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By

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ABSTRACT

AN ASSESSMENT OF ATTITUDES, KNOWLEDGE AND BELIEFS OF GLOBAL WARMING: A COMPARISON BETWEEN TWELFTH GRADE STUDENTS IN LANSING, MICHIGAN AND VALDOSTA, GEORGIA

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The purpose of this study was to compare environmental attitudes, knowledge and beliefs held by two regionally separated populations. More specifically, the objectives of this study were (1) to assess the attitudes twelfth grade students hold toward environmental issues; (2) to assess how knowledgeable twelfth grade students are about global warming; (3) to assess twelfth grade students' beliefs of environmental responsibility: conservation, management and protection; and (4) to assess if regionally separated twelfth grade students differ in environmental attitudes, knowledge and beliefs.

Data were collected from four high schools, two in Lansing, Michigan (Everett High School, Eastern High School) and two in Valdosta, Georgia (Lowndes High School, Valdosta High School). Seven hundred and eighty-four students participated in the study by completing a five-page questionnaire. Following the analysis of the questionnaires, twelve focus groups were developed. Sixty-one students participated in the focus group sessions, six sessions in each region. In achieving the objectives of this study, responses to the questionnaire were reported and analyzed by one or more of the following techniques: (1)

frequencies, (2) analysis of variance, (3) correlations, (4) regression analysis, (5) Chi-square, and (6) descriptive statistics (mean and standard deviation).

The quantitative results suggested that the environmental attitudes of the Georgia respondents were significantly more positive than the Michigan respondents, this was also supported by the focus group sessions. The quantitative and qualitative data of this study also found the respondents to lack knowledge of general environmental issues, and global warming. The results also indicated that the Georgia respondents were significantly more knowledgeable of global warming. Additionally, the quantitative results of this study found twelfth grade students from both regions lack beliefs of responsibility. However, the focus group sessions revealed that the participants do possess moderate-to-strong beliefs of responsibility, but they are currently being masked by a sense of powerlessness.

The findings of the study have implications for environmental education, students, secondary school teachers, parents and decision makers.

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CHAPTER I

INTRODUCTION OF RESEARCH TOPIC

In the last two decades, researchers have focused on people's knowledge of environmental issues, their attitudes toward the environment, and behavior related to environmental concerns. Many have suggested that the roots of environmental problems stem, in large part, from the basic values upon which society has been built (Swan, 1971). Although environmental issues have received considerable attention by the public in recent years, environmental problems have and will continue to exist for many years. The early stages of the Industrial Revolution produced serious environmental problems. However, human response to environmental problems, until recent years (i.e., 1970's) has been what T.C. Sinclair describes as "episodic and specific" (Sinclair, 1973).

Pinhey and Patterson (1976) note that the environment had become a major issue of concern to the citizens of the United States by 1970. Their account of the shift in the perception of the environment as a major social problem is delineated as follows: When the first national polls on pollution appeared in the late 1960s, only about one-tenth of the U.S. public considered the problem of environmental degradation a serious one (Collver, 1974). By 1970, the environment had achieved a high place on the list of the most important problems

facing the nation. This shift in public sentiment was witnessed by phenomena such as Earth Week, the introduction of environmental control laws at the state and Federal levels (Buttel and Flinn, 1974; Ridgeway, 1971), and an increase in the number of environmentally oriented articles appearing in various U.S. periodicals (McEvoy, 1972; Pinhey and Patterson, 1976).

The public and governmental concern with the environment during the early 1970s has led many social scientists to define it in terms of a social movement (Albrecht, 1982). Since the emergence of the environmental movement, there has been a proliferation of research articles in the environmental and social science literature concerning the impact that environmental problems will have on the future of society.

The environmental movement has also had an impact on people's knowledge, attitudes and behavior toward the environment. However, research by some social scientists suggests that the influence of the environmental movement will be greater for some groups than it is for others. Van Liere and Dunlap (1980), in a review of empirical literature on the factors related to environmental concern, examine five general hypotheses that illustrate the variation in environmental concern by certain groups. They report that younger people are more concerned about environmental quality than older people. In terms of environmental concern relative to social class, Van Liere and Dunlap revealed that of three indicators of social class (education, income and occupational prestige) only education is related to environmental concern. They found the

relationship between educational level and environmental concern to be moderately strong and positive. That is, persons with higher levels of education are more likely to be concerned about the environment (Van Liere and Dunlap, 1980). On other sociodemographic variables, such as political party and ideology, Van Liere and Dunlap did not find much support for the hypothesis that Democrats and liberals are more likely to be concerned about the environment as compared to Republicans and conservatives. They also say that the findings did not support the hypothesis that gender is related to environmental concern (Van Liere and Dunlap, 1980). Although Van Liere and Dunlap did not focus specifically on the relationship between students and environmental concern, several recent studies have included students in their analyses of environmental issues.

This research will focus more specifically on twelfth grade students and global warming, a combination of sample and issue that has not been addressed by previous researchers. Empirical evidence of differentiation of environmental attitudes, knowledge and beliefs possessed by two regionally separated groups will be collected and studied. Twelfth grade students were selected for two reasons. First, twelfth grade students are in their last year of secondary education and are thought to be more mature than younger students. Maturity impacts respondent answers because surveys are often viewed as a waste of time by younger people and many students are preoccupied with other things. The second reason for selecting twelfth grade students is that they are representative products of at least

twelve years in their respective school systems. The researcher used length of residence as criterion for participation in the study.

Following the recommendations of Van Liere and Dunlap (1980), this research will be specific to the environmental issue of global warming and will examine the relationship between cognitive determinants and sociodemographic variables. Furthermore, it will examine the regional variation in twelfth grade students' beliefs of environmental responsibility, their attitudes toward environmental issues, and knowledge about a specific environmental concern (global warming).

Statement of the Problem

Several researchers have examined environmentalism among students by asking general questions about national environmental issues (Van Liere and Dunlap, 1980). Previous studies have shown that environmental concern varies by social class (i.e., education), age, gender, residence and political affiliation and ideology. However, no studies were discovered that examined regional differences in levels of environmental concern or empirical evidence of how students perceive global warming (i.e., attitudes, beliefs and knowledge). Therefore, there is a need to research the following relationships: (1) significant relationships between students' geographic region and attitudes toward environmental issues, (2) significant relationships between students' geographic region and knowledge of global warming, and (3) significant relationships between students' geographic

region and beliefs of environmental responsibility.

More specifically the following objectives will guide this study:

Objective I - To assess the attitudes twelfth grade students hold toward environmental issues.

Objective II - To assess how knowledgeable twelfth grade students are about global warming.

Objective III - To assess twelfth grade students' beliefs of environmental responsibility: conservation, management and protection.

Objective IV - To assess if regionally separated twelfth grade students differ in environmental attitudes, knowledge and beliefs.

In achieving the objectives seven hypotheses were stated for analysis purposes:

H1: Students in Lansing, Michigan will have significantly more positive attitudes toward the environment than students in Valdosta, Georgia.

H2: Students in Lansing, Michigan will have significantly more knowledge of Global Warming than students in Valdosta, Georgia.

H3: Students in Lansing, Michigan will have significantly stronger beliefs of environmental responsibility than students in Valdosta, Georgia.

H4: There will be a significant difference in students' attitudes toward the environment between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H5: There will be a significant difference in students' knowledge of Global Warming between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H6: There will be a significant difference in students' beliefs of environmental responsibility between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H7: There will be a significant positive relationship among students' attitudes toward the environment, their beliefs of responsibility and knowledge of global warming.

Rationale of Hypotheses

The motive for investigating each of these hypotheses can be summarized in the following manner.

Hypotheses 1-3

Several studies have examined the attitudes, beliefs and knowledge of students and the environment. Van Liere and Dunlap's (1980) research of 23 articles on environmental concern found the variable of residency, and its relationship to environmental concern, supported the hypothesis that urban students are more perceptive of environmental issues than rural students. Tremblay and Dunlap (1978) also found urban residents were more likely to be pro-environmentalists. Their findings support the hypotheses that Lansing students will be more positive toward the environment and possess stronger beliefs of responsibility than the Valdosta students. Cursory review of the sociodemographic characteristics of Lansing and Valdosta suggests that the Lansing research sample will consist largely of urban students while the Valdosta research sample will consist mostly of rural students. Furthermore, the cursory

review revealed that the level of income and educational attainment of the Lansing residents is slightly higher than the Valdosta residents. Social class (income) and education level has been found by some researchers to be a significant predictor of environmental attitudes, beliefs and knowledge (Buttel and Flinn 1974; Van Liere and Dunlap 1977; McEvoy 1972). They report that people with higher incomes and more education are more positively associated with environmental concern (attitudes, beliefs and knowledge) than those individuals with lower incomes and less education. The directional hypotheses were developed based primarily on previous research and this author's familiarity with the two regions. This research will attempt to clarify any differences that exist between the students' in the two regions and provide insight into the causes of these differences.

Hypotheses 4-6

The next hypotheses in the study states there will be a significant difference in the students' attitudes, beliefs and knowledge when the effects of the demographic variables (gender, race, residence, college education of parents) are controlled. Previous research has found attitudes, beliefs and knowledge toward the environment are associated with similar sociodemographic variables, therefore, in this study they were controlled. The basis for these hypotheses comes not only from the role of theory but mainly from the exposure of the author to students in both regions. For example, Lansing actively promotes a clean environment, has a

bottle return law that promotes recycling in the communities and a school district that is currently incorporating environmental education in the curriculum. In contrast the city of Valdosta does not actively promote environmental protection, nor does it have a bottle return law. Additionally, the school district is not incorporating environmental issues into the curriculum, nor do they have any plans to do so in the future. The existence of regional differences led this researcher to hypothesize that there will be regional differences in the students' attitudes, beliefs and knowledge.

