weiss, 1973; Ringness, 1975), the following studies suggest several factors which may influence students' overall expressed attitude change.

A positive relationship between students' attitude towards a specific subject and achievement in that subject has been confirmed in a large number of studies (McMillan, 1979). Researchers have stressed the importance of developing positive attitudes of students toward the subject matter they study (Bloom et al., 1971; Kahn and Weiss, 1973; Ringness, 1975) although little relationship between pupil attitudes toward school, in general, and scholastic success in specific subject areas has been found (McMillan, 1977).

Effect of Message Repetition on Attitude Change

Most research on attitude change employs only a single message repetition. This paradigm, however, differs from the manner in which students are typically exposed to persuasive subject material. In this era of mass communication, advertisers have long recognized the impact of repeatedly using identical or similar messages to influence peoples' attitudes towards specific products. Laboratory research investigating the effect of differing frequencies of message presentation have produced some important findings.

When testing effects of repetition of a persuasive message on attitude change, Johnson and Watkins (1971) found that repetition only facilitates attitude change when the message is not easily understood on the first presentation. Ostrem (1972) suggests that people will be more attentive to the message if it contains information which is new to them. He further states:

> When similar rather than identical stimuli are employed, repetition does result in an increasingly positive evaluation immediately following presentation (p. 38).

The suggestion that repetition can influence immediate attitude change is also supported by the Johnson and Watkins study (1971). In addition, the study reports that the respondents' attitude change had decayed considerably over time (two and one half months after initial testing) and that at the second testing there was no difference between those who received the message one time and those who received it repeatedly.

Effect of Praise, Effort and Quantity of Information on Attitude Change

After studying four undergraduate university classes, McMillan (1977) concluded that students will devel- develop more positive attitudes towards subject matter if they receive high praise comments from their instructors and if they complete assignments that require a high amount of effort on their part.

In a study of 454 high school students, Cohan (1973) reported that students with more environmental information had more favorable environmental attitudes and were also more willing to express them than those who received less environmental information. It is also postulated by Anderson (1970) that attitudes are a function of the accumulation and amount of favorable information, and that factors such as order and importance of information are independent of the evaluative process and thus will not interact with them.

While the results of these studies do indicate that information can be a factor in attitude change, caution should be used in placing an overreliance on information alone to alter attitudes. Kirchner and Wilder (1959) point out that attitude change does not rest on the basis of information alone; a more significant determinant is the nature and degree of the students' involvement with the subject area.

Experiments in Energy Behavior: Cognitive Methods

Most experimental studies that have been done in energy conservation have occurred in the years since the Oil Embargo. A number of these studies have used information or feedback in an effort to convince people of the seriousness of the energy problem and/or to have them adopt favorable conservative attitudes and behaviors. While such treatments are akin to education, none were conducted in the formal educational system.

To clarify, the studies reviewed are divided into two broad areas:

1. Studies using only information or feedback as a treatment condition.
2. Studies using information or feedback plus incentives as a treatment condition.

Experimental Studies Using Only Information or Feedback

An early attempt at using information to alter energy consumption was designed by Heberlein (1975). The first study was conducted in the Spring of 1973 after energy information had been mailed to 96 residents in a Madison, Wisconsin apartment complex. A follow-up study was conducted a year later at the same complex following the Oil Embargo. Both studies indicate that no significant change in electricity consumption occurred as a result of either the presented information or the embargo.

Seligman and Darley (1976) looked at the effects of four consumption feedback techniques on the use of home air conditioning by residents in a Planned Unit Development in Twin Rivers, New Jersey. The studies indicate that feedback can be an effective method for energy conservation and that feedback is more successful with moderate users than with high users of electricity.

In another feedback experiment, Palmer et al. (1977) concluded that information on daily electric consumption was sufficient to affect a decrease in the amount of electricity used by three out of the four households studied. Generalization of this study is restricted, however, due to the small sample size.

There have been several studies which have added variables to the feedback or information used as a treatment condition. Hass (1975) examined the effect of two information variables, the magnitude of noxiousness of a potential energy crisis and its probability of occurrence, on respondents' perceptions of the energy problem. Increases in the perceived likelihood of an energy shortage had no effect, but increments in perceived noxiousness or severity of an energy crisis strengthened the respondents' intentions to reduce energy consumption. The researchers therefore concluded that energy information should stress the severity of the problem. In a replication, Wasco et al. (1976) supported these findings.

Hutton (1977) used both feedback and goal setting as treatment conditions. The group that set a goal of reducing energy consumption by 20 percent and who were given daily weather-corrected feedback, significantly reduced their energy consumption by 13.4 percent.

In a 1977 follow-up to the 1974-76 Michigan studies, Zuiches et al. (1978) experimentally tested alternative energy conservation programs using three kinds of information[1] and two methods of delivery.[2] Findings indicate that

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[1]The information consisted of (1) government pamphlets concerning energy conservation; (2) computerized energy audit of the housing unit; (3) infrared heat loss pictures of the dwelling unit and an interpretation of the picture.

[2]Delivery methods were either personal visits or the postal system.

the effect of information on attitudes was to increase the belief in the reality of the energy problem. This was especially evident in the group who received their information by personal visits; they expressed a 77 percent belief in the energy problem as compared to 65 percent of the group who received no information at all. Data also indicated that all treatment groups made a greater attempt than the control group to maintain lower thermostat settings. These findings suggest, then, that personalization of information can alter energy perception.

Experimental Studies Using Information or Feedback Plus Incentives

Some other completed studies have approached the issue of energy conservation from the perspective of combining information and incentives.

The effects of monetary incentives and of information alone on energy conservation behavior was examined by Winett and Nietzel (1975). The incentive group averaged approximately 15 percent more reduction in electricity use than the information group, which averaged about 8 percent. This trend was maintained in two week and two month follow-ups. Kagel et al. (1976) performed a replication of this study but found that only a high price rebate condition reduced consumption and this reduction was quite small (5 to 8 percent). Support for the Kagel finding comes from Battalio (1976) who reported that although electricity use did decline with monetary incentives and information, the reduction was not large relative to the size of the price rebates.

Kohlenberg (1976) looked at efforts of information, feedback and monetary incentives on the electric peaking behavior of families in Seattle during the winter months. He found that a combination of feedback plus incentives worked most effectively, reducing peak electricity consumption by about 50 percent. In a similar experiment, Seaver and Patterson (1976) assessed two methods of facilitating fuel oil conservations in Pennsylvania households. They found that feedback plus commendation provided the greatest decrease in fuel consumption.

Investigating the effects of payments, information and feedback on electricity consumption, Hayes and Cone (1977) reported that, in general, combinations of payments and either information or feedback were found to produce no greater effects than payment alone.

These studies indicate that, generally, the information or persuasion approach is the least effective method of producing a change in energy attitudes or behaviors. They further suggest that incentives, especially monetary incentives, are the most effective in promoting at least short-term behavioral change. Reviews by Tuso and Guller (1976), Olsen and Goodnight (1977) and Leedom (1978) support these conclusions.

Energy Education in the Schools

Recognizing that a change in energy attitudes and behaviors cannot even begin to occur without some information, elementary and high schools are beginning to include some aspects of energy education as part of their curricula (Leedom, 1978). However, this approach is very recent and is still in its early development stages.

McKenna (1978) concludes that families view the energy information received by their children at school as useful and reported that the "students were using less energy at home because of information learned at school." Stevens et al. (1979) adds that energy conservation units taught in high school classes and task-oriented instruction techniques have a significantly positive impact on student energy conservation attitudes and actions.

Although the impact of energy education in schools has been studied to a limited degree, there are a number of studies which conclude that environmental information has an impact on environmental attitudes and behaviors (Leedom, 1978). Since many of the principles of environmental education can also be applied to meet the needs of energy education, this conclusion is important. Environmental education is ". . . intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life" (U.S. Government Printing Office, 1971, p. 5).

This intent can be directly applied to the energy situation.

Experimental Studies Relating Attitudes to Behaviors

Lounsbury (1973) cautioned that a great difference often exists between environmental attitudes and environmental behaviors. With the issue of energy, favorable attitudes are not enough if they do not lead to conservation behaviors.

Some evidence is offered that, indeed, energy attitudes do play a role in energy consumption behavior (Brunner, 1976; Curtain, 1976; Murray, 1974; Zuiches, "Household Energy Conservation," 1976). Other evidence is offered that indicates people often express attitudes favorable to energy conservation yet behave in a conflicting manner (Milstein, 1977).

Further evidence indicates that attitudes and behaviors, in general, are not necessarily related (O'Riordan, 1976; Wicker, 1969; Zimbardo and Ebbesen, 1969). In a review of studies, Wicker (1969) concluded that only about 10 percent in overt behavioral measures can be accounted for by attitudinal data. Care must therefore be exercised in not automatically implying favorable energy conservation behavior from favorable energy conservation attitude data.

CHAPTER III

METHODOLOGY

The methodology described within this chapter include:

1. Description of the Sample Population
2. Selection and Description of the Sample
3. Research Methodology
   a. Methodology Selection
   b. Questionnaire Development
   c. Distribution and Collection of Pretest Questionnaires
   d. Introduction of the Independent Variable
   e. Distribution and Collection of Posttest Questionnaires
   f. Processing of Data
4. Statistical Procedure
5. Research Hypotheses
6. Assumptions
7. Limitations of the Study

Description of the Sample Population

This study focuses on the effects of energy information, presented in a classroom experience, on the energy beliefs and attitudes of selected undergraduate students enrolled at Michigan State University during the ten week Spring Term, 1978.

Founded in 1855, Michigan State University is the second largest state university in the state of Michigan and is located in the south-central section of the state, within the greater metropolitan Lansing area. During the Spring Term, 1978 (March 30 through June 9), Michigan State University had a total enrollment of 39,897, of which 32,127 were undergraduates in the university's 17 colleges.[1] One of these colleges is The College of Human Ecology. Its programs use an ecological or systems approach developed to study the interrelationships between individuals and families and the environmental support systems.

In addition to the general education requirements of the university and the major education requirements of each of the four departments within the college (Family and Child Sciences, Family Ecology, Food Science and Human Nutrition, and Human Environment and Design), all human ecology students are required to enroll in a Core Studies Program consisting of three courses. These courses include: (1) The Family in Its Near Environment, which is usually taken during the sophomore year, (2) Management and Decision-Making in the Family, generally taken during the junior year, and (3) Human Ecological Approach to Contemporary Issues, taken during the senior year (issues vary each term).

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[1]Office of Registration; Hannah Administration Building, Michigan State University.

Selection and Description of the Sample

The subjects selected for this research were all juniors or seniors enrolled in the College of Human Ecology, Michigan State University during Spring Term, 1978. They were all enrolled in either the second or third of the three Core Courses in the college. Those enrolled in the third Core Course, HEC 401, "Energy and the Designed Environment," were members of the experimental group; those enrolled in the second Core Course, HEC 301, "Management and Decision-Making in the Family," were members of the control group.

Table 1 summarizes the enrollment in the College of Human Ecology during Spring Term, 1978 by departments within the college. It also indicates the enrollment in HEC 301, "Family-Decision Making" (control group), and HEC 401, "Energy and the Designed Environment" (experimental group), according to departments.

Selection and Description of the Subsample

The subsample for this study was selected from the larger sample on the following criteria:

1. Enrollment in either HEC 401 or HEC 301 for the entire Spring Term, 1978;[1]
2. Completeness of research data.

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[1]Six students were simultaneously enrolled in HEC 401 and HEC 301 during Spring Term, 1978. The data from their questionnaires was therefore rejected and not used in this study.

Table 1.--College of Human Ecology Enrollment, Spring Term, 1978.

Departments in College	Total Undergraduates	HEC 401	HEC 301
Family & Child Sciences	265	27	27
Family Ecology	262	16	15
Food Science & Human Nutrition	388	34	34
Human Environment & Design	921	98	97
Total	1836[a]	175*	173**

*Total HEC 401 enrollment was 179; four students were from colleges other than Human Ecology.

**Total HEC 301 enrollment was 179; six students were from colleges other than Human Ecology.

[a]Total undergraduate enrollment = 1837, one student was in a nondegree and no major program.

Total enrollment for College of Human Ecology = 2067 including masters and doctoral students.

These criteria reduced the subsample size from 175 students to 67 students in the experimental group and from 173 to 64 students in the control group. The total subsample size was 131. The large attrition rate can be attributed to the time and method in which the posttest was administered. The posttest was given to students on the last day of class, along with the final examination. Both were to be taken home, completed, and returned to the instructors' offices within a specified time period. Since many of the students neglected to return the questionnaire with the final examination, there was a lack of across-time data for almost half of the students in each class.

To better understand the socio-economic characteristics of the subsample, the following tables are presented. Table 2 indicates that a majority of both the experimental group (68.7 percent) and the control group (74.7 percent) come from what could be termed smaller families (four or less). The relatively high percentages of the totals in both groups in the one to two person category may be explained by students who are married or students who are single and have established households separate from their families' (parents').

The overall yearly family income for both groups appears to be relatively high (see Table 3). Over half of the students' families earned more than $20,000 per year (59.7 percent, HEC 401--experimental; 55.2 percent, HEC 301--control). About 45 percent of the experimental group

Table 2.--Total Number of Persons in Students' Family Home.

Size of Family	HEC 401 Percent	HEC 301 Percent
1-2 persons	23.9	21.9
3	19.4	15.6
4	25.4	17.2
5	10.4	26.6
6	7.5	7.8
7	7.5	4.7
8 or more persons	3.0	4.7
No response	3.0	1.6
	100.0 (N = 67)	100.0 (N = 64)

Table 3.--Yearly Income of Students' Families.