Hypothesis 7

The final hypothesis states there will be a significant positive relationship among students' attitudes toward the environment, their beliefs of responsibility and knowledge of global warming. Several studies have investigated the relationship between attitudes, beliefs and knowledge (Ramsey and Rickson, 1976; Arbuthnot, 1977; Maloney and Ward, 1973). They all found environmental knowledge to be positively associated with environmental concern (attitudes and beliefs). For example, Ramsey and Rickson (1976) using three high schools researched the relationship between environmental knowledge and environmental attitudes. They reported that increased knowledge moderates environmental concern (attitudes and beliefs). Similarly, many studies have reported results inconsistent with Ramsey and Rickson's study (Ajzen and Fishbein, 1977; Fishbein and Ajzen, 1975; Campbell, 1963) thus, by using both quantitative and qualitative

research methods this researcher will attempt to fill gaps currently found in the literature.

Significance of the Study

This study is significant for several reasons. First, it will provide data on a sizeable minority population (twelfth grade students) in the U.S. that will have a significant impact on the future of our environment. This research will also contribute to our understanding of the future by providing information about where we must concentrate our environmental education efforts and what factors may be affecting the attitudes, beliefs and knowledge of regionally separated students.

Furthermore, this study will focus on a specific environmental problem (i.e., global warming). While other research has attempted to assess the environmental beliefs, attitudes, and knowledge of students, the comparisons have been made across groups (e.g., urban versus rural). No previous studies were found representing regional comparisons (e.g., Midwest versus Southeast).

Moreover, this study will draw from the experience of previous research and combine, in a single study, many factors believed to be related to environmental concerns. The combination of all these variables in a single study, on a significant minority population, will enhance our knowledge base about how students perceive and respond to environmental issues and concerns (e.g., global warming).

Finally, it is believed that the current study will assist those involved in program development, environmental education and policy decisions in developing and implementing programs that will be directed toward students.

Organization of the Study

An introduction, a statement of the problem, objectives, hypotheses and the significance of the study have been provided in this first chapter. Additional background information has been discussed, including the study's importance to higher education. In Chapter II, the review of literature describes the manner in which people view environmental problems and the historical context of the environmental movement. Chapter III describes theories underpinning the people and environment interface and provides an exploration of the variations in the students' attitudes, beliefs and beliefs. Chapter IV focuses on the research methodology, population and sample, method of data collection, and variables to be measured. Chapter V is a reporting and discussing of study. Chapter VI contains a summary, conclusions, implications and recommendations for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

One purpose of the literature review is to organize the paper in a manner in which the research problem can be understood. The literature review was established through books, periodicals and research reports that document what has been done in the past concerning the research problem. For logical presentation, the literature review and this chapter are organized around the following areas: (1) Overview of Global Warming; (2) Public Opinion of Global Warming; (3) Overview of Environmental Research; (4) Students and Environmental Concern; and (5) Students and Environmental Education. Its organization provides the reader with a historical context of the environmental movement in the United States. It will illustrate specific empirical research conducted during the last three decades on environmental concern (attitude, knowledge and beliefs) and its social basis.

Global Warming Overview

Global warming is not a new phenomenon in the United States. Its existence can be traced back to the 1800s when the Industrial Revolution started

in Great Britain (MacLean, 1991). All projections of global warming are based on an assumed doubling of carbon dioxide (CO_2) emissions into the atmosphere resulting in a greenhouse effect (Morandi, 1990). The most important effect on the climate can be attributed to the rise in the concentration of atmospheric carbon dioxide caused by the burning of ever-increasing amounts of coal, oil, and other fossil fuels (Budyko, 1982). Another influence on the climate is associated with the fact that energy consumption by various kinds of human activities results in additional heating of the atmosphere (Budyko, 1982). Several gases are responsible for global warming, the most important being carbon dioxide. In 1846, John Tyndall was probably the first to point out that a change of the atmospheric CO_2 content could have been the cause of climate changes in the geological past (Bach, 1984). Svante Arrhenius, a Swedish chemist, warned in 1986 that carbon dioxide released into the atmosphere from burning coal for industrial power is likely to make the world warmer (MacLean, 1991). Arrhenius calculated that an increase in carbon dioxide by a factor of 2.5 to 3 parts per million would increase the temperature by 8 to 9 degrees Celsius (Bach, 1984). To a lesser extent, the clearing of land for agriculture and cities has also contributed to the increased concentration of carbon dioxide. Other important greenhouse gases are methane, nitrous oxide, various types of chlorofluorocarbons (CFCs), and ground-level ozone. All atmospheric concentrations of these gases have been observed to be increasing (UCS, 1989).

Carbon Dioxide concentrations in the atmosphere have increased from 270

ppm to 339 ppm (approximately 26%) since pre-industrial times, and have been increasing by approximately 1 to 1.5 ppm per year (Cushman, 1989). Methane is of considerable interest because of the relatively rapid increase in its concentration, 1% per year in the last decade meaning that the concentration has more than doubled in the past 200 years (Matthews, 1987). Human activities contributing to methane emissions include increased animal husbandry, rice production, biomass burning, losses from natural gas wells and pipelines, sewage and municipal waste disposal.

Chlorofluorocarbons emissions are increasing at the fastest annual rate-7 percent higher than any of the other greenhouse gases (Morandi, 1990). As a result, the CFC molecule has the greatest potential to contribute to global warming (Dickinson, 1986). Chlorofluorocarbons (CFCs), a class of halogenated hydrocarbons, are synthetic chemicals used primarily in propellants, foams and refrigerants (Wuebbles, 1986). Initial concern over CFCs was related to their ability to deplete the ozone layer that protects the earth's atmosphere from ultraviolet radiation. Recently, international measures have been taken to limit CFC production. For example, signatories to the Montreal Protocol of September 1987 pledged to reduce the production of CFCs according to time tables explained in the protocol (Malone, 1989).

Like other important greenhouse gases, atmospheric nitrous oxide concentrations are increasing (D.O.E, 1989). Nitrous oxide concentration decreases stratospheric ozone that increases the earth's surface temperature

(Wuebbles, 1986). It was in the 1970s when, with the use of high speed computers, climatologists began projecting warming of 3 to 9 degrees by the end of the 21st century (MacLean, 1991). These calculations used CO_2 levels as the unit of measurement. Developments in computers, model equations, and knowledge of clouds and oceans all promise to improve predictive model capabilities and reliability (D.O.E, 1989). Worldwide temperature records suggest that, within the last 100 years, we have experienced some very significant changes, with five of the warmest years occurring in the 1980's (Fisher, 1989).

While most scientists agree that greenhouse gas emissions are increasing, there is uncertainty in the scientific community as to the rate at which the related warming will occur (Benioff, 1991). Scientists have documented gradual fluctuations by identifying changes in soil layers and rocks, and bubbles trapped in glacial ice (Nierenberg, 1989). In 1985, scientists from 19 countries agreed with a study crediting other trace gases, including CFCs, with contributing to the greenhouse effect as much as carbon dioxide (MacLean, 1991). In 1987 and 1988, a series of droughts, fires and severe heat waves aroused the public's anxiety about the possibility that these were the first signs of global warming (MacLean, 1991). In light of some uncertainties, scientists are confident that agriculture, water resources, and human health will be affected.

Impact scenarios suggest that agricultural regions will shift northward as growing seasons presently limited by cold temperatures are extended with warmer temperatures. Crop production in the south may be reduced with many crops

currently grown close to their high temperature tolerance (Rosenzweig, 1989). Some regions, in particular, the southern plains and the southwestern United States, may become more arid from changes in rainfall and increased rates of evaporation. Already a scarce and valued resource in these regions, water may become insufficient to sustain agriculture or increase residential development.

Among the other possible results of global warming are an increased frequency and severity of storms and increased energy consumption for cooling (EPA Region IV, 1991). In 1989, seventy-one nations meeting in The Netherlands agreed to a declaration on Atmospheric Pollution and Climate Change. And, in 1990, the United States joined 73 other nations in agreeing that human activities were causing the Earths' atmosphere to heat up (MacLean, 1991). In the past it took a disaster for the United States to act, but deliberate actions (such as the meetings mentioned above) show that global warming is considered serious and should be approached as a threat to all humankind.

Furthermore, it is perceived by some scientists that the causes of global warming are escalating as quickly as solutions to the problem are being discussed. There has been increased research activity in the last few decades. Sustained research over the next decade will enable scientists to build on this foundation, investigate outstanding questions, and provide society with the knowledge needed for making prudent decisions (D.O.E, 1989). "Unless solutions can be found to this problem, the nation will enter the 21st century declining in wealth, power and influence . . ." (Brookes, 1989 p.98).

For problems of global warming to be solved or reduced, it will require the public to become more informed and willing to support appropriate education while pursuing courses of action that ensure protection of the environment. Global warming is not only a problem for the environmental sciences, it is also a social problem (i.e., a problem affecting a significant number of people, who perceive it to be a problem, and collectively believe that the problem can be solved).

Since global warming is a social problem, it has come to the attention of the social sciences. Social scientists have, in the last two decades, focused on the perceptions of people regarding environmental problems, their attitudes toward environmental issues, and behavior related to environmental concerns. In the section following, this literature review provides a summary of social science research literature on environmental problems, issues, and concerns.

Public Opinion of Global Warming

Despite extensive media attention and an increase in environmental education, the public's awareness of global warming appears to remain uncertain and incomplete. The public does, however, consider global warming a "serious environmental threat" and many believe it will cause both environmental and health problems in the future (The Los Angeles Times, 1989; The Washington Post, 1990; and The Analysis Group). Questions have been incorporated into many environmental surveys and polls to assess the public's opinion of global

warming and related issues such as: greenhouse effect, ozone depletion and air pollution. The polls or surveys inquired about people's awareness of global warming and ozone depletion, level of concern, and opinions about policy actions that should be taken to deal with these problems (Farhar, 1993, p.29).