Income	HEC 401 Percent	HEC 301 Percent
Under $5000	1.5	1.6
$5000-$9999	3.0	4.7
$10,000-$14,999	10.4	6.3
$15,000 - $19,999	10.4	20.3
$20,000 - $24,999	14.9	15.6
$25,000 or more	44.8	40.6
No response	14.9	10.9
	100.0 (N = 67)	100.0 (N = 64)

and 11 percent of the control group come from families with incomes over $25,000 per year.

The Ford Foundation Energy Policy Report (1974) classifies families earning more than $20,000 yearly as "upper" and those earning more than $25,000 yearly as "well off."

The predominant type of family dwelling unit in the subsample was the single family: 82 percent for the experimental group and 91 percent for the control group (see Table 4). Very few of the students lived in what may be classified as apartments (4.5 percent, experimental; 6.3 percent, control).

Table 4.--Type of Family Dwelling Unit of Respondent.

Dwelling Type	HEC 401 Percent	HEC 301 Percent
Single family	81.5	90.6
Duplex	4.5	1.6
Fourplex	1.5	0.0
Multi-family (5-10 apts.)	3.0	6.3
High Rise (10-40 apts.)	1.5	0.0
No response	4.5	1.6
	100.0 (N = 67)	100.0 (N = 64)

Table 5 indicates that most members of both the experimental and control groups live in urban centers.

Table 5.--Location of Students' Family Dwelling Unit.

Location	HEC 401 Percent	HEC 301 Percent
Farm	1.5	4.7
Country/Nonfarm	1.5	3.1
Village (under 10,000) or town	22.4	20.3
Small City (10,000-50,000)	23.9	12.5
Medium City (50,000-500,000)	28.4	29.7
Large City (over 500,000)	19.4	28.1
No response	3.0	1.6
	100.0 (N = 67)	100.0 (N = 64)

Almost half of the experimental group (48.8 percent) come from homes in medium to large cities while 57.8 percent of the control group comes from medium to large cities. Percentages for both groups drop somewhat in the combined categories of village/small town and small cities (46.3 percent, experimental; 32.8 percent, control). The highest representation comes from medium sized cities (28.4 percent, experimental; 29.7 percent, control).

Research Methodology

Methodology Selection

As previously stated, the purpose of this study is to determine if energy information, presented in a classroom experience, has an effect on the energy beliefs and attitudes of selected college juniors and seniors. Therefore, the experimental research design was chosen as an appropriate methodology for testing any change in these beliefs and attitudes.

A pretest/posttest format was chosen as the research approach for this study. Rotzel (1974) states that the objective of using the pretest/posttest approach in education research has been to investigate some of the structural factors of curricula materials which are thought to affect attitude change. The basic methodological assumption is that attitude change can be attributed to the effects of content stimuli by measuring a student's predispositions on a pretest and the effects of treatment presentation on a posttest.

Campbell and Stanley (1963) support this approach for experimental designs which lack optimal control but are worth undertaking where better designs are not possible.*

Questionnaire Development

For this study, self-administered questionnaires using close-ended questions were developed. Although there are some objections to the use of questionnaires to gather data (Galfo, 1965), they are generally accepted as a reliable source of data gathering (Heimsath, 1977). According to

*Campbell and Stanley developed the term "Pre/Post, Quasi-Experiment Test Approach" to describe such procedures.

Compton (1972), the use of a self-administered questionnaire is an efficient method to collect data on many variables from a large sample.

One questionnaire was used as the pretest for both the experimental and control groups. The questions were designed to establish:

1. Students' belief in and awareness of the energy situation

2. Students' attitudes related to energy use

The second questionnaire was used as the posttest for both the experimental and control groups. It contained questions identical to those in the pretest; in addition, the posttest asked questions concerning:

1. Students' demographic information

2. Students' evaluation of various aspects of HEC 401 (experimental group only)

The questions used to establish students' belief in and awareness of the energy situation, and students' attitudes related to energy use had been previously field tested. Three attitude scales (Gladhart, 1978): Eco-Awareness, Human Responsibility, and Life Style Flexibility, were used in their entirety in data evaluation of the attitude questions. Reliability tests were conducted on these three scales during this study as well as at the time of the original field testing. In both cases, the reliability levels were not optimal (Appendix E). The decision was made, however, to use the three Gladhart scales in this research for two reasons. First, the scales had been field tested in at least three previous studies (Gladhart, 1976; McKenna, 1978; Morrison et al., 1978). Secondly, no other more reliable scales had been found which would measure the three concepts of ecosystems awareness, personal responsibility for energy consumption patterns, and the willingness to alter life style in view of the global energy situation.

Distribution and Collection of Data

An important factor in gaining cooperation for research studies is the credibility of those directing the research (Milstein, 1977; Craig, 1977). In order to establish credibility for this study, cooperation was enlisted from the instructors of HEC 401, Dr. Bonnie Maas Morrison, and HEC 301, Beverly Anderson. Both instructors agreed to allow their classes to be the samples for the study and to administer the questionnaires at the appropriate times.

The Pretest Questionnaire

The pretest questionnaires were administered to those students in both the experimental and control group (HEC 401, "Energy and the Designed Environment" and HEC 301, "Management and Decision-Making in the Family" respectively) the first day of class, Spring Term, 1978, prior to any information about the content of either class being given (Time I). In both classes, the instructurs were assisted in passing out and collecting the questionnaires by graduate students assigned to the classes.

Introduction of the Independent Variable

During the ensuing term, students in HEC 401 received energy information throughout their classroom experience while the HEC 301 students did not receive energy information in their classroom experience.

The following description of the course content and format of HEC 401, "Energy and the Designed Environment," is presented to demonstrate the extent of the energy information presented to students in the experimental group through their classroom experience.

Human Ecology Core Studies Program: HEC 401.--As the third component of the College of Human Ecology's Core Studies Program, HEC 401 is structured to provide senior level students with the opportunity to synthesize learning which has occurred throughout the college years. During the Spring of 1978, the synthesized learning process was directed towards the issue of energy and its increasingly important impact upon individuals/families, their environments and the interaction between the two. Entitled "Energy and the Designed Environment," the Spring 1978 Core Course was developed and taught by Dr. Bonnie Maas Morrison.

Using an ecosystems approach to the subject of energy, HEC 401 had two explicit goals:

1. To help HEC 401 students become more aware of the energy situation, in general, and to understand the impacts and opportunities it presents to individuals, both as private citizens and as professionals, in specific.
2. To establish interest in the HEC 401 Core Course as relevant to senior level students in Human Ecology, thereby increasing the students participation in class work, their learning of major concepts presented, and their ability to synthesize the information acquired.

This research was directed primarily towards assessment of the first of these two goals.

The Course Content.--In order to implement these goals, "Energy and the Designed Environment," HEC 401, examined three dimensions of the energy situation. The first part of the course focused upon the global scope of energy resources, their supply and their demand. The second part of the course was directed towards the unique aspects of the energy situations within the United States and especially within the State of Michigan. The last part of the course dealt with the relationships between energy and various aspects of the designed near-environment, including housing and interior design, clothing and textiles, food supplies and nutrition--indicating the social and economic impacts on world, national, family, and individual levels.

Throughout the term, students received energy information in three diverse but interrelated learning strategies. These were as follows:

1. Class Lectures and Special Presentations--These included lectures by the instructor, by selected guests and by two student issue debate panels.
2. Reading Assignments - The reading assignments included both a text (Stein, 1977) as well as supplementary library assignments.
3. Six Energy Related Activity Options - Students were able to choose one of six option projects (individual contracts were developed with each student). The option projects were supervised by the instructor, the graduate assistants or qualified and interested persons.

   The options were:

   --Development of an Energy Issues Journal from newspapers, magazines, and other printed materials.

   --Developing and writing an Energy Related Term Research Paper

   --Voluntary participation in SUN DAY (May 3, 1978), a global celebration of solar energy.

   --Michigan Energy Administration Volunteer. The activity allowed specially selected students to work at MEA on ongoing energy projects.

   --*Michigan Eco* Article--The activity allowed students to write articles for publication in *Michigan Eco* (published version included in the *Michigan Eco*, Vol. 1, No. 3, Fall, 1978).

--Energy Issue Debate Panels--Two panels of six students each developed arguments and presented two sides of the following questions in class presentations:

1. Is there an energy problem?

2. Can individuals in families or as professionals influence the resolution to the energy situation?

Student course grades were based upon their ability to synthesize the acquired information in three take-home essay examinations as well as the individual contracted options. Substantial weight was given to the contracted options to encourage quality participation in the options.

Table 6.--Criteria for HEC 401 Student Course Grade.

Classroom Experience/Project	Points Possible
Examination I	30
Examination II	30
Examination III (Final)	45
Contracted Options	45
Total Possible Points	150

The Posttest Questionnaire

The posttest questionnaires were administered to both classes (HEC 401 and HEC 301) at the time of the final examination for both classes (Time II). As previously stated, the posttest contained the same questions as the pretest concerning students' interest in the Core Studies

Course, students' interest in energy related information, students' beliefs in and awareness of the energy situation, and students' attitudes related to energy use. In addition, the posttest contained demographic questions as well as class format evaluation questions (HEC 401, experimental group only).

As with the pretest, the HEC 401 and HEC 301 instructors were assisted in administering the posttest by their respective graduate assistants.

Processing the Data

The raw data obtained from the pretest and posttest questionnaires was coded and transferred to coding sheets by a trained coder. A 25 percent reliability check was then made on the coding by both the coder and researcher. Random samples from both the experimental and control groups were drawn from those students who completed both the pretest and posttest. The samples were drawn to approximate the proportion of the various majors within the College of Human Ecology as represented in the class enrollments of HEC 401 and HEC 301 during the 1978 Spring Term. The sub-sample size was 67 for HEC 401 (experimental) and 64 for HEC 301 (control). Total sample size was 131.

The key punching of computer cards and a 10 percent reliability verification were completed by Michigan State University Computer Center keypunchers. After the cards were returned to the researcher, they were further verified against the raw data (25 percent check) and found to be accurate.

Statistical Procedure

A statistical program using frequencies, independent and dependent t-tests of mean differences was developed to test the hypotheses by detecting the extent of any change in the students' energy beliefs and attitudes between Time I (prior to the delivery of course content) and Time II (immediately after the delivery of course content).

The program was run on the CDC 6500 computer, Michigan State University, using the Statistical Package for the Social Sciences (SPSS) program.

Mean scores and standard deviations are reported for the responses to the three energy belief questions, the three energy attitude scales, and the questions within each scale (Appendix D). Frequencies are also reported for these same categories (Appendix C).

Research Hypotheses

From the conceptual framework used in this research, and the review of the literature, the following hypotheses were developed. They have been stated in the null form according to standard statistical procedure.

Hypothesis 1

$H_0$1.1: There is no difference in energy beliefs, as measured on three energy belief items between

HEC 301 and HEC 401 students at the beginning of Spring Term, 1978 (Time I).

$H_0$1.2: There is no difference in energy attitudes, as measured on three attitude scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility, between HEC 301 and HEC 401 students at the beginning of Spring Term, 1978 (Time I).

Hypothesis 2

$H_0$2.1: There is no difference in the energy beliefs of HEC 301 students as measured on three energy belief Items between the beginning of Spring Term 1978 (Time I) and the end of Spring Term, 1978 (Time II).

$H_0$2.2: There is no difference in the energy attitudes of HEC 301 as measured on three Energy Attitude Scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between the beginning of Spring Term 1978 (Time I) and the end of Spring Term, 1978 (Time II).

Hypothesis 3

$H_0$3.1: There is no difference in the energy beliefs of HEC 401 students as measured on three energy belief questions between the beginning of Spring Term, 1978 (Time I) and the end of Spring Term, 1978 (Time II).

$H_0$3.2: There is no difference in the energy attitudes of HEC 401 students as measured on three energy attitude scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between the beginning of Spring Term 1978 (Time I) and the end of Spring Term, 1978 (Time II).

Hypothesis 4

$H_0$4.1: There is no difference in energy beliefs, as measured on three energy belief items between HEC 301 and HEC 401 students at the end of Spring Term, 1978 (Time II).

$H_0$4.2: There is no difference in energy attitudes, as measured on three Energy Attitude Scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between HEC 301 and HEC 401 students at the end of Spring Term, 1978 (Time II).

Assumptions

1. Experimental research design is an appropriate research design methodology for testing a change in beliefs and attitude hypotheses.

2. A questionnaire is an appropriate research instrument for collecting information concerning students' energy beliefs and attitudes.

Limitations of the Study

The limitations of this study relate to several factors which can affect students' expressed energy beliefs and energy attitudes. First, questionnaires and their manner of administration can, in themselves, influence responses and in turn bias the findings. Secondly, students' access to information from outside the classroom experience may be different. Those in the control group may have had access to energy information in other classes or in the mass media. It should be noted that during the ten week period of the study, the local printed media was relatively void of energy information. The lone exception to this fact was the coverage given to the Lansing celebration of SUN DAY activities which was coordinated by Lansing Community College. Thirdly, the Winter of 1977-1978 was especially long and cold in the state of Michigan. Personal circumstances of restricted and/or expensive energy supplies may have impacted the students' perception of the energy situation during the 1978 Spring Term. Finally, the socialization process of each individual student may influence that student's perception of the information presented.

Another limitation requires that these findings must be considered representative of only those students enrolled in the subject classes. They are not necessarily representative of all college students enrolled in other curricula. Further study would be required to determine if other college students hold the same energy beliefs and attitudes as the tested students.

Finally, caution must be exercised in drawing conclusions on such a complicated and multifaceted issue as the energy situation. As Dr. Glenn T. Seabourg points out, "Energy is the essential underpinning of almost all of our society" (Miller, 1975, p. 229). There are no simple answers for such a complex question.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter contains the results of the analysis of data. The hypotheses developed and tested in this study have been stated in the null form according to standard methodological procedure. It was assumed that the populations sampled were normal. The two sample sizes were 63 and 67. A significance level of .025 (2 tail tests) was determined prior to the data analysis.