In 1989, Roper surveyed 1623 adults. They were asked, "Do you find you are more concerned about worldwide environmental problems such as the greenhouse effect that may result in global warming--or do you find that local environmental problems concern you more?" (The Los Angeles Times, 1989). In response to this question 46% reported more concern for local problems while 44% selected global environmental problems as most important.

In a similar study the following year, Roper surveyed 1016 adults and asked: "Generally speaking, are you more concerned about worldwide environmental problems like global warming and saving the rain forests or do local environmental problems concern you more?" (The Washington Post, 1990). Forty-eight percent (48%) of the respondents chose local environmental problems and 45% reported that they are more concerned with worldwide environmental problems such as global warming.

In 1992, Gallup surveyed 22 countries, 25,000+ respondents were asked: "How serious do you personally believe a particular environmental problem to be in the world?" (Dunlap and Gallup, 1992). The U.S. respondents, when compared to the other countries, were less likely to identify global warming and loss of ozone as "very serious" environmental problems. They did, however, identify

issues such as poor water (22%), poor air (18%), inadequate sewage (18%), contaminated soil (12%), too many people (11%), too much noise (7%) as "very serious" (Dunlap and Gallup, 1992).

When 1250 residential electricity customers were asked by Cambridge Reports (1990) to identify the single most important environmental concern on an open-ended question, the greenhouse effect was the third most frequently named response, behind air pollution and water pollution, respectively (Cambridge Reports, September 1990). Those same respondents were also asked to rank environmental problems based on their perception of "threat" to environmental quality. Fifty-seven percent (57%) of the respondents reported that depletion of ozone layers in the atmosphere is "a large threat," and 42% felt that global warming from the greenhouse effect was also "a threat" to environmental quality.

In 1989, a national sample of twelve hundred (1200) registered voters were asked by Research/Strategy/Management Inc. (RSM), "When you think about the environment, what do you think is the most important problem facing it today--the one you are most concerned about?" Atmospheric problems were reported by the majority (52%) of the respondents as their highest concern; these problems included global warming, greenhouse effect, ozone layer, smog, and air pollution (RSM, 1989). Between 1981 and 1991, Roper asked national samples about natural resource depletion in the next 25 to 50 years. Most respondents (56%) were concerned about running out of clean air, while only 13% (least concerned) felt the U.S. was in danger of running out of coal.

In 1992, a national survey of the League of Women Voters' (LWV) leaders (chapter officers and board members) were asked about global warming. Ninety-seven percent (97%) viewed global warming as a "real environmental threat," and the majority (81%) reported that citizens and local officials do not have enough information to make informed decisions about public policy on global warming (League of Women Voters Education Fund, 1992).

Cambridge Reports (February 1990) asked 1250 adults in a national survey "What do you think are some of the causes of the greenhouse effect (in the atmosphere that could cause global warming)?". Most respondents mentioned the following in response to this open-ended item: automobiles, air pollution, aerosol sprays, factories, deforestation, and ozone destruction (Farhar, 1993). A smaller percentage (42%) reported they had little or no knowledge about global warming.

In September 1988, The Analysis Group polled 1001 registered voters in an attempt to assess level of concern about the "greenhouse effect," they were asked if they were "extremely worried," "somewhat worried," "a little worried" or "not worried at all." Seventy-five percent (75%) responded that they were "extremely worried" or "somewhat worried" about the greenhouse effect and 24% reported they were only "a little worried" or "not worried at all" (The Analysis Group, 1988).

In December 1990, (RSM) asked 1200 registered voters "Do you believe the U.S. should join other industrial countries in committing to carbon dioxide emissions limits, or should we wait for greater scientific certainty before making

such a commitment? " (RSM, 1990). Seventy percent (70%) reported we should commit to the reduction of our carbon dioxide emissions with other countries and 26% said we should wait for more scientific evidence; Four percent (4%) reported they did not know.

Results of surveys and polls taken that have asked questions relating to global warming (greenhouse effect etc.) illustrate moderate to high levels of concern and awareness. However, none of the previous studies have assessed the level of concern or opinions of high school students nor was there evidence of any regional comparisons.

In 1991, Willett Kempton conducted a study to assess lay perspectives on global climate change. Using extensive open-ended interviews with a small but diverse group of U.S. residents, the researcher accomplished his goal. He included topics, such as personal weather observations, the respondents' definition of global warming, and the values they would use in making decisions regarding global climate change. Twelve interviews were conducted for this study that took approximately 45 minutes each. The interviewers asked several questions about the participants perceptions of weather, and if they had heard of the greenhouse effect. Ten of the twelve participants had heard of the greenhouse effect (Kempton, 1991). They also found that most participants blamed aerosol cans for ozone depletion despite how often the interviewers mentioned CO_2 and the greenhouse effect (Kempton, 1991). It was also discovered that several "participants understood and could recite the idea that trees absorb CO_2 and

produce oxygen" (Kempton, 1991, p.187). When the participants were asked "What factors affect weather?", human activities were mentioned exclusively by five of the participants, three mentioned both human and natural phenomena, and four listed natural phenomena exclusively (Kempton, 1991). It was discovered that "the majority of the participants believe that they have observed a change in the weather" (e.g., warmer winters and more variable and more violent weather were common observations) (Kempton, 1991, p.193). The participants were also asked: "If they felt protecting the environment was extremely important," and to that question they all agreed. One question designed to seek information about the participants' environmental values asked about preservation of the environment for descendants. Ten of the twelve participants expressed overwhelming support for the environmental preservation for descendants. "This was, in fact, the strongest value basis to emerge in the interviews" (Kempton, 1991, p.197).

Environmental Concern Overview

The 1970s ushered in a public outcry for improvement of the environment. "Public concern played a major role in the sudden emergence of environmental problems as a leading item on the national agenda at the beginning of the 1970's" (Mitchell, 1980, p.8). One of the first research projects conducted by the Opinion Research Corporation in 1973 found that 60 percent of the respondents in a national sample felt that businesses were responsible for environmental pollution

and problems (Anthony, 1982).

Also in 1973, the President's Council on Environmental Quality (CEQ) conducted a study to learn whether the public felt there was enough spending on the environment by the Federal Government. The conclusion was "60 percent of the respondents felt too little was spent by the government on environmental issues" (Anthony, 1982, p.17). Similarly, The Roper Organization (1973) found 45 percent felt there was too little spending on the environment while 30 percent felt spending was on target.

Other research projects measured commitment to environmental issues based on demographic factors. Throughout the literature, five general themes--age, residence, political affiliation, social class, and education--emerge as variables in support of theoretical hypotheses related to environmental issues and concerns.

Age

In 1974, K.E. Hornback found that young people were more supportive of environmental issues than older individuals. This was also the conclusion of a study done in late 1969 by J. Harry (1971).

Malkis and Grasmick (1972) suggest that the exposure of the youth movement of the Sixties and Seventies may help account for the greater concern about environmental problems in individuals 18 to 30 years of age. Specifically, they argue that the involvement of youth in environmental issues is a logical outgrowth of their high level of mobilization over receding issues of civil rights

and Vietnam. Continued exposure to alarming information on environmental deterioration has left an indelible imprint on many young people during the past decade. Thus, Malkis and Grasmick hypothesize that forming an ecology-minded generation whose commitment to environmental reform should not disappear as they move into adulthood. The CBS News/New York Times Poll (1981) concluded that the age group most concerned about environmental issues was 18-29 followed by 30-44 year of age and least concerned were individuals 85 and over.

Further research on the issue of age and environmental concern was conducted by Van Liere and Dunlap (1980). Most research supported the hypothesis that younger individuals were more environmentally conscious. However, some studies fail to do so. For example, Koenig (1975) and Constantini and Hanf (1972) report no relationship; McEvoy (1972) reports only a negligible (less than .1%) negative relationship, while Arbuthnot and Lingg (1975), Tognacci et.al. (1972) Van Liere and Dunlap (1978), and Harris (1970) all report slight relationships between age and at least one of their measures of environmental concern.

Residence

A survey was conducted by Leftridge and James (1980) to test the hypothesis of whether geographical regions affect environmental perception. Subjects employed for the study were selected from four central city schools and

five rural schools. The central schools were defined as those located in cities with populations over 100,000 and having school enrollments of approximately 30 percent non-white minority representations (Leftridge and James, 1980). A two-part instrument was designed to assess the students' perceptions. The first section used a questionnaire to obtain demographic data. Part two used slides showing environmental issues, such as air pollution, water pollution, waste disposal and land use to test the students' perceptions. It was concluded that, despite issue, geographic setting, or amount of education, rural students were found statistically more perceptive of environmental issues than were urban students (Leftridge and James, 1980). This finding contradicts the work of Van Liere and Dunlap (1980) that found urban students more perceptive of environmental issues.

A review of past research on the variable of residency and its impact on environmental concern reflects that urban residents are more likely to be environmentally conscious. This contradicts the Leftridge and James (1980) study as mentioned above that found rural students statistically more perceptive of environmental issues while using geography (residence) as a variable.

"Pro-environmentalists are more likely to be urban, with farmers the least likely to demonstrate environmental concern" (Tremblay and Dunlap, 1978, p.480). First, urban residents should be more concerned with environmental problems because they are generally exposed to higher levels of pollution and other types of environmental deterioration. This explanation assumes the place of residence as an indicator of the objective physical conditions. It also assumes that

exposure to poor environmental conditions leads to environmental concern (Tremblay and Dunlap, 1978).

According to a study conducted by Murdock and Schriner (1977), urban residents have more concern for the environment due to the enormous concern for economic growth. Van Liere and Dunlap's (1980) research of 23 articles on environmental concern found the variable of residency, and its relationship to environmental concern, supported the hypothesis that urban residents are more interested in the environment.

Political Affiliation

In early studies of the 1970s, it was predicted that liberals would be more supportive of environmental issues than their conservative counterparts. "The rapid rise of widespread public support for environmental reform in the late sixties and early seventies led to arguments that environmental concern transcended political cleavages" (Ogden, 1971, p.245). Studies conducted by Buttel and Johnson (1978) concluded that the Democratic Party was more concerned about environmental issues. "There is support from the research that Democrats are more environmentally concerned than Republicans" (Koenig, 1975, p.475). However, Dillman and Christenson's (1972) research uncovered no significant association between environmental concern and political party identification. Studies, such as those conducted by Buttel and Flinn (1978a), reported no significant difference between the conservatives and liberals.

Later studies of the period found that support for environmental reform varies among political groupings (Buttel and Flinn, 1976). Further specification of liberal ideology by Buttel and Flinn (1978) led to the distinction between anti-laissez-faire and welfare state liberalism. Although both correlate positively with environmental concern, anti-laissez-faire liberalism has shown significantly stronger association (Buttel and Johnson, 1978).

Anti-laissez-faire liberalism reflects a belief that the national government should compel private individuals and legal entities to obey regulatory laws when such laws protect the collective well-being of the nation (Samdahl and Robertson, 1989). Although typically used by economists to reflect restrictions in freemarket policies, the concept of anti-laissez-faire addresses a broader belief in the appropriateness of governmental regulation on the behavior of citizens. The "Welfare-State" liberalism addresses the belief that the national government has a responsibility to assist citizens who are unable to maintain a minimal standard of living (Samdahl and Robertson, 1989). This calls for active governmental involvement in programs to reduce socioeconomic inequality. These two beliefs are highly correlated and address distinct types of problems and strategies for solutions. The differentiation between anti-laissez-faire liberalism and welfare state liberalism in predicting environmental concern reflects an improvement in the measurement and specification of political ideology (Samdahl and Robertson, 1989).

Social Class and Education Level

A review of the literature addressing the variables of social class and education and their impact on environmental concern reflects two schools of thought. The first school of thought is lead by theoretician R.E. Dunlap (1975), whose research concluded that there is a correlation between education and social class. Environmental concern is positively associated with social class as measured by education, income and occupational prestige (Van Liere and Dunlap, 1980). This hypothesis rests on Maslow's 1970 hierarchy of needs theory, and assumes that concern for environmental quality is something of a "luxury". He says environmental concern can only be indulged after more basic material needs [e.g., adequate food, shelter, and economic security] are met (Dunlap, 1975).

In addition to the preceding findings, there has been other research conducted on social class and environmental concern. Longitudinal studies conducted by Buttel and Flinn (1974), found a positive relationship between education level and environmental concern. Furthermore, a study conducted by Van Liere and Dunlap (1977) found the associations between educational level and environmental concern support the hypothesis that education is positively associated with environmental concern. The correlations are all positive, and most are moderately strong generally ranging between 15 and 40 percent.

On the issue of income and environmental concern, several studies report moderately positive associations, thereby supporting the hypothesis that higher income groups are more environmentally concerned than lower income groups

(Buttel and Flinn, 1974). Another investigation conducted by McEvoy (1972), reviewed environmental concern and income level. This research concluded that people in higher income brackets are more environmentally conscious.

According to research conducted by Van Liere and Dunlap (1980), correlations between social class and environmental concern are positive, but with most so slight that it is difficult to conclude that the hypothesized relationship is supported (Van Liere and Dunlap, 1980). On the other hand, other scholars have rejected the hypothesis that there is a positive association between social class and environmental concern (Malkis and Grasmick, 1977; Constantini and Hanf, 1972).

Buttel and Flinn (1978) disagree with the idea of middle and upper classes being more responsive to environmental issues. "Because the lower and working classes typically reside in highly polluted areas, work in poor physical environments, and have access to poor recreational facilities, they should be expected to express concern about poor environmental conditions" (Buttel and Flinn, 1978a, p.22). Thus, contrary to most research findings, Buttel and Flinn hypothesize that the lower working classes are more concerned about environmental problems (Van Liere and Dunlap, 1980).

Samdahl and Robertson (1989) conducted a study on the negative relationship between education and environmental concern. This comprehensive study was drawn from 12,000 residents of the state of Illinois. The sample was obtained through a mailed questionnaire that produced a 68.6% response rate. They concluded that the negative association between education and

environmental concern is not a spurious relationship (Samdahl and Robertson, 1989). The fact that the level of education in relation to environmental concern remained negative in the analysis of both subsamples with high and low education suggests this is a stable characteristic of this population (Samdahl and Robertson, 1989).

Similarly, a study conducted by Buttel and Flinn (1978b) measured the difference between persons with high and low education levels. "The sample was split into two groups (those with education less than high school and those with education of high school or more) and the analysis was repeated for each group" (p.32). This study concluded there was no significant relationship between level of education and environmental concern. Lastly, Tognacci (1972) and Koenig (1975), validated the previous studies rejecting the positive association of higher levels of education leading to increased concern for the environment.

Students and Environmental Concern

A study was conducted by Robert E. Roth (1989), a professor in the School of Natural Resources, The Ohio State University and Julio Perez, an education specialist for the Office of Environmental Education in Santa Domingo, Dominican Republic. Data was gathered from 647 Dominican Republic secondary school students using a stratified random sample. The purpose of the study was to determine the environmental knowledge and attitudes of high school students who have received exposure to environmental education. The survey

concluded that the student's knowledge and attitudes toward environmental issues were low with the total scores averaging 51 percent and 55 percent, respectively (Roth and Perez, 1989). The students felt that poverty and deforestation were the most important environmental issues. Ironically poverty is not traditionally considered an environmental issue.

There has been other research to document students' attitudes toward the environment. Thompson and Gasteiger (1989) used an attitudinal survey of 3,419 students in 1971 and 3,867 students in 1981 from Cornell University to assess the students' perceptions on environmental/energy questions. Demographically, the studies were similar in the two test periods, except an increase in females in the 1981 sample due to increased enrollment. The results of the two surveys suggest significant changes in attitudinal responses to environmental material, and energy resources occurred among Cornell students during the ten-year span (Thompson and Gasteiger, 1989). The results of the findings were the following: 1) In both surveys students from the higher income brackets were most reluctant to conserve; 2) In the 1971 and 1981 survey, students with liberal political beliefs were more willing to sacrifice items to improve the environment; and 3) In both surveys respondents from rural areas in comparison with urban respondents were most willing to give up items to enhance the environment.

Wiegard and Trent (1984), conducted a unique study to examine the difference between University students in Monongalia county in Northern West Virginia and residents of an Appalachian community in their attitudes toward the

environment. To test the hypothesis, subjects were asked questions about the importance of the environment relative to economic growth and energy. It was concluded "regarding the hypothesis, that students were not more pro-environment versus energy nor more pro-environment versus economic growth" (Wiegard and Trent, 1984, p.32).

Another study on environmetal concern was conducted by the National Wildlife Federation (1989) using University students. They found that "the overwhelming majority of America's college students, much maligned as materialistic, socially unconcerned and ideologically disconnected are intensely concerned about environmental quality" (National Wildlife Federation [NWF], 1989, p.9). This study sought to determine the level at which students participate in environmental activist organizations; and who is responsible for solving environmental problems. Results of the findings include the following: (1) Nine out of 10 students are willing to pay more for products and packaging that are environmentally safe; (2) Nearly 75 percent of the students believe that recycling of newspapers, glass and cans should be required by law in all communities; (3) While 66 percent believe industry today is more concerned about environmental protection than it was five years ago, 76 percent believe that industry influences government to pass less effective environmental protection laws; (4) Students say they take their environmental concerns into voting booths, with more than 70 percent agreeing that environmental protection is important in electoral decisions; (5) Virtually everyone (95 percent) believes that Congress

should pass tougher laws to protect the environment; (6) Nonetheless, the majority (60 percent) believe that "all of us" have primary responsibility for protecting the environment with only 24 percent laying responsibility on the doorstep of the federal government; (7) 54 percent of the students identified air and atmospheric problems--such as ozone depletion, global warming and acid rain--as the most urgent environmental problems; (8) An overwhelming majority (94 percent) agreed that students can make a difference in environmental protection; (9) The media got high marks for their environmental coverage, with students listing newspapers (35 percent), television and radio (23 percent), and magazines (14 percent) as their primary sources of information; and (10) Eighty percent (80%) believed they could do more for the environment if only they were better informed about what they could do (NWF, 1989).

Students and Environmental Education

"The goal of environmental education is to bring about informed environmental policies for society that will be compatible with the maintenance of a suitable planetary environment" (Pettus, 1976, p.48). More specifically, Hungerford *etal.,* (1980), say "the goal of environmental education is to help students become environmentally knowledgeable, skilled, and dedicated citizens. It should also produce citizens who are willing to work, individually and collectively, toward achieving and maintaining a dynamic equilibrium between the quality of life and the quality of the environment" (p.2).

In 1978, Childress conducted a study of 301 environmental education programs and found that less than 40% of those surveyed considered the following to be the major objectives: (1) synthesizing various alternative solutions to environmental problems into a comprehensive plan; (2) analyzing the role of contributing factors to the causes of environmental problems; (3) evaluating how varying value systems modify and shape the environment; and (4) developing proficiency in environmental data collection (Childress, 1978, p.5). He concluded that more emphasis was placed on environmental knowledge than on helping students develop skills to solve environmental problems.

Environmental education is largely represented by two schools of thought: (1) That we change behavior by making people more knowledgeable of environmental issues and problems and thus they will, in turn, act more responsible toward the environment; (2) The increase of environmental knowledge leads to the development of favorable attitudes that, in turn, leads to action promoting better environmental quality (Ramsey and Rickson, 1976).