For each hypothesis, the findings and discussion of the statistical tests are reported, in separate sections according to when (Time I, Time II) and to which group (HEC 401, Experimental; HEC 301, Control) the questionnaires were administered:

1. Time I (Pretest); Control (HEC 301, Experimental HEC 401)
2. Time I, Time II (Pretest, Posttest), Control (HEC 301)
3. Time I, Time II (Pretest, Posttest); Experimental (HEC 401)
4. Time II (Posttest); Control, Experimental (HEC 301, HEC 401)

Time I--Control and Experimental Groups

To detect a change in subjects due to a treatment, it is necessary that the control and experimental groups not be significantly different from each other prior to the application of the treatment. Independent t-tests were employed to test the null hypothesis that, in fact, the students in HEC 301 and HEC 401 did not differ significantly in their energy beliefs and attitudes at the beginning of the Spring Term, 1978.

Hypothesis 1.1 and 1.2

$H_0$1.1: There is no difference in energy beliefs, as measured on three energy belief items between HEC 301 and HEC 401 students at the beginning of Spring Term, 1978 (Time I).

$H_0$1.1 Findings.--Hypothesis $H_0$1.1 was supported on all three items indicating no significant difference in the two groups at the beginning of the study on their beliefs in the energy problem (Table 7).

$H_0$1.1 Discussion.--In both groups, the percentage who did express belief was considerably higher than the results from other studies cited. About 95 percent of the experimental group expressed a belief in the energy crisis "now" and "in the near future" whereas 87 percent of the control group expressed belief on these same questions. When asked about an energy crisis in the "distant future," 88 percent of the experimental group and 70 percent of the control group expressed belief. These figures indicate a

Table 7.--Mean Scores, Standard Deviations and Probability Levels for Energy Belief Items by Groups at Time I.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
Belief in an Energy Problem Now	HEC 301	1.11	.317	1.64	128	.103
	HEC 401	1.02	.244			
Belief in an Energy Problem in the Near Future	HEC 301	1.03	.358	.32	100.49	.751
	HEC 401	1.02	.214			
Belief in an Energy Problem in the Distant Future	HEC 301	1.08	.543	.60	106.21	.548
	HEC 401	1.03	.347			

slightly decreasing belief in an energy problem with time in both groups. This is contrary to other studied reviewed (pp. 12-17) where increasing belief was noted as time became future oriented.

Several factors could attribute to these results. College students, by nature of their age and experience levels, seem to be generally more aware of and concerned with popular issues of the period. Since the Oil Embargo of 1973-1974, energy has been such an issue. Secondly, some may have expressed what they deemed to be an expected or proper response for a Core Course in Human Ecology. Finally, some may have been influenced by personal experiences during the severe Michigan winter which immediately preceded this study.

In the question concerning an energy crisis in the distant future, "distant future" was defined as the year 2000--22 years after the study, when the respondents will be in their forties and undoubtedly experiencing a different lifestyle. Most persons in their twenties cannot relate to middle age lifestyle; which might explain the drop in expressed belief. The lower percentage could also be reflecting an affirmation in the concept that technology will, by that time, be able to solve the energy crisis.

$H_0 1.2$: There is no difference in energy attitudes, as measured on three attitude scales: (1) Eco-Awareness, (2) Human Responsibility, (3) Life Style Flexibility, between HEC 301 and HEC 401 students at the beginning of Spring Term, 1978 (Time I).

$\underline{H_0 1.2 \text{ Findings}}$.--The null hypothesis of no difference was confirmed on the Human Responsibility Scale ($p = .110$) and Life Style Flexibility Scale ($p = .634$) but rejected on the EcoAwareness Scale ($p = .020$). This suggests a significant difference between the two groups as to their awareness of the ecosystem at the beginning of the study (Table 8).

$\underline{H_0 1.2 \text{ Discussion}}$.--Although the hypothesis was rejected on the EcoAwareness Scale, a look at the probability levels of the individual questions within the scale indicates that the two groups were indeed more similar than the t-test reveals. The groups were found to be significantly different on only two of the 11 questions. When asked to what extent the scarcity of fossil fuels was a part of the energy crisis, 51 percent of the control group and 80 percent of the experimental group answered "a great extent" ($p = .000$). When asked whether they thought the price of energy is too low considering that most energy sources are nonrenewable, 52 percent of the experimental group "agreed or strongly agreed" whereas only 31 percent of the control group expressed the same agreement ($p = .004$). Therefore, the difference found on these two questions was not felt to undermine the concept of similar energy attitudes in both groups at Time I.

Table 8.--Mean Scores, Standard Deviations and Probability Levels for Energy Attitude Scales by Groups at Time I.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
EcoAwareness	HEC 301	31.28	4.647	-2.36	125.97	.020
	HEC 401	33.10	4.164			
Human Responsibility	HEC 301	18.83	2.740	-1.61	129	.110
	HEC 401	19.54	2.285			
Life Style Flexibility	HEC 301	38.38	4.053	-.48	129	.634
	HEC 401	38.72	4.137			

Time I, Time II--Control Group HEC 301

If a control group is not subjected to a treatment, it would be expected that the expressed beliefs and attitudes concerning the subject or issue being tested would not change significantly over time. It is important, therefore, to determine whether the energy beliefs and attitudes of the HEC 301 students did or did not change significantly between the beginning and end of the 1978 Spring Term. To test the null hypothesis that they did not change, dependent t-tests were employed.

Hypothesis 2.1 and 2.2

$H_0$2.1: There is no difference in the energy beliefs of HEC 301 students as measured on three energy belief items between the beginning of Spring Term 1978 (Time I) and the end of Spring Term, 1978 (Time II).

$H_0$2.1 Findings.--This hypothesis was confirmed at the $\alpha = .025$ level on all three items (Belief "now," $p = .083$; Belief "near future," $p = .289$; Belief "distant future," $p = 1.000$), showing no significant difference in the energy beliefs of the control group at the two times tested (Table 9).

$H_0$2.1 Discussion.--The percentages of respondents expressing belief in the energy crisis "now" and "in the near future" were virtually unchanged from Time I to Time II ("now": 87 percent and 89 percent; "near future": 87 percent and 87 percent). There was, however, an increase

Table 9.--Mean Scores, Standard Deviations and Probability Levels for Energy Belief Items by the Control Group (HEC 301) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
Belief in an Energy Problem Now	Time I	1.11	.319	1.76	61	.083
	Time II	1.01	.338			
Belief in an Energy Problem in the Near Future	Time I	1.03	.361	-1.07	61	.289
	Time II	1.10	.349			
Belief in an Energy Problem in the Distant Future	Time I	1.08	.548	0	62	1.000
	Time II	1.08	.414			

of 13 percent in belief in an energy crisis in the distant future; this in spite of identical means. Looking at the standard deviations indicates a wider range of responses on the pretest than on the posttest; in other words, a narrowing of group opinion across time. This conclusion is supported by the rise in percent--half of which appears to come from students who expressed no belief on the pretest and half from students who expressed no opinion on the pretest. This slight move towards belief in a future crisis could be a result of information gained outside the controlled classroom situation such as from media, other course studies, or personal experiences.

> $H_0$2.2: There is no difference in the energy attitudes of HEC 301 as measured on three Energy Attitude Scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between the beginning of Spring Term, 1978 (Time I) and the end of Spring Term, 1978 (Time II).

$H_0$2.2 Findings.--As with the belief component, the dependent t-tests indicated no significant difference between the energy attitudes of the HEC 301 students expressed at the beginning and end of the 1978 Spring Term, thereby confirming the null hypothesis at $\alpha = .025$ (Table 10: EcoAwareness, $p = .682$; Human Responsibility, $p = .304$; Life Style Flexibility, $p = .715$).

$H_0$2.2 Discussion.--Within the three attitude scales, there is a total of 31 questions. On only one was there any significant difference found. On the EcoAwareness

Table 10.--Mean Scores, Standard Deviations and Probability Levels for Energy Attitude Scales by the Control Group (HEC 301) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
EcoAwareness	Time I	31.22	4.660	-.41	62	.682
	Time II	31.44	4.109			
Human Responsibility	Time I	18.76	2.710	1.04	62	.304
	Time II	18.38	3.113			
Life Style Flexibility	Time I	38.32	4.059	-.37	62	.715
	Time II	38.63	6.384			

Scale, students were asked to what extent they thought waste and inefficient use of energy contributed to the energy problem. On the pretest, 85 percent answered "great extent," but this dropped to 71 percent on the posttest. Thus, although significantly different, the means moved in the direction of less awareness by the control group over time.

Time I, Time II--Experimental Group HEC 401

As Rotzel (1974) states, the basic assumption in experimental research design, using a pretest/posttest format, is that any attitude change can be considered a result of the treatment condition employed. Since this study was specifically structured to determine if the energy information presented to HEC 401 students could heighten their energy beliefs and attitudes, the following hypotheses are most important. Although stated in the null form, the hypotheses of interest are based upon the premise that the energy information presented would result in a more positive belief in an energy problem as well as more positive personal attitudes towards the awareness, responsibility and flexibility aspects of the energy situation. The dependent t-test was used to test the null hypotheses at the probability level of $\alpha = .025$.

Hypothesis 3.1 and 3.2

$H_0 3.1$: There is no difference in the energy beliefs of HEC 401 students as measured on three energy belief questions between the beginning of Spring Term, 1978 (Time I) and the end of Spring Term, 1978 (Time II).

$\underline{H_0 3.1 \text{ Findings}}$.--No significant differences in means were found between the pretest and posttest for HEC 401 students on any item. This would indicate that the energy information presented did not affect the students' energy beliefs, thereby accepting the null hypothesis at $\alpha = .025$ (Table 11: Belief "now," $p = .321$; Belief "near future," $p = .058$; Belief "distant future," $p = .370$).

$\underline{H_0 3.1 \text{ Discussion}}$.--When a group of respondents communicate an existing strong belief in an issue, it may be difficult to employ a treatment that would significantly change that belief. This appears to be the case for these three questions. The HEC 401 pretest shows that a large percentage of the students held positive beliefs in the existence of the energy crisis at the three points in time designated (94 percent "now": 95.5 percent "in the near future": 88.1 percent "in the distant future"). Based upon this starting point, it was not surprising that a significant change was not found on any of the belief items.

On the question concerning the energy crisis in the distant future, there was an increase of 4.5 percent in belief and an identical decrease in the no opinion category. Much of the energy information presented to the HEC 401 students stressed the long term implications of the global energy situation, both in terms of conservation requirements and constrained availability of alternative energy sources (given today's technologies). Thus the tested classroom

Table 11.--Mean Scores, Standard Deviations and Probability Levels for Energy Belief Items by the Experimental Group (HEC 401) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
Belief in an Energy Problem Now	Time I	1.03	.244	1.00	66	.321
	Time II	.99	.275			
Belief in an Energy Problem in the Near Future	Time I	1.02	.214	-1.93	65	.058
	Time II	1.09	.290			
Belief in an Energy Problem in the Distant Future	Time I	1.03	.347	-.90	66	.370
	Time II	1.07	.265			

experience exhibits the potential for encouraging students to at least form an opinion as to the existence of an energy crisis; in this study, evidence would suggest that the change would be towards positive belief.

> $H_0$3.2: There is no difference in the energy attitudes of HEC 401 students as measured on three energy attitude scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between the beginning of Spring Term, 1978 (Time I) and the end of Spring Term, 1978 (Time II).

<u>$H_0$3.2 Findings</u>.--This hypothesis was partially confirmed. There was a significant difference in the energy attitude on the EcoAwareness Scale from the beginning to the end of the 1978 Spring Term ($p = .001$). No such significant differences were found, however, on the Human Responsibility Scale ($p = .653$) or the Life Style Flexibility Scale, although the latter difference could be considered meaningful ($p = .074$) (Table 12).

<u>$H_0$3.2 Discussion</u>.--Because the concept of attitude change due to the information presented is at the heart of this study, and because the results of the dependent t-tests are varied, each attitude scale will be discussed separately.

<u>EcoAwareness</u>. At Michigan State University, the College of Human Ecology is organized around an ecological or systems model which stresses the interdependence and interrelatedness of human life within its environment. Its Core Studies Program is an integral element of this

Table 12.--Mean Scores, Standard Deviations and Probability Levels for Energy Attitude Scales by the Experimental Group (HEC 401) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
EcoAwareness	Time I	33.10	4.164	-3.39	66	.001
	Time II	34.81	3.212			
Human Responsibility	Time I	19.54	2.285	-.48	66	.653
	Time II	19.67	2.156			
Life Style Flexibility	Time I	38.75	4.137	-1.82	66	.074
	Time II	38.67	4.315			

organization. By the senior level course, HEC 401, students are encouraged to draw from their past learning experiences and synthesize them towards a specified issue. Therefore, the findings of this study can be termed very important from the college's ecological perspective.

Within this scale, three items exhibited a significant increase in awareness. The first dealt with overconsumption of energy resources by United States citizens ($p = .006$). In the pretest, 71.6 percent of the responding students said the U.S. overconsumption was, to a great extent, a part of the energy problem. At the end of the term, this rose to 85.1 percent.

A meaningful difference was found in students' responses to the question pertaining to what extent they thought waste and inefficient use of energy was a part of the energy problem ($p = .070$). The percent citing "great extent" rose from 85 on the pretest ot 94 on the posttest.

A third item showed a significant difference in the number of students who thought the energy crisis was a "put on" ($p = .001$). At Time I, only 7.6 percent disagreed with the statement: "The 'energy crisis' was a 'put on' in order to raise prices of fuels." At Time II, this percent increased over 12 fold to 92.4 percent.