Ramsey and Rickson (1976) tested the belief that increased knowledge leads to favorable attitudes toward pollution abatement that, in turn, leads to a sustainable environment. A knowledge and attitude questionnaire was administered to 482 high school students. The study revealed that: (1) most students who had a high knowledge of tradeoff cost also had a high knowledge of pollution related facts, and (2) the positive attitudes toward pollution abatement were positively related to each other, and both were negatively related to attitudes

of resignation to pollution and of giving a high priority to tradeoff costs. This study's most significant findings reveal that knowledge appears to lead to a moderate position between tradeoff cost and pollution abatement (Ramsey and Rickson, 1976).

Hungerford and Volk (1990) use five objectives--(awareness, sensitivity, attitudes, skills and participation)--from the 1977 Tbilisi Intergovernmental Conference on Environmental Education, to define "an environmentally responsible citizen as one who has: (1) an awareness and sensitivity to the total environment and its allied problems; (2) a basic understanding of the environment and its allied problems; (3) feelings of concern for the environment and motivation for actively participating in environmental improvement and protection; (4) skills for identifying and solving environmental problems; and (5) active involvement at all levels in working toward resolution of environmental problems" (Hungerford and Volk, 1990, p.9).

Environmental education according to Stapp (1969), "is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems and aware of how to help solve these problems" (Stapp, 1969, p.30). In Stapp's opinion, environmental education was intended to help the individual acquire: (1) a clear understanding that people are an inseparable part of a system, consisting of man, culture and the biophysical environment, and that people can alter the interrelationships of this system; (2) a broad understanding of the biophysical environment, both natural and manufactured, and its role in

contemporary society; (3) a fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution; and (4) attitudes of concern for the quality of the biophysical environment that will motivate citizens to participate in biophysical environmental problem solving (Stapp, 1969, p.31). These pronouncements have led to a nationwide environmental education movement in the United States.

In a 1976 ERIC publication, Roth (1976) reviewed research spanning the years 1973 to 1976 on the cognitive and affective dimensions of environmental education. Several researchers (Perkes, 1973; Bohl, 1976; Richmond, 1976; Horvat, 1974; Zacher, 1974; Swan, 1970) were included in his study and will be reviewed here briefly. Using an inventory developed by ERIC Clearinghouse, Perkes (1973) determined the relationship of environmental knowledge and attitudes of tenth and twelfth grade students to variables of interest such as grade level, sex and size of community (Roth, 1976). The tenth graders scored less than the twelfth graders on environmental concepts but not on items requiring knowledge of facts. Perkes also found male students scored significantly higher than females on knowledge. The size of the community where the student lived and went to school was significantly related to knowledge of the major environmental issues of concern in his or her own community, but was not significantly related to knowledge of facts and concepts related to general environmental issues.

A parallel study to that of Perkes was conducted by Bohl (1976). Three subpopulations were identified through his finding: (1) most of the students possess a low amount of cognitive information and have positive attitudes, (2) several students possess a high amount of cognitive information and have positive attitudes, and (3) a small number of students possess a low amount of cognitive information and have negative attitudes. From his findings, he concluded that the average high school student has a limited amount of environmental cognition and has positive attitudes, but not firm beliefs (Roth, 1976).

Richmond (1976) conducted a survey of environmental knowledge and attitudes on Fifth Grade students in England in 500 elementary schools. He found that students demonstrated a good understanding of environmental concepts, although the students responded poorly to factual knowledge items, and possessed positive attitudes toward their environment.

A similar study by Horvat (1974) found eighth grade students to be less optimistic toward the future than fifth graders. He also found students with high I.Q.s having significant relationships to environmental orientation. Horvat's study concluded that students with high socioeconomic-status were mostly concerned with wilderness preservation and population control. On the other hand, students with low socioeconomic status showed greater concern for noise and water pollution (Roth, 1976).

Using the Syracuse Environmental Awareness Test, Zacher (1974) measured the environmental knowledge of Eleventh Grade Montana students.

He found that Montana students scored higher than the norm for the test. Furthermore, he found that students from smaller families scored higher than students from larger families, and that males scored higher than females. He also found that students who were regular readers of three or four periodicals scored higher than those reading two or less (Roth, 1976).

Swan (1970) developed a study to assess attitudes and coping responses to environmental problems. His findings revealed that senior high school boys considered air pollution a serious environmental problem, yet they knew little about air pollution or how to control it (Roth, 1976).

Alaimo and Doran (1980) administered an environmental survey to 615 students ranging from seventh grade through twelfth grade. They investigated students' concern for the environment, their locus of control, their knowledge of environmental issues, and sources of information (e.g., environmental education). They found all students to have a high level of concern for the environment, and for eighth and twelfth graders to have higher levels of concern than for students in other grades. Seventh through tenth graders had a low perception of their chances for solving environmental problems, while twelfth grade students felt strongly they could affect a change. Alaimo and Doran also reported that all students believed they knew a little about the environment, but twelfth graders felt they were most knowledgeable. Newspapers and magazines were identified as sources of environmental information by the eleventh and twelfth graders only. All the students felt that television was a source of environmental information, but

parents were not considered as a good source of information by any of the students.

Horsley (1984) tested the hypothesis that American students' attitudes were significantly more positive (pro-environment) toward the physical environment than those of non-American students. A positive level of concern for the preservation and conservation of the natural environment is considered pro-environmental. The students were asked how they felt about the physical environment, what they knew about it, and what commitments they have made concerning the future of their own physical environment. Eight hundred and eighteen (818) foreign students (England, Hong Kong, Taiwan, India, Switzerland, Nigeria, Kenya, Virgin Isles, China) and 204 American high school students were administered questionnaires that contained 40 statements requiring a response on a Likert scale (e.g., agree/disagree) (Horsley, 1984). The questionnaire was designed to measure seven value items concerning the environment: (1) social value, (2) political value, (3) punitive value, (4) economic value, (5) health value, (6) beauty value, (7) powerness value. The foreign students obtained a higher mean score on the beauty value item than the American students, but did not score higher on the other six value items. Horsley's explanation for the higher scores by American students is attributed to the availability of data and television concerning environmental issues. On the same seven value items, suburban students obtained the highest average scores and urban students scored the lowest-- with rural students scoring between the two. They shared values on

beauty and varied greatly on political values. Horsley concluded that American urban, rural, and suburban students differ statistically on environmental issues.

Jaus (1984) investigated the development and retention of environmental attitudes in third grade children. He studied the effects of environmental education instruction using five lessons on recycling, pollution, and conservation. A questionnaire was administered before and after instruction, and again two years later to the same students. It was concluded from the study that highly positive attitudes can be formed using only minimal instruction in elementary school students, and that these positive attitudes were retained over time. Slightly positive attitudes were found among elementary school students before formal environmental education intervention (Jaus, 1984, p.35).

Although environmental education has become increasingly popular, it still has not been adopted by most educators nor has it been incorporated into the curriculum or their instruction (Ramsey, Hungerford, and Volk, 1992). According to Lane et al. (1994), teachers have indicated that environmental education is unrelated to their subject matter, and the lack of an environmental education background has prevented them from incorporating environmental education into their curriculum and instruction. Some researchers have reported that "environmental education has not found an established niche in the U.S. schooling process" (Ramsey, Hungerford, and Volk, 1992, p.37). "Although the literature contains much speculation as to the best way to integrate environmental education into the school system, very little research has actually been done to explore how

environmental education has been implemented" (Samuel, 1993, p.26). This may be, in part, because very little has been done to integrate environmental education into school systems, particularly at the secondary level (Hungerford & Volk, 1990; Volk, Hungerford, & Tomera, 1984). According to Ramsey, Hungerford, and Volk, (1992), environmental education is not theoretical, systematic, or comprehensive in context. If environmental education is to become an integral part of instruction, it must go beyond current efforts of awareness or knowledge toward the development of a sense of environmental ownership and a feeling of empowerment (Hungerford and Volk, 1990).

Summary

An attempt has been made, in this chapter, to provide a review of research done on how people view environmental problems and the historical context of the environmental movement. A review of the literature revealed that:

(1) A large percentage of public is concerned about global warming and is not factually knowledgeable about the issue (Dunlap and Gallup, 1992; League of Women Voters Education Fund, 1992; and The Analysis Group, 1988).

(2) Six general themes (age, residence, political affiliation, social class, education and gender) have been found to affect or influence the public's level of environmental concern (The CBS News/New York Times Poll, 1981; Van Liere and Dunlap, 1980; Buttel and Flinn, 1976; and Dunlap, 1975). Although the results have varied, most studies have revealed that

the age, residence, and education can have a statistically significant impact on a person's environmental attitudes, beliefs and knowledge.

(3) Almost consistently all of the studies revealed that students are intensely concerned about the environment despite age, level of education and residence (Ramsey and Rickson, 1976; Roth, 1976; Alaimo and Doran, 1980; and Jaus, 1984).

(4) The effect of environmental education on students has been positive and most studies have found that students lack factual knowledge about specific environmental issues, but do possess positive attitudes (Richmond, 1976; Zacher, 1974).

The contradictions between studies found in this literature review supports the need for further study and the need for new and creative means of data collection. This researcher hopes the use of quantitative and qualitative data collection methods adds or fills some gaps currently found in the literature. The next chapter will describe theories on the relationship between people and the environment and provide a possible explanation for variations in students' attitudes, beliefs, and knowledge.

CHAPTER III

THEORETICAL PERSPECTIVE

Introduction

The purpose of this chapter centers on the development of a theoretical perspective that provides a framework for development of hypotheses about environmental issues. Environmental problems and issues not only occur within the physical environment, but in social and psychological realms as well. The literature review in Chapter II has shown the interrelationship between people and the environment studied. Therefore, theoretical explanations of interrelationships between the sociocultural and social-psychological aspect of people and their environment must, by necessity, contain social and psychological variables. The following sections of this thesis provide a basis for the development of a theoretical perspective. This perspective will enhance the explanation for variations in students' attitudes, beliefs, and knowledge about environmental problems and issues.

Social-Psychological Perspective

The disciplines of sociology and psychology recognize the importance of one's culture in the acquisition of knowledge and the shaping of attitudes and

beliefs (Hollander, 1971; Knutson, 1965; Hilgard, 1951). The term, "culture" refers to a group's design for living (Hollander, 1971). That is, it is a learned and shared set of socially transmitted assumptions about the nature of the physical and social world, the goals of life, and the appropriate means for achieving them (Knutson, 1965). From one's own culture an individual acquires norms, values, beliefs, attitudes and language. Through language individuals give meaning to objects and situations and pass these meanings on to other members of their society. The definition that individuals inoculate through experience enables them to maintain an awareness of environmental elements and to relate to those aspects based on value orientations (Hollander, 1971). The capacity of individuals to react to situations is determined by the "shared content of the psychological field that defines and guides experience and action" (Hollander, 1971, p.313). Key psychological processes involved in the internalization of culture include memory, imagination, and recall (Knutson, 1965). Those psychological processes related to decision making and the action orientation of individuals are perception, cognition, and attitude formation (Shibutani, 1955). Although there is considerable disagreement among psychologists over the innateness of perception, there is general agreement that individuals organize perceptions and the meanings assigned to them by learning in association with other individuals within a sociocultural context (Hilgard, 1951).

Perceptual mechanisms provide individuals with what Knutson (1965) describes as a "filtering out" process: a person's perceptual mechanisms are the

sole means for maintaining an awareness of himself, or herself, other people, and other things. They serve in filtering out of the environment things that may be of immediate or potential significance, organizing them in meaningful ways, and bringing them into attention so that they may be used in guiding future actions.

Solley and Murphy (1960) have identified the components of the perceptual process as "expectancy, attending, reception, trial and check, autonomic and proprioceptive arousal, and the final structured perception" (p.23). Solley and Murphy describe the "perceptual act" in which individuals acquire meaning as the individual scans the environment, searches for meaning, organizes the sense data directly received by the sense receptors into form and shape, determines what to attend and what to ignore, determines the degrees of significance between alternative possible meanings, decides which of many sense modalities to give primary attention, integrates with the memory traces of the past experience, orientates in terms of expectations, and predicts the action that offers the highest probability of success for the individual (Solley and Murphy, 1960).

A second major psychological process relative to decision making and the action orientation of individuals is that of cognition. Some psychologists do not differentiate between perception and cognition. For example, Knutson (1965), recognizes that perception "involves the harmonious functioning of emotional and motivation, sensory and cognitive efforts" (p.47). Other psychologists, however, view cognition as a mediator of behavior, i.e., variables that intervene between the stimulus and the response (Hollander, 1971).

Cognition is based on information and beliefs relative to an individual's culture. Knutson (1965) notes that an individual's response to a situation is based upon a selective process between "subjective and objective facts." Knutson describes this process as follows. Each person perceives, knows, and experiences subjective facts in all areas in which objective facts exist. They may concern physical, biological, or social aspects of the environment, both concrete and abstract, and may, like objective facts, be concerned with the past, present or future. Specifically, Knutson notes that subjective facts are concerned with "hopes, fears, expectations, values, norms, standards, goals, incentives and other variables" which serve to govern an individual's behavior (Knutson, 1965).

The third psychological process influencing a person's behavior is attitude formation. Attitude formation is closely related to the process of perception. Watson (1959) argues that attitudes are built into the process of perception. They also involve the sensory mechanism expressed in terms of feelings or values. In addition, attitudes may be rational and/or logical. But, beneath superficial expressions, they may be based on the emotional aspects of situations (Watson, 1959).

The development of attitudes has been described by Watson (1959) as flowing from structure (S) to process (P) to attitude (A). In Watson's view, structure is the social system consisting of "interrelated positions," and for each position there is a set of expected behaviors governed by norms. The expected behavior is defined as roles characterized by certain obligations and privileges.

Environmental Attitude Formation

Since environmental attitudes are learned predispositions to respond favorably or unfavorably toward a given issue or object in question, feelings are usually based on at least some fragmentary information (Oskamp, 1991; Ajzen, 1988; Fishbein and Ajzen, 1975). Thus, an attitude may be formed if your early experience with an issue or object elicits a favorable or unfavorable feeling about it (Oskamp, 1991). In our everyday lives, attitudes play a major role in affecting our behavior. Attitudes influence our decisions and the positions we take toward public issues, such as energy conservation, global warming, land use, recycling and hazardous waste. Among the many factors affecting attitude formation, social psychologist emphasize the effect that the family has on a child's early developmental years, educational influences and peer-group pressures. Others stress the influence of mass media, particularly television (Oskamp, 1991; Ajzen, 1988; Zimbardo and Ebbesen, 1969). Attitude formation refers to the initial change from having no attitude toward a given issue or object to having some attitude toward it, either positive, negative, or in-between (Oskamp, 1991). Very little influence of the school can be separated from the social background of the students, and very little of the influence of social background can be separated from the influence of the schools (Brookover and Erickson, 1975). Attitudes are formed through direct personal experience, parental influence, group peer pressure, and the mass media.

Attitudes formed through direct personal experience with the attitude issue

or object are generally stronger than those formed through indirect or vicarious experience (Fazio, 1988). Salient incidents and repeated exposure are the two most fundamental ways in which attitudes are formed through direct personal experience. Salient incidents, particularly traumatic or frightening ones, are likely to remain very powerful in determining the person's attitude for a long time (Fishbein and Ajzen, 1975). Another way attitudes are formed is through repeated exposure to an object (person or idea) over time (Oskamp, 1991; Fishbein and Ajzen, 1975). This effect operates most strongly during the first few exposures, but attitudes continue to increase in favorability at a gradually slower rate over any number of exposures (Wilson, 1979; Zajonc, 1980).

Parental influence over a child's attitudes is so great that some authors have referred to childhood as a "total institution" (Oskamp, 1991). Children model themselves after adults; they adopt the attitudes and values of the adult world (Altman and Wohlwill, 1978). According to Oskamp (1991), a child's attitude is largely shaped by its own experience with the world, but much of this experience comprises the teachings and modeling of parental attitudes. Other studies have found that an adult's interaction with their children in the home is the major determinant of individual characteristics (attitudes and beliefs), rather than the economic level of the parents, their level of education, or other status characteristics (Bloom, 1964; Dave, 1963; Hanson, 1972; Wolf, 1966). The success or lack of success in a school subject eventually is a major force in determining how the student feels (attitudes) about the subject and his or her desire to learn

more about the subject (e.g., environmental issues) (Bloom, 1976).

Following parental influence and the school, a child's peer group is the next major determinant in the formation of attitudes (Oskamp, 1991). Peer groups at school have the most potent influence on a child's day-to-day behavior and formation of attitudes (e.g., how much time they spend on homework, whether they enjoy coming to school each day, and how they behave in the classroom) (Steinberg *et al.*, 1992). Where peer-group norms coincide with parental or school standards, existing attitudes may be strengthened, but peers also frequently introduce negative and/or alternative attitudes that conflict with both the parents' and school's position on the issue (e.g., environmental attitudes) (Youniss, 1980).

The mass media (newspapers, magazines, books, movies, radio, and television) is also an important factor in attitude formation. Many of our attitudes are formed neither from direct experience with the object of the attitude nor by way of some inference process. Instead, information about some issue or object is provided by an outside source, the media. Many factors determine the degree to which information will be accepted when provided by an outside force.

By age ten, TV and school has replaced the family as the most frequently mentioned sources of children's information; attention to news media then becomes the most important influence on children's socialization to public issues (e.g., environmental issues) (Conway, Wyckoff, Feldbaum, and Ahern, 1981; Garramone and Atkin, 1986). Exposure to outside sources of information will

usually lead to the formation of a descriptive attitude toward the issue or object. The particular source of influence for attitude formation varies from person to person and the learning experience depends on the context of the person's social structure: family, class, peer group, ethnic group, religious and political groups, and country (Rokeach, 1968).

Social-Psychological Basis of Environmental Knowing

Many social-psychological theories have been advanced to explain the basis of environmental knowing. These theories have resulted in many conflicting viewpoints and for this study two theories have been identified and examined. The two theories used most by researchers to explain the social-psychological basis of environmental knowledge, attitudes and beliefs held by children and adolescents are the social learning theory and the cognitive dissonance theory (Chawla, 1988; Muuss, 1982; Davis, 1983; Baum *et al.*, 1985).

The development of environmental cognition is at the base of all theories presented in this literature review. It is clear that a host of factors affect development of environmental cognition. "Some prominent possibilities include (1) the child's specific history of environmental behavior, activity patterns, and experience; (2) his or her future goals and expectations; (3) needs and values; (4) personality structure; (5) the structure of the prevailing socioculture and physical environment; (6) population changes; (7) changes in technology; (8) prevailing public attitudes and values toward the environment; (9) economic and class

structure; (10) life style; (11) social group membership and reference groups; (12) stage in life cycle, level of general cognitive development, and spatial relations ability; and (13) cultural and religious norms, rules, values, and beliefs; and so on" (Moore and Golledge, 1976, p. 142). Environmental knowing is the result of dynamic interaction between what a person brings to the situation and demands made on the person by the situation. There are many theories that treat cognition as a function primarily or entirely of contingencies from the immediate human environment, without ever considering the roles of the physical environment, cultural factors, personality, values, or intentions (Moore and Golledge, 1976).