Human Responsibility. HEC 401 students expressed a high level of human responsibility on the pretest. On five of the six questions in the scale, over 90 percent of the students answered, according to the scale, in a manner reflecting a high degree of personal responsibility felt for helping to solve the energy problem. These percentages held fast on the posttest. The sixth question, indicating a responsibility for not depriving the poorer peoples of the world of basic necessities due to high individual levels of living, rose from 77 to 85 percent. With such a high beginning level of expressed responsibility it would not be unexpected that a significant change in this attitude scale's means was not found.

Life Style Flexibility. Although not significant, the difference in means between the pre- and posttests on this scale is meaningful, indicating an increased willingness of the student to adopt his/her lifestyle to changing circumstances brought about by decreasing energy supplies and increasing energy costs. The most notable change was evidenced in the students' expressed willingness to pay for more costly solar energy to decrease the demand for petroleum ($p = .008$).

Time II--Control and Experimental Groups

Assuming that two groups are similar at the beginning of a treatment, the question must be asked whether the two groups are then similar or different at the end of the treatment. In order to assess the effectiveness of any treatment, the differences within each group from the pretest to the posttest must first be ascertained. The resulting gain or loss scores can then be compared to determine whether the beliefs or attitudes expressed by the two groups on the posttests were indeed significantly different from each other, given their respective positions on the pretest. The dependent t-test was used to test the null hypothesis that students in the experimental and control groups were not different in their energy beliefs and attitudes at the end of the treatment condition. The hypothesis of interest, however, is predicated upon an anticipated means difference between gain scores between groups.

Hypothesis 4.1 and 4.2

$H_0$4.1: There is no difference in energy beliefs, as measured on three energy belief items between HEC 301 and HEC 401 students at the end of Spring Term, 1978 (Time II).

$H_0$4.1 Findings.--On each of the three belief items, no significant difference was found between means of the difference between gain scores, suggesting that the HEC 301 and HEC 401 students were similar in their energy beliefs at the end of the 1978 Spring Term. The null hypothesis is thus confirmed (Table 13).

$H_0$4.1 Discussion.--As shown on the first belief hypothesis ($H_0$1.1) students in HEC 301 and HEC 401 were found to hold high degrees of belief on all items. Although the HEC 401 class did receive energy information throughout their classroom experience and the HEC 301 students did not, neither group changed significantly by the end of the term

Table 13.--Mean Scores, Standard Deviations and Probability Levels of the Gain Scores for Energy Belief Items by Groups at Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
Belief in an Energy Problem Now	HEC 301	.08	.447	.47	129	.641
	HEC 401	.04	.367			
Belief in an Energy Problem in the Near Future	HEC 301	-.08	.482	.16	112.13	.876
	HEC 401	-.09	.336			
Belief in an Energy Problem in the Distant Future	HEC 301	0	.667	.46	103.14	.645
	HEC 401	-.04	.406			

(Hypothesis $H_0 2.1$ and $H_0 3.1$). This would lead to the expectation that the two groups would not be significantly different in energy beliefs at Time II. Indeed, statistical evidence bears this out.

> $H_0 4.2$: There is no difference in energy attitudes, as measured on three Energy Attitude Scales: (1) EcoAwareness, (2) Human Responsibility, (3) Life Style Flexibility between HEC 301 and HEC 401 students at the end of Spring Term, 1978 (Time II).

<u>$H_0 4.2$ Findings</u>.--The null hypothesis was rejected on the EcoAwareness Scale ($p = .024$); it was confirmed on the Human Responsibility Scale ($p = .137$) and the Life Style Flexibility Scale ($p = .322$). These findings suggest that, at the end of Spring Term, 1978, the HEC 401 students were significantly more aware of the energy situation than the HEC 301 students. They also suggest that HEC 401 students exhibited slightly more personal responsibility for energy conservation and slightly more flexibility in willingness to adapt their lifestyles to a more energy restrictive world (Table 14).

<u>$H_0 4.2$ Discussion</u>.--Educators are becoming increasingly aware of the dimensions of affective learning; that is, the effect of lessons on the attitudes, beliefs, and values of their students (Heitzman, 1976). From the statistical evidence presented, it appears that the energy information presented to the HEC 401 students was at least a contributing factor in altering some of their energy attitudes.

Table 14.--Mean Scores, Standard Deviations and Probability Levels of the Gain Scores for Energy Attitude Scales by Groups at Time II.

		Mean Score	Standard Deviation	T-Value	Degrees of Freedom	2-Tail Probability
EcoAwareness	HEC 301	-.01	4.418	2.28	129	.024
	HEC 401	-1.71	4.132			
Human Responsibility	HEC 301	.73	4.044	1.50	99.15	.137
	HEC 401	-.13	2.309			
Life Style Flexibility	HEC 301	.14	7.735	1.00	97.58	.322
	HEC 401	-.96	4.301			

As with Hypothesis $H_0 3.2$, each attitude scale will be discussed separately.

EcoAwareness. On the EcoAwareness Scale, a difference of 1.49 was found between HEC 401 and HEC 301 gain scores at Time II.[1] This difference suggests an increased cognizance of energy's interactive role within the ecosystem by those students exposed to the information. The most significant difference was found in how the respondents perceived the reality of the energy crisis ($p = .010$). Between the pre- and posttests, there was an increase of 3 percent of HEC 301 respondents who expressed disagreement with the statement that the energy crisis was a "put on" in order to raise fuel prices (Pretest, 27 percent; Posttest, 30 percent). The percentage of HEC 401 students expressing the same disagreement rose from 21 percent on the pretest to 93 percent on the posttest--a gain of 72 percent.

Human Responsibility. On each of the six questions in the Human Responsibility Scale, the percent of HEC 401 students, whose answers indicated greater personal responsibility for energy conservation, averaged 10 percent higher than the percent of HEC 301 students at Time II.[2] The most

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[1]The range for the EcoAwareness Scale is 27.

[2]Based upon students who expressed "disagreement or strong disagreement with nonresponsible statements or "agreement or strong agreement" with responsible statements.

significant difference in gain scores on individual questions within the scale was found in how the two groups viewed the impact of individual family conservation measures ($p = .009$). This finding suggests that the students who did receive the energy information developed a more positive attitude that their individual family efforts at energy conservation could make a difference in the aggregate energy consumption.

Life Style Flexibility. Although the means of the difference between the HEC 301 and HEC 401 gain scores is not significant on the Life Style Flexibility Scale, the findings do indicate that the two groups did move farther apart on their expressed willingness to adapt their life-styles to a changing energy situation. The gain score for the control group, HEC 301, between Time I and Time II, was .41, whereas it was 1.71 for the HEC 401 experimental group.[1]

Within the flexibility scale, the greatest difference between HEC 301 and HEC 401 gain scores appeared in whether the students thought the energy situation would require families to do without the comforts and conveniences they had worked for just when they get to the point that they can live well. Eight percent more HEC 401 students expressed concern about this possibility on the pretest than on the posttest indicating that, possibly due to the

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[1]The range for the Life Style Flexibility Scale is 12.

information received in the classroom experience, students perceived a need to alter their future lifestyles in spite of what might be considered due them (pretest, 65 percent; posttest, 73 percent). In contrast, concern by the HEC 301 students dropped by 8 percent (pretest, 73 percent; posttest, 65 percent).

As measured by the gain scores, there was also a difference in the willingness of both groups to accept the possible risks to health and safety from nuclear power plants rather than severely limit their energy use. The percentage of HEC 301 students who were willing to accept the risks remained virtually constant over the term (85 percent, pretest; 86 percent, posttest) whereas, on the same issue, the percentage of HEC 401 students expressing willingness decreased from 94 percent to 87 percent.[1] The suggestion is thus made that the information presented either discouraged HEC 401 students about nuclear power itself and/or presented energy alternatives that were more acceptable to them than nuclear. Since the use of alternative energy sources was discussed throughout the term, this finding is important.

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[1]On the questionnaire, students were asked to agree or disagree with the statement, "I would accept 'possible risks' to health and safety from nuclear power plants, rather than severely restrict my energy use."

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATION

Within this chapter, the discussion will focus on the following points:

1. Overview of the Study
2. Conclusions
3. Other Conclusions
4. Implications of the Study
5. Implications for Further Research

Overview of the Study

The development of this research was based upon the assumption that receiving information about the energy situation could alter the energy beliefs and attitudes of pre-professional college students. It was theorized that this information would be incorporated into their future private and professional lives, thereby having a multiplier effect on energy conservation. It was further theorized that by helping to develop a new personal as well as professional energy awareness, conservation would become an integral part of their daily lives and professional practices--moving towards an energy conserving value in the American society.

This study specifically looked at the energy beliefs and attitudes of juniors and seniors enrolled in the College of Human Ecology at Michigan State University during the ten week Spring Term, 1978.

Self-administered questionnaires, containing previously field-tested questions designed to measure energy beliefs and attitudes, were administered to a control group (HEC 301) and an experimental group (HEC 401) at the beginning of the 1978 Spring Term (Time I). The experimental group then received energy information, through various educational strategies, throughout their classroom experience. At the end of this period, identical posttest questionnaires were given (Time II).

The major objective was to determine if disseminating energy information in a college classroom situation could contribute significantly to the alteration of energy beliefs and attitudes. Careful attempts were made to control for what could be other explanations for differences. Random samples, which approximate the enrollment distribution in departments within the college, were drawn from only those students who completed both the pre- and posttests. Data was checked and verified at three points of processing and found to be accurate.

It was not, however, within the scope of this research to control for the impact of outside variables such as information received through media or other course work, family beliefs and attitudes, or natural phenomena.

A statistical program using frequencies and independent and dependent t-tests of mean differences was developed using the Statistical Package for the Social Sciences (SPSS) program. Comparisons of means were made by groups and time.

Conclusions

Did the energy information presented alter the energy beliefs and attitudes of those who received it? Were the two groups studied significantly alike in their beliefs and attitudes before the information was presented and significantly different after? Several conclusions can be drawn from the analysis.

Altering Energy Beliefs and Attitudes

In providing conclusions based upon evaluation of an energy education program, two kinds of evidence should be provided. First, there should be evidence about the extent to which the program's goals are achieved. In this study, there is evidence that the program used did increase the students' perceptions of past, present, and future universal energy problems, as well as their cognizance of conservation measures.

There was an increasing move towards more positive energy attitudes in the HEC 401 experimental group between the beginning and the end of the term. The EcoAwareness Scale showed a significant difference at a probability level of .001. When looking within the scale, those items which showed the greatest difference related to overconsumption of energy resources by the United States, waste and inefficient use of energy, and a realization that the energy crisis was not a "put on."

At a probability level of .074, it was felt that the attitude change reflected on the Life Style Flexibility Scale was meaningful. This indicated a growing acceptance of changing lifestyle patterns in light of a restricting energy supply for the HEC 401 experimental group as compared to the HEC 301 control group.

The results showed no significant difference on the Human Responsibility Scale, but since the responses favoring responsibility were high (over 90 percent) on the pretest, it was not felt that this was a critical result.

The educational energy strategy did not produce any significant change in the three energy belief items of the experimental group. As with the Life Style Flexibility Scale, however, the percent expressing belief was overall very high on the pretest, and equally high on the posttest.

It is important, therefore, that the change-goal was achieved. From this analysis, it may be concluded that an energy education program, such as used in this study, is potentially effective in increasing students' perception of the energy crisis.

The second kind of evidence which should be presented in evaluating an energy education program concerns the appropriateness of the program for the target population of students. While no empirical data is available to measure appropriateness in this study, the findings do suggest that the HEC 401 students were receptive to both the information and the class format. In fact, by an almost 2:1 ratio, HEC 401 students indicated that they would favorably recommend the energy course to others.[1]

Similarities/Differences Between the Control and Experimental Groups

At the beginning of the study, the two groups were found to be similar in the beliefs and attitudes they held towards the energy question. It is on the basis of this similarity that an evaluation of the treatment condition can be formulated. In any experimental research design, it is imperative that the groups being studied be comparable on the issues in question. Without this common foundation, the structural factors of curricula materials which are thought to affect beliefs or attitude change cannot be evaluated.

With this similarity as a benchmark, the posttest results showed a significant difference between the gain scores of the two groups, as measured on the EcoAwareness

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[1]A question in the evaluation section of the HEC 401 posttest asked students if they would recommend the class to other students. Sixty percent said "yes," 33 percent said "no," and 9 percent gave no response.

Scale (p = .024). Although there were no significant differences found on the Human Responsibility Scale or on the Life Style Flexibility Scale, at probability levels of .137 and .322, respectively, they can be considered meaningful.

These findings, then, suggest that the information presented could be considered a factor in altering the expressed attitudes of the HEC 401 students. It may also be postulated that these new attitudes will become a cornerstone for their future private and professional lives. Time will have to answer this question.

When looking at the measures of belief in the energy crisis at three points in time (now, near future, distant future), no significant difference was found between the groups on either the pre- or posttests. The primary factor in these findings appears to be the high level of belief that each group expressed at the beginning of the term. The percentage saying they did believe in the energy crisis remained virtually constant between measures--that being in the 90 percent range for HEC 401 and in the 80 percent range for HEC 301. It was therefore not felt that these results indicated a lack of effectiveness by the HEC 401 course.

Other Conclusions

In the fourth century B.C., Diogenes, the Greek philosopher, said, "The foundation of every nation lies in the education of its youth." This statement is still applicable today, 24 centuries later, especially within the realities of decreasing world energy supplies and increasing world energy demands. The United States, with its unique position within the world's energy picture, has an opportunity to direct the dictum of the Greek philosopher towards answering the challenge of multidimensional and interconnected problems precipitated by the energy crisis.

In the past, the United States has traditionally used its vast educational system to discover and develop new ways to manipulate the earth's physical and ecological systems to meet its demands, while other cultures assimilated their societies into the environment. With the constraints of finite energy forms, this is no longer possible. Prudence would therefore suggest that the United States redirect its educational efforts--whether they be on the elementary, secondary, university, or continuing education level--towards a more energy conserving way of life. Educational programs, such as the one tested in this research, can be a step in this new direction.