The Social learning theory considers the role of the physical and human environments, in environmental knowing. Humans are social animals, and much of the information and skills we acquire are through observing, interpreting, and responding in social settings, and through receiving reinforcements (Davis, 1983). Learning by observing and imitating others is a very efficient method of learning and an effective method for teaching (Davis, 1983). Children learn from the people around them and the interaction they have with the physical environment. The educational implication for the social learning theory is that children and adolescents learn most complex skills more effectively by imitating the behavior of their parents, teachers, and peers rather than by reinforcement, trial and error, and, in certain situations, even better than by verbal instruction (Muuss, 1982). For children, adults often serve as more powerful models than peers, since they

have status, prestige, competence, and power. However, "with adolescents, peer group members do serve as models and may have greater influence on imitative behavior than parents and teachers, partly because they share common characteristics, partly because the peer group has control over the rewards that matters to adolescents" (Muuss, 1982, p. 290). The social learning theory offers an explanation for the way that environmental knowing (attitudes, beliefs and knowledge) can occur and provides an understanding for the social-psychological basis of their cognition.

The cognitive dissonance theory is based upon the assumption that people want to be consistent in their beliefs, attitudes, values, and behavior (Baum *et al.*, 1985). This theory strongly supports the fact that human beings cannot tolerate inconsistency and will try to eliminate or reduce it (Zimbardo, 1969). The word "cognitive" in this theory reflects cognition and pieces of knowledge people have about themselves and their behavior. According to this theory, inconsistencies between two cognitive elements--whether they represent knowledge, information, attitudes, or beliefs--produce dissonance (Ajzen and Fishbein, 1980). According to this theory, the inconsistency between the two elements makes humans feel uncomfortable and they do what it takes to get rid of that unpleasant feeling. They may change beliefs, attitudes and behavior in an attempt to make themselves feel better. The cognitive dissonance theory has three basic principles: "(1) Dissonance, being psychologically uncomfortable, will motivate a person to try to reduce the dissonance and achieve consonance . . . [and to] avoid situations and

information that would likely increase the dissonance; (2) The magnitude of the dissonance (or consonance) increases as the importance or value of the elements increases; and (3) The strength of the pressure to reduce dissonance depends on the magnitude of the dissonance" (Festinger, 1957, pp.3 & 18). For example, a worker in the automobile industry might have the following cognition about himself, "I am working in the auto industry to produce automobiles." Suppose this worker also knows automobiles pollute, and he or she is against polluting the environment; he or she would then have the opinion, "I am against the auto industry." These two cognitive elements do not follow from each other; they are dissonant. If the worker is against pollution, he or she feels they should not be working in it. Faced with such a dissonant situation, if the elements are personally important to him or her, the individual will try to reduce the dissonance in one or more of the following ways: (1) change a cognition about the behavior, for instance by giving up working in the auto industry, (2) change a cognition about the environment, for instance by deciding that automobiles are not harmful to the environment; or (3) by adding new cognition that reduces the dissonance. With respect to the last option he or she might conclude, "I believe the evidence linking the automobile industry to pollution is inconclusive and there are no great dangers to the environment." The theorist believes that consistency fulfills important needs in a person's life and is essential for a person's effective functioning in the world (Ajzen, 1988).

There are many other theories used for explaining the social-psychological

basis of environmental knowing (attitudes, beliefs and knowledge). These theories include the self-perception theory, the theory of classical conditioning, and operant conditioning theory. Bem's (1970) self-perception theory suggests that we often form attitudes and beliefs about something or someone based on observations of our own behavior. For example, if we enjoy country living, we would decide we must like the country setting and what it has to offer; thus we would avoid the city and assume that we must dislike the city. Bem's theory is interesting because it suggests that behavior can cause the development of attitudes, rather than the more common assumption that attitudes guide behavior (Baum *et al.*, 1985). The classical conditioning theory suggests that associations are formed between stimuli that continually occur together (Baum *et al.*, 1985). For example, suppose you have no particular attitude toward the environment (neutral stimulus), but you hate the fact that jobs are being lost due to stringent environmental laws. The repeated pairing of the environment with job loss would cause you to develop a very negative attitude toward the environment.

The operant conditioning theory has also been used to explain social-psychological basis of environmental knowing. The operant conditioning theory suggests that because incentives for holding an attitude or belief are stronger than those for not holding it, the attitude or belief will be stronger (Baum, *et al.*, 1985). For example, if maintaining certain attitudes or beliefs is rewarded by bringing about social approval or desired group membership, these attitudes or beliefs will be strengthened (Baum, *et al.*, 1985).

Currently, there is a paucity of reported research explicitly dealing with high school students' knowledge level and attitudes toward a specific environmental issue. On the other hand, there is a growing body of literature that invites efforts aimed at theory development on the attitudes and behavior of students toward the environment. Much of what is known about the social-psychological aspects of environmental problems and issues are based predominantly on studies of adults (over 17 years of age). However, there are a few empirical studies that examine differences in high school students' beliefs, knowledge and attitudes regarding the environment. It is believed that the body of theory characterizing empirical studies provides a basis for the deduction of hypotheses to be presented for testing in this dissertation.

CHAPTER IV

RESEARCH DESIGN AND METHODOLOGY

The purpose of this chapter is to present the methods used to achieve the objectives of the study, i.e., (1) to assess the attitudes twelfth grade students hold toward environmental issues; (2) to assess twelfth grade students' beliefs of environmental responsibility: conservation, management and protection; (3) to assess how knowledgeable twelfth grade students are about global warming; and (4) to assess if regionally separated twelfth grade students differ in environmental attitudes, beliefs and knowledge. Included in this chapter is a description of the population being studied, the method of sample selection, a description of the instrument and procedures used to obtain the data and a review of procedures used for data analysis.

Research Strategy

The choice of methodology for this study was governed by the axiom that the research must fit the research questions. According to Goetz and LeCompte (1984, p. ix) and Kantor, Kirby, and Goetz (1981, p.295), decisions on whether to use quantitative or qualitative methodologies should be based on the goals of the research.

The review of the literature in Chapters II and III revealed that a variety of factors can or do affect a persons' relationship with the environment. Thus, many theories have been developed and presented over the past two decades in an attempt to account for these differences. The review of the literature revealed that most studies have used one form of data collection, and their results have been inconsistent. Therefore, both quantitative and qualitative strategies, were used in this study to gather data. This methodology, which, according to Goetz and LeCompte (1984), has become more prevalent and is a sound approach to research. They state, "If a theory is valid, it should be amenable to substantiation through a variety of data-collection strategies. Although many theories are developed primarily through a single approach to data collection, they are generally enriched by broadening the data-collection base" (p.59).

While the quantitative portion of the study is concerned with reliability or the replicability of the findings, the qualitative portion is focused on discovering the meaning of the data and providing a valid interpretation (Rist, 1977, p.45). As Rist explains, qualitative methods enable the researcher "to get close to the data, to develop an empathetic understanding of the observed, to be able to interpret and describe the construction of reality as seen by the subjects, . . ." (Rist, p.45). By talking to the students, the researcher could find out what they meant by their answers in the questionnaire. In other words, the researcher could learn the participants' meaning from their perspective rather than simply imposing a perspective on the data.

The use of both quantitative and qualitative methods enabled the researcher to cross-check the data gathered through one means with data gathered through another means, a process called triangulation. Another possible advantage of the use of both methodologies according to Rist (1977) is the possibility that, through the juxtaposition of the two, the researcher will "see new and different things" (p.48).

The survey research sought not only a description of current attitudes, beliefs and knowledge of the students, but also explored the relationships of independent variables: gender, race, college education of parents, residence, and observation of environmental problems. These relationships were explored further by using focus groups that sought to explain or account for gaps or questions in the survey results.

Though focus groups can be self-contained, their results can also be combined with other means of results from earlier studies (Morgan, 1988). Focus groups can be used as a follow-up to data collection, pursuing "exploratory" aspects of the analysis. The goal is to strengthen the total research project through the triangulation of focus groups and survey design. The combination of methodologies can strengthen a study design (Patton, 1982).

Focus groups come with strengths and weaknesses. The strengths of focus groups are that they are easy to conduct, they can explore topics and generate hypotheses, and it is possible to collect data from group interaction. The weaknesses of focus groups are uncertainty about the accuracy of what the

participants say, lessened control of the researcher over the data generated, and uncertainty about whether the information mirrors individual behavior (Morgan, 1988).

Instrument Development

For the attainment of the objectives of this research it was essential, for reasons of relevance and validity, to obtain ideas for instrument development from various sources. Preparatory to the construction of the survey instrument, an extensive examination of the environmental literature was conducted to identify the most prevalent and/or pressing environmental and global warming issues affecting the nation. From the literature review, the main global warming concerns were identified, as well as the most important environmental issues facing this population. From these issues the items in the questionnaire were developed.

The Questionnaire

Four types of questionnaire items were constructed: (1) items that measure environmental attitudes; (2) items that measure knowledge of global warming; (3) items that measure beliefs of environmental responsibility: conservation, management and protection; and (4) demographic items. The attitude items were intended to measure what people say should be. The knowledge items were intended to measure awareness of the existence or occurrence of the global

warming phenomena, problems, and issues of concern. The belief items were constructed to measure what people think is true or false. The first draft questionnaire consisted of 12 attitude items, 17 knowledge items, 5 belief items, and 18 demographic items.

Questionnaire Pilot Study

The questionnaire was refined through a pilot study. The objectives of the pilot study were: to find out potential problems that could occur in the survey process; to learn the amount of time needed to respond to the instrument; and to observe the reactions of the students.

The questionnaire was administered to three senior class homerooms (Sexton High School) in Lansing, Michigan. The students were instructed to ask for clarification of terms and phrases not familiar to them. Any request for clarification helped to detect which items needed to be revised.

Final Instrument

An item analysis made on the pilot questionnaire resulted in the rejection of two attitude items and two knowledge items that were found difficult. All belief items were retained, but many of them were revised, in light of the items that presented a problem to the respondents during the pilot study. The final questionnaire consisted of 10 attitude items, 15 knowledge items, 5 belief items, and 18 demographic items (see Appendix A).