Questions about a program's rationale, goals and objectives, its content and instructional strategies, its provisions for instructor and student assessment, and its implementation represent considerations about the internal qualities of existing or proposed energy education programs which must be addressed.

Persons who are responsible today for making decisions about energy education are fortunate. Unlike the past when decisions had to be made primarily on the basis of testimony or observation, there is today an increasing body of evaluation research--in general education, in environmental education, and now beginning in energy education. One of the primary purposes of this evaluation research is to provide reliable information to educational decision-makers about how well energy education programs "can work."

Designing instructional strategies that teach people to alter beliefs and attitudes, and in turn values and behaviors, on the basis of what they have learned in energy education is a challenge of major magnitude.

Implications of the Study

Implications for Educational Programs

The consequences of world energy shortages coupled with increased energy costs affect people, on a personal level, throughout the world. In the United States, where much of the economic and social organization is structured on a foundation of low-cost, abundant energy, the change to high-cost, scarce energy represents a major national challenge, both in the immediate future and in the long term.

Education is an important tool in attempting to answer this challenge. Research, economic incentives, legal regulations, and law enforcement are likewise important, but each require varying degrees of energy education for policy-makers, researchers, opinion makers, and the general public. Gallagher (Dr. James Joseph, unpublished) emphasizes that

> . . . laws and institutionalized economic incentives lack the flexibility and responsiveness to new energy problems that an educated public provides. We can avoid greater restrictions of our individual freedom only to the extent that problems are solved through wise choices made by many people--choices based on sound education.

The United States' ability to solve its energy problems appears, then, to depend in some measure, on the ability of its citizens, and therefore on its educational system.

Individuals will be forced to make energy choices--their concerted decisions influencing national energy policy and their individual choices determining their life styles. This situation requires knowledgeable citizens, aware of their personal values and goals, who are skillful problem solvers and decision-makers and who are able to predict the consequences of their energy choices and decisions, both for themselves and for the society in which they live.

There are implications for energy education. Energy education must be multifaceted; it must present information, but also deal with social, economic, political and moral issues of the energy question. It must help increase individuals' abilities to define their values and goals, to solve problems, and to make decisions.

Implications for College and University Curricula Development

> The University engages in basic research; it supports elementary and secondary education; it engages in vocational training; it provides undergraduate instruction, professional education and advanced scientific training through educational television and educational services. Because of the interdisciplinary nature of energy education, it should be related to all those levels of endeavor (State of Florida, 1979).

Colleges and universities can play an important role in energy education. Besides training people to solve the technical problems, they can help educate all their students, as well as the general public, to understand the world-wide web of energy interrelationships and to incorporate energy awareness into personal and professional lifestyles. Informational strategies of this nature could educate the general public to understand the energy problem and make better choices as to where we (as a nation) are going (Magarrel, 1977).

Strategies used in such an educational endeavor might include:

1. Incorporating energy concepts into established curricula.

2. Utilizing experts from the many disciplines to present the energy problem from varying perspectives.

3. Encouraging and supporting the development of additional required and elective courses in different aspects of the energy issue.

Implications for Energy Consumption

One of the intents of the United States Energy Materials Conservation Act of 1975 was to call for a commitment of educators to "assist students in the process of changing attitudes" (Riendeau, 1975).

Attitudes are derived from some base of information; therefore, a necessary condition for attitude change must be appropriate kinds and amounts of new information. Gladhart (1976) states that the successful promotion of attitude and behavior change in regard to energy requires presentation of distinct types of credible information such that individuals can integrate them appropriately.

It cannot be assumed, however, that providing students with information about energy necessarily will have any effect on their energy consumption. Indeed, most of the studies cited in the review of literature did not reveal a consistent relationship between attitudes and behaviors. There is, however, a small body of evidence that does suggest that attitudes can affect overt behavior. Champagne (1977) points out that behaviors related to energy consumption, like those related to eating, are in general, habitual, requiring no deliberate attention from the individual. To achieve the goal of changing students' behaviors with respect to energy consumption, the instructional strategies must take this habitual nature of these behaviors into account.[1]

Implications for Further Research

Need for Study Replication.--A replication of the exploratory study with a more heterogeneous sample would be of value. The subsample used in this study was obviously rather homogeneous (similar majors in college, similar ages and years in college, similar demographic features). It would therefore be valuable to repeat this study in other colleges within Michigan State University and/or other universities.

Complete new scale items, still structured around the concepts of EcoAwareness, Human Responsibility and Life Style Flexibility might also be developed for any future replication. It might be that the questions used in this study were not as applicable to college students as to the families for whom they were originally developed. The fact that these scales had been successfully used in previous studies (Gladhart, 1976; McKenna, 1978; Morrison et al., 1978) led to their being adopted for this research.

In a replication, consideration should be given to the inclusion of a second control group, one which only would

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[1]Champagne defines educational strategy as the process by which the conditions for learning a certain class of behaviors are created.

be given the posttest questionnaire. By incorporating this second control group into the research design, comparisons could also be made between the experimental and control group which only was given the posttest. In this way, control would be exercised for possible biased results caused by the administration of a pretest to a single control group.

It would also be beneficial to alter the way in which the posttest questionnaire was administered. Rather than allow students to take the questionnaire home for completion, which could lead to biased responses, and did lead to a low rate of return, students should complete the posttest during the class period. This change in administration should yield a higher number of cases with complete data across time, and thus more meaningful results.

In a replication, it would be beneficial to precode, differently, the responses to some of the questions used in the scales. Such precoding would eliminate/reduce the need to "weight" those responses, thus making data analysis easier.

<u>Need for Further Data Analysis</u>.--Since respondent's demographic information was obtained in this study, it would seem useful to further analyze the data using this information as independent variables: dwelling type (single family, multi-family), dwelling location (rural, urban), family income, number of persons in the household.

These explanatory variables have potential to reduce the amount of unexplained variance.

Since the energy belief questions and three energy attitude scales had been previously field tested, it would be interesting to compare the data from this study with that from the previous studies. Such a comparison could well give insight into the concept of using the educational system as an avenue to greater national/individual energy conservation or as a comparison between aggregate college age youth and the adult population.

Need to Consider Other Independent Variables.--The relationship explored in this study primarily concerned the effect of energy information, presented in a classroom experience, on the energy beliefs and attitudes of selected college juniors and seniors. In any future replication, it would seem fruitful to obtain data on and analyze the possible impact of other independent variables on these expressed beliefs and attitudes: other energy courses taken by students, media exposure of energy issues, students' families' energy beliefs and attitudes, natural occurrences, and national or international events which could affect the lifestyles of the students and/or their families. Such an analysis might provide a more accurate assessment of the impact of the energy information presented in the classroom experiment.

Need for Respondent Follow-Up.--At a future point in time (such as three or five years), the possibility exists for using this data as a baseline for a follow-up study of the students in the experimental group. The major unanswered question exists: Did the energy information presented have any lasting impact on the energy consumption beliefs and attitudes of the students? A follow-up study could help answer this question.

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APPENDICES

APPENDIX A

QUESTIONNAIRES

APPENDIX A

QUESTIONNAIRES

Pretest/Posttest Questionnaire

The word energy is used in many ways. In this survey it is used to mean energy produced from coal, oil, natural gas, or existing nuclear power plants and used to provide fuels and electricity.

1. What is your opinion on the following questions? Check one answer for each question.

   Following the oil embargo of 1973 there was much discussion of an energy crisis or energy problem in this country.

   1. Do you think there IS an energy problem in this country NOW? __Yes __No __No Opinion

   2. Do you think there WILL BE an energy problem in this country in the near future (within the next five years)? __Yes __No __No Opinion

   3. Do you think there WILL BE an energy problem in this country in the more distant future (1985 to 2000)? __Yes __No __No Opinion

2. Please answer the following questions about how serious you think the energy problem is compared to other problems in the United States. Check (✓) one answer for each question.

	More Serious	As Serious	Less Serious
1. Compared to <u>inflation</u> the energy problem is	____	____	____
2. Compared to <u>crime</u> the energy problem is	____	____	____
3. Compared to <u>unemployment</u> the energy problem is	____	____	____

3. To what extent is each of the following a part of the energy problem? Check (✓) one answer on each line.

	Great Extent	Some Extent	Not At All	Never Thought About It
1. Scarcity of fossil fuels (natural gas, oil, coal)	____	____	____	____
2. Waste and inefficient use of energy	____	____	____	____
3. World overpopulation	____	____	____	____
4. Overconsumption by United States citizens	____	____	____	____

4. Below are statements of opinion about subjects related to the energy problem. Some people agree with these statements, others disagree. Please check (✓) the one answer that indicates to what extent you agree or disagree with each statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Most families in this neighborhood are taking steps to conserve energy at home.	____	____	____	____

	Strongly Agree	Agree	Disagree	Strongly Disagree
2. Our family is entitled to as many material goods as we can afford regardless of the energy required to produce them.	____	____	____	____
3. The amount of energy all American families could save is unimportant compared to the amount of energy that government and industry could save.	____	____	____	____
4. Government officials are not providing any clear directions to help families make decisions about energy use.	____	____	____	____
5. The citizens of the United States are entitled to use as much energy as they can afford.	____	____	____	____
6. My family can maintain a satisfying way of living even though we buy fewer material goods.	____	____	____	____
7. The technology is available to provide new sources of energy, only the commitment of resources is needed.	____	____	____	____
8. If each family tried to conserve energy, it would really make a difference.	____	____	____	____

	Strongly Agree	Agree	Disagree	Strongly Disagree
9. I should be concerned about the energy that will be available for future generations.	____	____	____	____
10. The natural environment should be preserved even if I must change my way of living.	____	____	____	____
11. The price of energy is too low when considering that most energy resources cannot be replaced.	____	____	____	____
12. The only way to get families to conserve energy is by imposing government controls.	____	____	____	____
13. The "energy crisis" was a "put on" in order to raise prices of fuels.	____	____	____	____
14. I don't mind hand-me-downs or used goods for my family.	____	____	____	____
15. Stopping pollution is more important than lower prices for products.	____	____	____	____
16. American car manufacturers make a good selection of economy cars.	____	____	____	____

	Strongly Agree	Agree	Disagree	Strongly Disagree
17. I am concerned that the cost of travel is becoming so expensive that I will not be able to visit friends or relatives often enough.	____	____	____	____
18. I am concerned that the cost of housing is becoming so expensive that I will not be able to afford enough space for my needs.	____	____	____	____
19. I would pay for more costly solar energy to decrease the demand for new sources of petroleum.	____	____	____	____
20. Small cars are not as safe as big cars.	____	____	____	____
21. Buying imported cars is unpatriotic.	____	____	____	____
22. Small economy cars are durable.	____	____	____	____
23. It is hard to relax and be comfortable in a home kept at 68°.	____	____	____	____
24. If most Americans continue their present high levels of living, they will deprive people in poorer parts of the world of basic necessities.	____	____	____	____

	Strongly Agree	Agree	Disagree	Strongly Disagree
25. If we continue our high levels of energy use, future generations will not be able to have a level of living like ours.	____	____	____	____
26. Today, when families get to the point where they can begin to live well, they are asked to do without the comforts and conveniences they have worked for.	____	____	____	____
27. I would accept "possible risks" to health and safety from nuclear power plants, rather than severely restrict my energy use.	____	____	____	____
28. I would rather pay extra than keep my house at 68°.	____	____	____	____
29. I would rather pay extra than decrease the temperature or use of hot water in my home.	____	____	____	____
30. I would give up living space to install a solar heating and cooling system in my house.	____	____	____	____

Demographic Questions Added to the Posttest Questionnaire for Both the Control and Experimental Groups

In order to do analysis which will have meaning, we need to know the following characteristics of your family. Check (✓) one answer for each question.

1. Where is your home?

____In a large city (over 500,000)
____In a medium city (50,000-500,000)
____In a small city (10,000-50,000)
____In a village or town (under 10,000)
____In open country, nonfarm
____On a farm

2. What kind of house do your parents live in?

____Single family
____Duplex
____Fourplex
____Multi-dwelling (5-10 apartments)
____High-rise (10-40 apartments)

3. How many persons live in your family home?

____1-2
____3
____4
____5
____6
____7
____8
____9
____10 or more

4. Approximately what is the total income of your family from all sources, during the past year?

____Under $5,000
____$5,000 - $9,999
____$10,000 - $14,999
____$15,000 - $19,999
____$20,000 - $24,999
____$25,000 or more

Answers to all questions will be held in strict confidence.

Class Evaluation Questions Added to the Posttest Questionnaire for the Experimental Group, HEC 401

The following questions are designed to allow you to evaluate various aspects of HEC 401. Your answers are important in designing future energy issue related classes.

1. Rank in order of importance the various presentations in HEC 401.

    1 = very important
    2 = important
    3 = unimportant
    4 = very unimportant
    5 = no opinion, did not hear lecture

    ____ 1. Dr. Herman Koenig and James Shaffer
    ____ 2. Jeanne Alissi Ortiz
    ____ 3. B. Chadwick Walter III
    ____ 4. Robert Capelletti
    ____ 5. Richard G. Stein
    ____ 6. Volker Hartkopf
    ____ 7. Dr. Bonnie M. Morrison
    ____ 8. Joel Sharkey
    ____ 9. Gordon Vandertill
    ____10. Denise Guerin
    ____11. Dr. Kaye Crippen
    ____12. Dr. Peter Gladhart
    ____13. Dr. Joanne Keith
    ____14. Dr. Denton Morrison
    ____15. Representative Jondahl
    ____16. Energy source panel
    ____17. Energy and society panel

2. Where did you gain the most information generally? Check (✓) one.

    ____the lecture (live or tape)
    ____the assigned readings
    ____the individual projects

3. How often did you use the tapes of class lectures? Check (✓) one.

    ____never (0 times)
    ____seldom (1-5 times)
    ____often (6-15 times)

4. Describe the take home examination as: (Check ✓ one)

    ____too easy
    ____fair
    ____too difficult

5. Did the take home examination reinforce learning about energy issues generally and in your professional life? Check (✓) one.

    ____greatly reinforced
    ____slightly reinforced
    ____did not reinforce

6. Would you recommend Energy and the Designed Environment to fellow students? (Check ✓ one)

    ____Yes
    ____No

APPENDIX B

FORMAT OF HEC 401, "ENERGY AND THE DESIGNED ENVIRONMENT

APPENDIX B

FORMAT OF HEC 401, "ENERGY AND THE DESIGNED ENVIRONMENT"

Speakers and Topics for HEC 401,
Spring Term 1978
(In order of presentation)

Speaker	Topic
Dr. Bonnie Maas Morrison, Dept. of Human Environment and Design, M.S.U.	Energy and the Designed Environment: An Ecological Approach
Dr. Herman Koenig, Director Center for Environmental Issues and Dr. James Shaffer, Dept. of Agricultural Economics, both from M.S.U.	The Energy Dilemma: Physical and Economic Issues
Jeanne Alessi Ortiz, Graduate Assistant, Dept. of Human Environment and Design, M.S.U.	Energy and Human Ecology
B. Chadwick Walter, III, AIA, Lansing, Michigan Architect	Energy: The Challenge to the Designer/Architect
Robert Capelletti, Acting Director, Michigan Energy Administration	Energy Efficient Building Codes and Standards
Richard G. Stein, FAIA, Richard Stein and Partners, New York City*	Architecture and Energy

*Author of Architecture and Energy, the text used in HEC 401.

Speaker	Topic
Volker Hartkopf, Director Advanced Buildings Studies, Carnegie-Mellon University	Rehabilitation and Energy Conservation
Jack Sharkey, Supervisor, Issue Analysis, Public Service Commission, Michigan	Energy Systems and Michigan
Gordon Vander Fill, Director of Alternative Energy Divisions of Jordan College, Michigan	Alternative Energy Systems
Denise Guerin, Graduate Assistant, Dept. of Human Environment and Design, M.S.U.	Solar Interiors: Energy, A New Element in Design
HEC 401 Students (Option Project)	The Energy Source Panel
Dr. Kaye Crippen, Energy Institute, University of Houston, Texas	Energy and Textile Production
Dr. Peter M. Gladhart, Dept. of Family Ecology, M.S.U.	Energy and Life Style
Dr. Joanne G. Keith, Dept. of Family and Child Sciences, M.S.U.	Household Energy Conservation: Behavior or Technology
Dr. John S. Steinhart, Dept. of Geology and Geophysics, University of Wisconsin in Madison	Energy and the Food System
Dr. Denton E. Morrison, Dept. of Sociology, M.S.U.	Energy and Equity
HEC 401 Students (Options Project)	The Energy and Society Panel
Rep. Lynn Jondahl, Michigan House of Representatives, 59th District	Energy and the Michigan Legislature

Examination I, HEC 401

Name ______________________

Student Number ______________________

Major ______________________

ENERGY AND THE DESIGNED ENVIRONMENT
HEC 401

Dr. Bonnie Maas Morrison April 25, 1978

Take Home Examination I

INSTRUCTIONS:	Use only this sheet - (including backside). Type or write clearly - outline or paragraph form acceptable.

Question: Is there an energy problem? State a position and defend it, pro or con.

Criteria for Grading:

1. Statement of position (clarity will be considered) — 5 pts.
2. Defense of position (logic and clarity of position development will be considered) — 15 pts.
3. References or documentation from lectures, assigned reading and other sources. — 10 pts.

KEY TO REFERENCES:

S = Stein	M = Morrison
K = Koenig	C = Capelletti
SH = Shaffer	H = Hartkopf
O = Ortiz	EB = Extension Bulletin
W = Walter	B = Book (text)
	ME = Michigan Energy Code

Develop others as needed.

Examination II, HEC 401

Name ____________________

Student Number ____________________

Major ____________________

ENERGY AND THE DESIGNED ENVIRONMENT
HEC 401

Dr. Bonnie Maas Morrison May 11, 1978

Take Home Examination II

INSTRUCTIONS:	Use only this sheet - (Including Backside). Type or write clearly - outline or paragraph form acceptable.

Question: What are the implications for your professional life in the state of Michigan, given present and future energy forms. (Note: Think about your career opportunities and/or constraints as well as responsibilities in light of the energy question.)

Criteria for Grading:

1. Opportunities and/or constraints defined and explained in relationship to the Michigan energy picture. 10 pts.______

2. Responsibilities defined and explained in relationship to the Michigan energy picture. 10 pts.______

3. References or documentations from lectures, assigned readings and other sources. 10 pts.______

KEY TO REFERENCES:

	Develop others as needed.
S = Stein	DG = Denise Guerin
K = Koenig	M = Morrison
SH = Shaffer	C = Capelletti
O = Ortiz	H = Hartkopf
W = Walter	EB = Extension Bulletin
JS = Joel Sharkey	B = Book (text)
GVT = Gordon Vander Till	ME = Michigan Energy Code

Examination III (Final), HEC 401

Name ____________________

Student Number ____________________

Major ____________________

ENERGY AND THE DESIGNED ENVIRONMENT
HEC 401

Dr. Bonnie Maas Morrison May 25, 1978

Take Home Examination III

DUE June 2
BY NOON

INSTRUCTIONS: Type or write clearly using no more than 2 pages (this sheet and one other). Return to Dr. Morrison no later than NOON, June 2. Turn in at the Institute.

Question: What will life in the year 2000 be like? (1) List three possible energy related futures. (Hint: you could refer to Dr. Shaffer's energy cost and time curves.)
(2) Choose one of these possible energy futures and discuss in depth the lifestyle or social implication. (Hints: Think about employment, cost and kinds of energy, housing, food, clothing, transportation, recreation and appliances. Think about family roles across generations and between family members: males, females and children. Think about education for necessary skills and knowledge. Think about human energy and time.)

INSTRUCTIONS: You need not discuss all of these, but concentrate on what you think is most important. You may take a positive or a negative stance.

Criteria for Grading:

1. List three energy related futures. (Give each a name and describe in one sentence or so.) 15 pts.________

2. Detailed discussion of one of the energy futures related to life-style. (You may concentrate on one aspect, or develop a broad perspective.) 20 pts.________

3. References and/or documentation from lectures, reading and other sources. 10 pts.________

TOTAL 45 pts.________

KEY TO REFERENCES:

S = Stein
K = Koenig
SH = Shaffer
O = Ortiz
W = Walter
JS = Joel Sharkey
GVT = Gordon Vander Till
PG = Peter Gladhart
JK = Joanne Keith
DM = Denton Morrison

Develop others as needed.
DG = Denise Guerin
M = Morrison I
C = Capelletti
H = Hartkopf
EB = Extension Bulletin
B = Book (text)
ME = Michigan Energy Code
EPI - Energy Panel I
EPII = Energy Panel II

APPENDIX C

STUDENT RESPONSES

APPENDIX C

STUDENT RESPONSES

Table 15.--Belief Responses Reported by HEC 301 (Control) and HEC 401 (Experimental) Students, Spring Term, 1978.

Questions		N*	Percentages** Yes	No	No Opinion
Do you think there IS an energy problem in this country now?	HEC 301 (Time I)	63	87	11	0
	HEC 301 (Time II)	64	89	6	5
	HEC 401 (Time I)	67	94	5	2
	HEC 401 (Time II)	67	93	3	5
Do you think there WILL BE an energy problem in this country in the near future (within next five years)?	HEC 301 (Time I)	63	87	8	5
	HEC 301 (Time II)	64	87	11	2
	HEC 401 (Time I)	66	96	3	2
	HEC 401 (Time II)	67	91	9	0
Do you think there WILL BE an energy problem in this country in the more distant future (1985 to 2000)?	HEC 301 (Time I)	64	70	19	11
	HEC 301 (Time II)	64	83	13	5
	HEC 401 (Time I)	67	88	8	5
	HEC 401 (Time II)	67	93	8	0

*Total N for HEC 301 = 64; total N for HEC 401 = 67.

**Variation in results due to rounding.

Table 16.--EcoAwareness Responses Reported by HEC 301 (Control) and HEC 401 (Experimental) Students, Spring Term, 1978.

Question		N*	Percentages**		
			More Serious	As Serious	Less Serious
How serious do you think the energy problem is compared to other problems in the United States?					
Energy compared to					
1. Inflation is[a]	HEC 301 (Time I)	64	27	59	14
	HEC 301 (Time II)	64	62	19	19
	HEC 401 (Time I)	67	21	70	9
	HEC 401 (Time II)	66	25	69	6
2. Crime[a]	HEC 301 (Time I)	64	14	48	38
	HEC 301 (Time II)	64	37	16	48
	HEC 401 (Time I)	67	24	51	25
	HEC 401 (Time II)	66	22	61	16
3. Unemployment is[a]	HEC 301 (Time I)	64	29	49	22
	HEC 301 (Time II)	63	60	17	22
	HEC 401 (Time I)	67	21	66	13
	HEC 401 (Time II)	66	18	75	8

Table 16.--Continued.

Question		N*	Percentages**		
			Great Extent	Some Extent	Not at All or Never Thought About It
To what extent is each of the following a part of the energy problem?					
4. Scarce fossil fuels (natural gas, oil, coal)[b]	HEC 301 (Time I)	64	51	38	11
	HEC 301 (Time II)	64	52	43	5
	HEC 401 (Time I)	66	80	18	2
	HEC 401 (Time II)	67	75	25	0
5. Waste and inefficient use of energy[b]	HEC 301 (Time I)	64	71	25	3
	HEC 301 (Time II)	64	83	17	0
	HEC 401 (Time I)	67	85	13	2
	HEC 401 (Time II)	67	94	6	0
6. World overpopulation[b]	HEC 301 (Time I)	64	30	56	14
	HEC 301 (Time II)	64	37	56	8
	HEC 401 (Time I)	66	36	62	2
	HEC 401 (Time II)	67	37	58	5
7. United States citizens use too much energy[b]	HEC 301 (Time I)	64	57	37	6
	HEC 301 (Time II)	64	60	38	2
	HEC 401 (Time I)	67	72	28	0
	HEC 401 (Time II)	67	85	15	0

Table 16.--Continued.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Strongly Disagree
8. The natural environment must be preserved even if I must change my way of living[c]	HEC 301 (Time I)	64	40	54	6	0
	HEC 301 (Time II)	63	40	52	8	0
	HEC 401 (Time I)	66	50	47	3	0
	HEC 401 (Time II)	67	48	51	2	0
9. The price of energy is too low when considering that most energy resources cannot be replaced.[c]	HEC 301 (Time I)	63	5	26	65	5
	HEC 301 (Time II)	62	10	41	43	7
	HEC 401 (Time I)	67	19	33	46	2
	HEC 401 (Time II)	66	26	47	27	0
10. Stopping pollution is more important than lower prices for products.[c]	HEC 301 (Time I)	62	14	62	19	2
	HEC 301 (Time II)	63	10	67	23	0
	HEC 401 (Time I)	61	8	66	26	0
	HEC 401 (Time II)	66	8	68	24	0

Table 16.--Continued.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Strongly Disagree
11. The "energy crisis" was a "put on" in order to raise prices of fuels[d]	HEC 301 (Time I)	61	15	58	27	0
	HEC 301 (Time II)	62	15	56	25	5
	HEC 401 (Time I)	64	27	52	19	3
	HEC 401 (Time II)	67	0	8	52	41

[a]Responses were scored: (4) more serious, (2.5) as serious, (1) less serious.

[b]Responses were scored: (4) great extent, (2.5) some extent, (1) not at all, (1) never thought about it.

[c]Responses were scored: (4) strongly agree, (3) agree, (2) disagree, (1) strongly disagree.

[d]Responses were scored: (1) strongly agree, (2) agree, (3) disagree, (4) strongly disagree.

*Total N for HEC 301 = 64; total N for HEC 401 = 67.

**Variations in results due to rounding.

Table 17.--Human Responsibility Responses Reported by HEC 301 (Control) and HEC 401 (Experimental) Students, Spring Term, 1978.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Strongly Disagree
1. Our family is entitled to as many material goods as we can afford regardless of the energy required to produce them.[b]	HEC 301 (Time I)	64	5	11	60	24
	HEC 301 (Time II)	64	0	13	62	25
	HEC 401 (Time I)	66	0	5	73	23
	HEC 401 (Time II)	66	0	5	62	33
2. The citizens of the United States are entitled to use as much energy as they can afford.[b]	HEC 301 (Time I)	63	0	8	50	42
	HEC 301 (Time II)	62	0	11	51	38
	HEC 401 (Time I)	66	0	2	39	59
	HEC 401 (Time II)	67	2	5	49	45
3. If each family tried to conserve energy, it would really make a difference.[a]	HEC 301 (Time I)	64	33	62	5	0
	HEC 301 (Time II)	62	25	67	8	0
	HEC 401 (Time I)	66	35	62	3	0
	HEC 401 (Time II)	67	40	55	5	0
4. I should be concerned about the energy that will be available for future generations.[a]	HEC 301 (Time I)	64	48	51	2	0
	HEC 301 (Time II)	63	48	47	5	0
	HEC 401 (Time I)	67	55	43	2	0
	HEC 401 (Time II)	67	54	46	0	0

Table 17.--Continued.

Question		N*	Percentages** Strongly Agree	Agree	Disagree	Strongly Disagree
5. If most Americans continue their present high levels of living, they will deprive people in poorer parts of the world of basic necessities.[a]	HEC 301 (Time I)	62	18	43	34	5
	HEC 301 (Time II)	62	16	46	36	3
	HEC 401 (Time I)	66	21	56	21	2
	HEC 401 (Time II)	66	20	65	14	2
6. If we continue our high levels of energy use, future generations will not be able to have a level of living like ours.[a]	HEC 301 (Time I)	64	24	59	16	2
	HEC 301 (Time II)	63	27	52	21	0
	HEC 401 (Time I)	65	34	57	9	0
	HEC 401 (Time II)	66	32	61	6	2

[a]Responses were scored: (4) strongly agree, (3) agree, (2) disagree, (1) strongly disagree.

[b]Responses were scored: (1) strongly agree, (2) agree, (3) disagree, (4) strongly disagree.

*Total N for HEC 301 = 64; total N for HEC 401 = 67.

**Variation in results due to rounding.

Table 18.--Life Style Flexibility Responses Reported by HEC 301 (Control) and HEC 401 (Experimental) Students, Spring Term, 1978.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Strongly Disagree
1. My family can maintain a satisfying way of living even though we buy fewer material goods.[a]	HEC 301 (Time I)	64	19	71	10	0
	HEC 301 (Time II)	64	27	66	6	0
	HEC 401 (Time I)	66	23	76	2	0
	HEC 401 (Time II)	67	25	75	0	0
2. I don't mind hand-me-downs or used goods for my family.[a]	HEC 301 (Time I)	64	8	56	33	3
	HEC 301 (Time II)	63	11	60	27	2
	HEC 401 (Time I)	65	9	57	32	2
	HEC 401 (Time II)	67	10	63	22	5
3. I would pay for more costly solar energy to decrease the demand for new sources of petroleum.[a]	HEC 301 (Time I)	61	5	60	33	2
	HEC 301 (Time II)	63	15	60	21	5
	HEC 401 (Time I)	67	15	66	19	2
	HEC 401 (Time II)	65	19	74	8	0
4. I would give up living space to install a solar heating and cooling system in my house.[a]	HEC 301 (Time I)	62	11	66	23	0
	HEC 301 (Time II)	63	18	60	18	5
	HEC 401 (Time I)	64	14	77	9	0
	HEC 401 (Time II)	67	12	73	10	5

Table 18.--Continued.

Question		N*	Percentages** Strongly Agree	Agree	Disagree	Strongly Disagree
5. I am concerned that the cost of travel is becoming so expensive that I will not be able to visit friends or relatives often enough.[b]	HEC 301 (Time I)	64	5	41	49	5
	HEC 301 (Time II)	63	8	45	47	0
	HEC 401 (Time I)	67	5	42	51	3
	HEC 401 (Time II)	66	5	49	47	0
6. I am concerned that the cost of housing is becoming so expensive that I will not be able to afford enough space for my needs.[b]	HEC 301 (Time I)	64	22	57	21	0
	HEC 301 (Time II)	63	16	65	16	3
	HEC 401 (Time I)	67	11	61	28	0
	HEC 401 (Time II)	67	13	48	39	0
7. Small cars are not as safe as big cars.[b]	HEC 301 (Time I)	64	10	42	35	13
	HEC 301 (Time II)	63	16	34	44	6
	HEC 401 (Time I)	63	8	54	30	8
	HEC 401 (Time II)	65	12	55	26	6
8. Buying imported cars is unpatriotic.[b]	HEC 301 (Time I)	64	2	16	47	35
	HEC 301 (Time II)	63	2	5	58	35
	HEC 401 (Time I)	64	2	13	52	34
	HEC 401 (Time II)	64	5	14	47	34

Table 18.--Continued.

	Question		N*	Percentages**			
				Strongly Agree	Agree	Disagree	Strongly Disagree
9.	Small economy cars are durable.[a]	HEC 301 (Time I)	59	7	48	36	9
		HEC 301 (Time II)	60	8	56	29	7
		HEC 401 (Time I)	59	3	56	36	5
		HEC 401 (Time II)	65	2	60	29	9
10.	It is hard to relax and be comfortable in a home kept at 68°.[b]	HEC 301 (Time I)	62	15	5	54	26
		HEC 301 (Time II)	63	11	16	45	27
		HEC 401 (Time I)	67	3	13	54	30
		HEC 401 (Time II)	67	0	10	64	25
11.	Today, when families get to the point where they can begin to live well, they are asked to do without the comforts and conveniences they have worked for.[b]	HEC 301 (Time I)	61	2	27	67	5
		HEC 301 (Time II)	63	5	31	60	5
		HEC 401 (Time I)	63	2	33	60	5
		HEC 401 (Time II)	66	2	27	67	5

Table 18.--Continued.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Strongly Disagree
12. I would accept "possible risks" to health and safety from nuclear power plants, rather than severely restrict my energy use.[b]	HEC 301 (Time I)	63	2	13	45	40
	HEC 301 (Time II)	63	2	13	52	34
	HEC 401 (Time I)	67	2	8	43	48
	HEC 401 (Time II)	66	0	14	35	52
13. I would rather pay extra than keep my house at 68°.[b]	HEC 301 (Time I)	64	0	16	57	27
	HEC 301 (Time II)	62	5	10	51	34
	HEC 401 (Time I)	67	2	10	60	28
	HEC 401 (Time II)	66	0	6	65	29

Table 18.--Continued.

Question		N*	Percentages**			
			Strongly Agree	Agree	Disagree	Disagree Strongly
14. I would rather pay extra than decrease the temperature or use of hot water in my home.[b]	HEC 301 (Time I)	63	0	18	60	23
	HEC 301 (Time II)	63	3	16	55	26
	HEC 401 (Time I)	67	0	13	63	24
	HEC 401 (Time II)	66	0	14	62	24

[a]Responses were scored: (4) strongly agree, (3) agree, (2) disagree, (1) strongly disagree.

[b]Responses were scored: (1) strongly agree, (2) agree, (3) disagree, (4) strongly disagree.

*Total N for HEC 301 = 64; total N for HEC 401 = 67.

**Variation in results due to rounding.

APPENDIX D

T-TESTS OF MEAN DIFFERENCES

APPENDIX D

T-TESTS OF MEAN DIFFERENCES

Table 19.--EcoAwareness Scale and Items Within Scale: T-Tests of Differences Between Means for Both Groups at Time I.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
EcoAwareness Scale	HEC 301	31.28	4.647	-2.37	129	.019
	HEC 401	33.10	4.164			
Items Within Scale:						
Energy Compared to Inflation	HEC 301	2.69	.945	.05	129	.956
	HEC 401	2.68	.806			
Energy Compared to Crime	HEC 301	2.17	1.051	-1.66	129	.100
	HEC 401	2.48	1.060			
Energy Compared to Unemployment	HEC 301	2.59	1.065	-.11	129	.915
	HEC 401	2.61	.878			
Scarcity of Fossil Fuels	HEC 301	3.11	1.025	-3.75	108.10	.000
	HEC 401	3.68	.672			
Waste and Inefficient Use of Energy	HEC 301	3.51	.804	-1.97	129	.051
	HEC 401	3.75	.618			
World Overpopulation	HEC 301	2.73	.972	-1.88	128	.062
	HEC 401	3.02	.767			

Table 19.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Overconsumption by United States	HEC 301	3.27	.926	-2.11	115.54	.037
	HEC 401	3.57	.681			
Preserve Natural Environment Even if Way of Living Must Change	HEC 301	3.34	.597	-1.24	128	.217
	HEC 401	3.47	.561			
Price of Energy Too Low Considering Most Energy Sources Can't Be Replaced	HEC 301	2.32	.643	-2.95	124	.004
	HEC 401	2.70	.796			
"Energy Crisis" was "Put On" to Raise Fuel Prices	HEC 301	2.90	.651	-.89	123	.373
	HEC 401	3.02	.766			
Stopping Pollution More Important Than Lower Prices	HEC 301	2.90	.646	.76	121	.446
	HEC 401	2.82	.563			

Table 20.--Human Responsibility Scale and Items Within Scale: T-Tests of Differences Between Means for Both Groups at Time I.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Human Responsibility Scale	HEC 301 HEC 401	18.83 19.54	2.740 2.285	-1.61	129	.110
Items Within Scale:						
Family Entitled to Material Goods If Can Afford	HEC 301 HEC 401	3.05 3.18	.744 .493	-1.22	108.98	.227
Citizens of U.S. Entitled to Use as Much Energy as Can Afford	HEC 301 HEC 401	3.35 3.58	.626 .528	-2.23	127	.028
If Each Family Tries to Conserve, It Would Make a Difference	HEC 301 HEC 401	3.28 3.32	.548 .531	-.39	128	.697
I Should be Concerned About Energy for Future Generations	HEC 301 HEC 401	3.47 3.54	.534 .532	-.74	129	.463
Continuing Present High Standard of Living Deprives Poorer Peoples of Basic Necessities	HEC 301 HEC 401	2.76 2.97	.824 .701	-1.57	126	.119

Table 20.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Continuing High Levels of Energy Use Prevents Future Generation From Having a High Level of Living	HEC 301	3.06	.687	-1.60	127	.112
	HEC 401	3.25	.613			

Table 21.--Life Style Flexibility Scale and Items Within Scale: T-Tests of Differences Between Means for Both Groups at Time I.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Life Style Flexibility Scale	HEC 301	38.38	4.053	-.48	129	.634
	HEC 401	38.72	4.137			
Items Within Scale:						
Even Buying Fewer Material Goods, My Family Maintain A Satisfying Way of Living	HEC 301	3.11	.538	-1.19	128	.238
	HEC 401	3.21	.448			
Don't Mind Hand-Me-Downs or Used Goods for Family	HEC 301	2.69	.664	-.44	127	.659
	HEC 401	2.74	.664			
Would Pay for Costly Solar Energy to Decrease Petroleum Demand	HEC 301	2.69	.593	-2.14	123	.034
	HEC 401	2.92	.625			
Would Give Up Living Space to Install Solar Heating/Cooling	HEC 301	2.89	.576	-1.69	124	.094
	HEC 401	3.05	.486			
Am Concerned About Cost of Travel; Too Expensive to See Family/Friends	HEC 301	2.53	.666	.08	129	.938
	HEC 401	2.52	.636			

Table 21.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Concerned Cost of Housing Becoming Too High That I Can't Afford Space Needed	HEC 301 HEC 401	1.98 2.17	.654 .606	-1.68	126	.095
Small Cars Not as Safe As Big Cars	HEC 301 HEC 401	2.52 2.38	.840 .750	1.01	124	.316
Buying Imported Cars Unpatriotic	HEC 301 HEC 401	3.14 3.19	.759 .710	-.34	125	.733
Small Economy Cars Durable	HEC 301 HEC 401	2.54 2.58	.750 .649	-.26	116	.793
Hard to Relax and Be Comfortable in Home at 68°	HEC 301 HEC 401	2.92 3.10	.946 .741	-1.24	127	.217
Families Asked to Do Without Just When They Begin to Live Well	HEC 301 HEC 401	2.75 2.68	.567 .591	.69	122	.493
Rather Accept "Risks" From Nuclear Power Than Restrict Energy Use	HEC 301 HEC 401	3.24 3.37	.734 .703	-.99	124	.323

Table 21.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Rather Pay Extra Than Keep House at 68°	HEC 301 HEC 401	3.13 3.15	.655 .657	-.21	129	.833
Rather Pay Extra Than Decrease Hot Water Temperature	HEC 301 HEC 401	3.06 3.10	.644 .606	-.37	128	.709

Table 22.--EcoAwareness Scale and Items Within Scale: T-Tests of Differences Between Means for the Control Group (HEC 301) At Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
EcoAwareness Scale	Time I	31.22	4.660	-.41	62	.682
	Time II	31.44	4.109			
Items Within Scale:						
Energy Compared to Inflation	Time I	2.69	.952	1.47	62	.146
	Time II	2.50	.933			
Energy Compared to Crime	Time I	2.14	1.033	.76	62	.450
	Time II	2.02	1.105			
Energy Compared to Unemployment	Time I	2.60	1.073	1.15	62	.253
	Time II	2.43	.950			
Scarcity of Fossil Fuels	Time I	3.10	1.027	-.78	62	.439
	Time II	3.21	.888			
Waste and Inefficient Use of Energy	Time I	3.52	.800	-2.61	62	.011
	Time II	3.74	.574			
World Overpopulation	Time I	2.74	.979	-1.59	62	.117
	Time II	2.93	.911			
Overconsumption by United States	Time I	3.26	.928	-1.00	62	.321
	Time II	3.38	.792			

Table 22.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Preserve Natural Environment Even If Way of Living Must Change	Time I	3.32	.594	0	61	1.000
	Time II	3.32	.621			
Price of Energy Too Low Considering Most Energy Sources Can't Be Replaced	Time I	2.33	.625	-2.09	60	.041
	Time II	2.54	.765			
Stopping Pollution More Important Than Lower Prices	Time I	2.92	.651	.54	58	.594
	Time II	2.86	.571			
"Energy Crisis" was "Put On" to Raise Fuel Prices	Time I	2.86	.634	.54	57	.594
	Time II	2.81	.760			

Table 23.--Human Responsibility Scale and Items Within Scale: T-Tests of Differences Between Means for the Control Group (HEC 301) At Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Human Responsibility Scale	Time I	18.76	2.710	1.04	62	.304
	Time II	18.38	3.113			
Items Within Scale:						
Family Entitled to Material Goods If Can Afford	Time I	3.03	.740	-.92	62	.359
	Time II	3.13	.609			
Citizens of U.S. Entitled to Use as Much Energy As Can Afford	Time I	3.35	.606	1.29	59	.203
	Time II	3.25	.654			
If Each Family Tries to Conserve, It Would Make a Difference	Time I	3.30	.558	1.82	60	.073
	Time II	3.16	.553			
I Should be Concerned About Energy for Future Generations	Time I	3.45	.533	.22	66	.829
	Time II	3.44	.590			
Continuing Present High Standard of Living Deprives Poorer Peoples of Basic Necessities	Time I	2.73	.806	-.32	58	.749
	Time II	2.76	.727			

Table 23.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Continuing High Levels of Energy Use Prevents Future Generation From Having a High Level of Living	Time I	3.05	.688	-.19	61	.849
	Time II	3.06	.698			

Table 24.--Life Style Flexibility Scale and Items Within Scale: T-Tests of Differences Between Means for the Control Group (HEC 301) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Life Style Flexibility Scale	Time I	38.32	4.059	-.37	62	.715
	Time II	38.63	6.384			
Items Within Scale:						
Even Buying Fewer Material Goods, My Family Maintain a Satisfying Way of Life	Time I	3.10	.534	-1.22	61	.226
	Time II	3.21	.547			
Don't Mind Hand-Me-Downs or Used Goods for Family	Time I	2.68	.672	-1.59	61	.117
	Time II	2.81	.649			
Would Pay for Costly Solar Energy to Decrease Petroleum Demand	Time I	2.68	.600	-.142	58	.162
	Time II	2.83	.723			
Would Give Up Living Space to Install Solar Heating/Cooling	Time I	2.88	.585	-.20	59	.843
	Time II	2.90	.752			
Am Concerned About Cost of Travel; Too Expensive to See Family/Friends	Time I	2.53	.671	1.83	61	.072
	Time II	2.39	.636			

Table 24.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Concerned Cost of Housing Becoming Too High That I Can't Afford Space Needed	Time I	1.98	.665	-.84	61	.402
	Time II	2.06	.674			
Small Cars Not as Safe as Big Cars	Time I	2.49	.829	1.03	60	.307
	Time II	2.39	.842			
Buying Imported Cars Unpatriotic	Time I	3.15	.749	-1.53	60	.132
	Time II	3.28	.636			
Small Economy Cars Durable	Time I	2.52	.746	-1.18	53	.242
	Time II	2.67	.752			
Hard to Relax and Be Comfortable in Home at 68°	Time I	2.90	.951	.27	59	.792
	Time II	2.87	.947			
Families Asked to Do Without Just When They Begin to Live Well	Time I	2.75	.575	1.47	58	.146
	Time II	2.63	.667			
Rather Accept "Risks" from Nuclear Power Than Restrict Energy Use	Time I	3.25	.745	.57	60	.568
	Time II	3.18	.719			

Table 24.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Rather Pay Extra Than Keep House at 68°	Time I	3.13	.645	-.18	60	.854
	Time II	3.15	.792			
Rather Pay Extra Than Decrease Hot Water Temperature	Time I	3.05	.644	0	60	1.000
	Time II	3.05	.740			

Table 25.--EcoAwareness Scale and Items Within Scale: T-Tests of Differences Between Means for the Experimental Group (HEC 401) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
EcoAwareness Scale	Time I	33.10	4.164	-3.39	66	.001
	Time II	34.81	3.212			
Items Within Scale:						
Energy Compared to Inflation	Time I	2.68	.806	-.80	66	.427
	Time II	2.79	.794			
Energy Compared to Crime	Time I	2.48	1.060	-.76	66	.450
	Time II	2.59	.937			
Energy Compared to Unemployment	Time I	2.61	.878	-.47	66	.641
	Time II	2.66	.745			
Scarcity of Fossil Fuels	Time I	3.68	.672	.62	65	.536
	Time II	3.61	.661			
Waste and Inefficient Use of Energy	Time I	3.75	.618	-1.84	66	.070
	Time II	3.91	.358			
World Overpopulation	Time I	3.02	.767	.19	65	.849
	Time II	3.00	.846			
Overconsumption by United States	Time I	3.57	.681	-2.85	66	.006
	Time II	3.78	.539			

Table 25.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Preserve Natural Environment Even if Way of Living Must Change	Time I	3.47	.561	0	65	1.000
	Time II	3.47	.533			
Price of Energy Too Low Considering Most Energy Sources Can't be Replaced	Time I	2.69	.801	-2.08	61	.042
	Time II	2.94	.721			
Stopping Pollution More Important Than Lower Prices	Time I	2.82	.563	-.36	60	.718
	Time II	2.85	.543			
"Energy Crisis" was "Put On" to Raise Fuel Prices	Time I	3.02	.766	-3.48	63	.001
	Time II	3.31	.614			

Table 26.--Human Responsibility Scale and Items Within Scale: T-Tests of Differences Between Means for the Experimental Group (HEC 401) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Human Responsibility Scale	Time I	19.54	2.285	-.48	66	.635
	Time II	19.67	2.156			
Items Within Scale:						
Family Entitled to Material Goods If Can Afford	Time I	3.18	.493	-1.41	65	.163
	Time II	3.29	.548			
Citizens of U.S. Entitled to Use as Much Energy as Can Afford	Time I	3.58	.528	2.51	65	.015
	Time II	3.58	.651			
If Each Family Tried to Conserve, It Would Make A Difference	Time I	3.32	.531	-.06	65	.553
	Time II	3.36	.572			
I Should be Concerned About Energy for Future Generations	Time I	3.54	.532	0	66	1.000
	Time II	3.54	.502			
Continuing Present High Standard of Living Deprives Poorer Peoples of Basic Necessities	Time I	2.98	.696	-.65	64	.521
	Time II	3.05	.623			

Table 26.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Continuing High Levels of Energy Use Prevents Future Generation from Having a High Level of Living	Time I	3.25	.613	.18	64	.854
	Time II	3.23	.632			

Table 27.--Life Style Flexibility Scale and Items Within Scale: T-Tests of Differences Between Means for the Experimental Group (HEC 401) at Time I and Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Life Style Flexibility Scale	Time I Time II	38.72 39.67	4.137 4.315	-1.82	66	.074
Items Within Scale:						
Even Buying Fewer Material Goods, My Family Maintain a Satisfying Way of Life	Time I Time II	3.21 3.26	.448 .441	-.69	65	.495
Don't Mind Hand-Me-Downs or Used Goods for Family	Time I Time II	2.74 2.77	.644 .679	-.36	64	.718
Would Pay for Costly Solar Energy to Decrease Petroleum Demand	Time I Time II	2.92 3.13	.635 .495	-2.73	61	.008
Would Give Up Living Space to Install Solar Heating/Cooling	Time I Time II	3.05 2.92	.486 .650	1.34	63	.185
Am Concerned About Cost of Travel; Too Expensive to See Family/Friends	Time I Time II	2.53 2.42	.638 .583	1.31	65	.196

Table 27.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Concerned Cost of Housing Becoming Too High That I Can't Afford Space Needed	Time I	2.17	.606	-.73	63	.470
	Time II	2.23	.684			
Small Cars Not as Safe as Big Cars	Time I	2.38	.750	.67	62	.146
	Time II	2.27	.766			
Buying Imported Cars Unpatriotic	Time I	3.17	.708	.70	62	.484
	Time II	3.11	.825			
Small Economy Cars Durable	Time I	2.58	.649	.18	58	.859
	Time II	2.56	.650			
Hard to Relax and Be Comfortable in Home at 68°	Time I	3.10	.741	-.62	66	.536
	Time II	3.15	.584			
Families Asked to Do Without Just When They Begin to Live Well	Time I	2.68	.591	-.68	62	.497
	Time II	2.75	.567			
Rather Accept "Risks" from Nuclear Power Than Restrict Energy Use	Time I	3.37	.703	-.18	62	.859
	Time II	3.38	.728			

Table 27.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Rather Pay Extra Than Keep House at 68°	Time I	3.14	.654	-1.29	65	.203
	Time II	3.23	.549			
Rather Pay Extra Than Decrease Hot Water Temperature	Time I	3.09	.601	-.20	65	.843
	Time II	3.11	.611			

Table 28.--EcoAwareness Scale and Items Within Scale: T-Tests of Differences Between Means of the Gain Scores for Both Groups at Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
EcoAwareness Scale	HEC 301	-.01	4.418	2.28	129	.024
	HEC 401	-1.71	4.132			
Items Within Scale:						
Energy Compared to Inflation	HEC 301	.19	1.018	1.58	129	.117
	HEC 401	-.11	1.148			
Energy Compared to Crime	HEC 301	.12	1.234	1.08	129	.284
	HEC 401	-.19	1.205			
Energy Compared to Unemployment	HEC 301	.16	1.138	122	111.11	.225
	HEC 401	-.04	.782			
Scarcity of Fossil Fuels	HEC 301	-.12	1.204	-.64	129	.522
	HEC 401	.01	1.013			
Waste and Inefficient Use of Energy	HEC 301	-.21	.647	-.46	129	.646
	HEC 401	-.16	.697			
World Overpopulation	HEC 301	-.19	.945	-1.01	129	.314
	HEC 401	-.01	1.007			
Overconsumption by United States	HEC 301	-.12	.938	.62	103.94	.539
	HEC 401	-.20	.578			

Table 28.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Preserve Natural Environment Even If Way of Living Must Change	HEC 301	.13	.882	1.22	129	.225
	HEC 401	-.04	.706			
Price of Energy Too Low Considering Most Energy Sources Can't Be Replaced	HEC 301	-.14	.889	1.36	117.40	.177
	HEC 401	-.40	1.292			
Stopping Pollution More Important Than Lower Prices	HEC 301	.08	1.059	1.71	129	.090
	HEC 401	-.22	.966			
"Energy Crisis" was "Put On" to Raise Fuel Prices	HEC 301	.09	1.218	2.64	129	.009
	HEC 401	-.40	.922			

Table 29.--Human Responsibility Scale and Items Within Scale: T-Tests of Differences Between Means of the Gain Scores for Both Groups at Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Human Responsibility Scale	HEC 301	.73	4.044	1.50	99.15	.137
	HEC 401	-.13	2.309			
Items Within Scale:						
Family Entitled to Material Goods if Can Afford	HEC 301	-.03	.959	.52	105.61	.604
	HEC 401	-.10	.606			
Citizens of U.S. Entitled to Use As Much Energy as Can Afford	HEC 301	.19	1.067	.24	112.00	.813
	HEC 401	.15	.744			
If Each Family Tries to Conserve, It Would Make A Difference	HEC 301	.27	.821	2.64	124.63	.009
	HEC 401	-.09	.712			
I Should be Concerned About Energy for Future Generations	HEC 301	.14	.906	1.02	114.02	.312
	HEC 401	0	.651			
Continuing Present High Standard of Living Deprives Poorer Peoples of Basic Necessities	HEC 301	.08	1.117	.80	116.34	.427
	HEC 401	-.06	.833			

Table 29.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Continuing High Levels of Energy Use Prevents Future Generation From Having a High Level of Living	HEC 301	.09	.904	.85	129	.397
	HEC 401	-.03	.758			

Table 30.--Life Style Flexibility Scale and Items Within Scale: T-Tests of Differences Between Means of the Gain Scores for Both Groups at Time II.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Life Style Flexibility Scale	HEC 301	.14	7.735	1.00	97.58	.322
	HEC 401	-.96	4.301			
Items Within Scale:						
Even Buying Fewer Material Goods, My Family Maintain a Satisfying Way of Life	HEC 301	0	.959	.62	109.63	.534
	HEC 401	-.09	.645			
Don't Mind Hand-Me-Downs or Used Goods for Family	HEC 301	-.03	.835	.68	129	.499
	HEC 401	-.13	.903			
Would Pay for Costly Solar Energy to Decrease Petroleum Demand	HEC 301	-.19	1.167	.19	129	.846
	HEC 401	-.22	.966			
Would Give up Living Space to Install Solar Heating/Cooling	HEC 301	-.09	.938	-.47	129	.639
	HEC 401	-.01	.977			
Am Concerned About Cost of Travel; Too Expensive to See Family/Friends	HEC 301	.22	.745	.67	129	.503
	HEC 401	.13	.694			

Table 30.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Concerned Cost of Housing Becoming Too High That I Can't Afford Space Needed	HEC 301	-.02	.826	.19	129	.846
	HEC 401	-.18	.869			
Small Cars Not as Safe as Big Cars	HEC 301	.16	1.027	.73	109.01	.468
	HEC 401	.04	.684			
Buying Imported Cars Unpatriotic	HEC 301	-.08	.948	-.93	129	.353
	HEC 401	.07	.926			
Small Economy Cars Durable	HEC 301	-.11	1.393	.40	114.17	.692
	HEC 401	-.19	1.004			
Hard to Relax and Be Comfortable in Home at 68°	HEC 301	.03	1.297	.43	87.02	.669
	HEC 401	-.04	.589			
Families Asked to Do Without Just When They Begin to Live Well	HEC 301	.06	1.037	1.42	129	.157
	HEC 401	-.18	.903			
Rather Accept "Risks" from Nuclear Power Than Restrict Energy Use	HEC 301	.05	1.030	1.20	129	.231
	HEC 401	-.16	.979			

Table 30.--Continued.

		Mean Score	Standard Deviation	T-Value	Degree of Freedom	2-Tail Probability
Rather Pay Extra Than Keep House at 68°	HEC 301	.11	.893	.96	129	.337
	HEC 401	-.03	.758			
Rather Pay Extra Than Decrease Hot Water Temperature	HEC 301	.03	.835	-.10	129	.924
	HEC 401	.04	.787			

APPENDIX E

RELIABILITY TESTS

APPENDIX E

RELIABILITY TESTS

Table 31.--Reliability Coefficients for Energy Attitude Scales.

	Scale	Alpha
Gladhart, 1976	Ecosystem Awareness	
	women	.783
	men	.777
	Human Responsibility	
	women	.735
	men	.740
	Life Style Flexibility	
	women	.701
	men	.682
Knutson, 1979	EcoAwareness	
	pretest	.559
	posttest	.613
	Human Responsibility	
	pretest	.727
	posttest	.692
	Life Style Flexibility	
	pretest	.571
	posttest	.625