The Focus Group

The first draft of focus group questions consisted of 20 items, each of which was made up of a group of related questions centered on three themes: (1) responsibility; (2) the role of government in environmental protection; and (3) willingness to sacrifice. The items included the same issues and problems identified from the literature review as described earlier. The intention of the focus group was to probe into the perceptions, opinions, feelings, and values of the students to verify and supplement answers obtained through the questionnaire. The focus groups also allowed the students to freely express themselves, articulate their knowledge of environmental issues and their level of comprehension. Additionally, this process revealed their belief of responsibility by allowing the students to openly state what he or she was willing or not willing to do to protect the environment, without being forced into selecting from a set of prepared answers.

Pilot Study of Focus Group

According to Morgan (1988) a focus group consisting of five or six individuals provides the basis for a successful focus group session, therefore a group was developed using five senior students. They were asked to respond to 20 open-ended questions. Participants in the pilot study revealed that the process was too long and that some questions were repetitive. Considering their comments, the number of open-ended questions was reduced from twenty to eight

questions (see Appendix B).

Validity and Reliability of the Instruments

A step toward content validity was sought by reviewing the current environmental literature for the most pressing and urgent issues relating to global warming and other prevalent environmental issues. This review gave the assurance that the topics included in the instruments concerned relevant issues that pertain to high school students. Additionally, the instruments were submitted for review by two science education specialists, three high school teachers and researchers who had instrument development experience.

The reliability of an instrument is its ability to obtain the same results if administered to the same group (sample) on two different occasions. In other words, it is the internal consistency between two measures of the same thing.

A measure of stability is often called a test-retest estimate of reliability. It is obtained by administering a test to a group of persons, and then readministering the same test to the same group later, and correlating the two sets of scores (Mehrens and Lehmann, 1984). To determine questionnaire reliability, the researcher used a test-retest measure of stability (three week intervals, 90 respondents, all twelfth grade students) which gave the following Pearson r_{xx}: 0.80 for attitude section, 0.85 for knowledge section, and 0.64 for the belief section. Based on the results, one can conclude that the questionnaire has a sufficient level of reliability to make it acceptable for this study.

University Committee on Human Subjects

Approval by University Committee on Research Involving Human Subjects for use of participants in the Assessment of Attitudes, Beliefs, and Knowledge of Global Warming: A Comparison Between Twelfth Grade Students in Lansing, Michigan and Valdosta, Georgia was granted on April 20, 1995. The authorization code issued was IRB #95-153.

Modifications to the instruments were organizational and not substantial. They did not require further authorization by the University Committee on Research Involving Human Subjects.

Research Hypotheses:

H1: Students in Lansing, Michigan will have significantly more positive attitudes toward the environment than students in Valdosta, Georgia.

H2: Students in Lansing, Michigan will have significantly more knowledge of Global Warming than students in Valdosta, Georgia.

H3: Students in Lansing, Michigan will have significantly stronger beliefs of environmental responsibility than students in Valdosta, Georgia.

H4: There will be a significant difference in the students' attitudes toward the environment between Georgia and Michigan, when the effects of the demographic variables (gender, race, residence, college education of parents) are controlled.

H5: There will be a significant difference in the students' knowledge of Global Warming between Georgia and Michigan, when the effects of the demographic variables (gender, race, residence, college education of parents) are

controlled.

H6: There will be a significant difference in the students' beliefs of environmental responsibility between Georgia and Michigan, when the effects of the demographic variables (gender, race, residence, college education of parents) are controlled.

H7: There will be a significant positive relationship among the students' attitudes toward the environment, their beliefs of responsibility and knowledge of global warming.

Data Collection

The questionnaire was administered to the research sample (which consisted of twelfth grade students living in Lansing, Michigan and Valdosta, Georgia) during April and May of 1995. Twelve hundred twenty (1220) questionnaires were distributed (603 twelfth grade students in Lansing, Michigan and 617 twelfth grade students in Valdosta, Georgia) for data collection. Seven hundred eighty-four (784) questionnaires were collected (420 Michigan students, 364 Georgia students). Two hundred thirty-one (231) questionnaires were not returned and one hundred three (103) questionnaires were voided because they were incomplete due to the failure of the students to answer the questionnaires seriously and completely. An additional one hundred two (102) questionnaires were discarded due to the length of residence in their respective regions. Those respondents living in the two regions less than twelve years were excluded from the study. That was one criterion (length of residence) set by the researcher in the sample selection procedure. Only seven hundred eighty-four (784) questionnaires of the 989 returned were used for the research sample.

Research Sample

The subjects involved in this study were from four secondary schools, two in Lansing, Michigan and two in Valdosta, Georgia (Lowndes County). The four schools were selected using two criterions: geographic location and similarity of characteristics in both cities (i.e., school size, median income, and other social demographics) (see Appendix C). The first group consisted of 420 twelfth grade students enrolled in Everett High School (220) and Eastern High School (200) in Lansing, Michigan. The second group consisted of 364 twelfth grade students enrolled in Lowndes High School (175) and Valdosta High School (189) in Valdosta, Georgia. The total number in the research sample was seven hundred eighty-four (784).

Selection of Research Sample

All twelfth grade students enrolled in their respective schools were asked to participate in the study. Twelfth grade students in their respective homerooms (every student has a homeroom assignment in their respective schools) were asked to participate in the study by completing a questionnaire. The homeroom teachers administered the questionnaire to the twelfth grade students and provided them with the opportunity to complete the questionnaire.

A stratified sample design was used to draw the final research sample. The subdivision of the student population by grade (i.e., twelfth) represents the first stratification. The second stratum was the subdivision of the senior student

population by length of residence in their respective geographic regions or states. Those students who have attended school in their respective regions (states) for twelve or more years were considered by this researcher to be most likely to provide an accurate reflection of environmental attitudes and knowledge held by those students in that region. The total collection of student questionnaires represents the second stratum used in this study.

Following the analysis of the questionnaires, twelve focus groups (six groups of five or more students in each region) were developed, to discover why and how the students have formed the attitudes and beliefs they hold. The focus groups also were used to gain an understanding of where the students have obtained their knowledge of environmental issues.

They were asked to participate in the focus group sessions via parental consent (see Appendix D). The students who received parental consent were then randomly selected for participation in the focus group sessions. Although anonymity was lost, the students' names were not included in the results, thereby assuring confidentiality.

Dependent Variables

There were three dependent variables in this study: (1) attitudes toward environmental issues; (2) knowledge level concerning global warming and other environmental issues; and (3) beliefs of environmental responsibility: conservation, management and protection. An attitude index score was created by taking the

mean of the responses across the 10 attitude items (Section A of questionnaire). Similarly a belief index score was computed as the mean of the responses across five belief items (Section C of the questionnaire). The outcome on the knowledge of global warming and other environmental issues was measured as the net correct responses to the 15 factual questions.

Independent Variables

There were seven independent variables in this study: gender, region, race, residence, observed environmental problems, source of environmental knowledge, and college education of parents.

Statistical Techniques for Quantitative Data Analysis

Because the main purpose of this study was to measure the environmental attitudes, beliefs and knowledge of secondary school students, suitable test items were developed and/or selected from other sources within these three broad categories.

The following statistical techniques were used: frequencies, analysis of variance (ANOVA), correlations, regression analysis, chi-square, and descriptive statistics (mean and standard deviation).

Frequencies were used to assess the frequency of responses on each item and the frequency on gender, age, geographic region, and length of residence.

Analysis of variance (ANOVA) was used to test significance of the differences in attitudes and beliefs between the Michigan and Georgia respondents.

Correlations were used to investigate the relationships that might exist between the dependent variables.

Regression analysis was used to show the combined effects of a set of independent variables and the separate effects of each independent variable while controlling for the others on the attitude and belief index scores.

Chi-square was used to check significance of difference of the responses on the knowledge items.

Descriptive statistics (mean and standard deviation) were employed to show the general perceptions of respondents on each category of the questionnaire.

Results of the data analysis will be presented in Chapter V.

Qualitative Data Analysis

Descriptive information was gathered during the audio-taped focus group sessions. Because of the small numbers of people, it was not possible to determine whether there were patterns in the information. The audio tapes and notes of the sessions became a source of data that seemed to support what was found in the quantitative data. This information was used to describe the

reactions and behavior identified by the participants. It was also a narrative way to support the quantitative analysis. The focus groups provided additional insight into what the participants were thinking, how they gain knowledge, and what they feel is important.

Research limitations

This study has two serious limitations that affected the generalizability of the findings: (1) It is not a national sample nor is it representative of twelfth grade students in Georgia or Michigan, or representative of twelfth grade students; (2) There are advantages and disadvantages to conducting focus groups and using questionnaires. The major advantage of doing both is that surveys allow for quantification of responses, while interviews allow for the interpretation of responses. The biggest disadvantage is that the two methods are mutually contaminating. Because of the limited number of participants in this part of the study, it was important not to make survey-like interpretations with the focus group information (Morgan, 1988).

CHAPTER V

PRESENTATION AND ANALYSIS OF DATA

The purpose of this chapter is to present and analyze data concerning the hypotheses, and exploratory findings of the students' environmental attitudes, level of global warming knowledge, and beliefs of environmental responsibility. Results are presented by giving a statistical analysis of the quantitative data and a descriptive analyses of the qualitative data. Both quantitative and qualitative data are reported in an attempt to give an objective and rich description of the research findings. The research sample responding to the questionnaire consisted of two groups-high school seniors in Valdosta, Georgia (Lowndes County) and high school seniors in Lansing, Michigan (Ingham County). In addition, twelve focus group sessions were conducted using students in Georgia and Michigan.

The researcher used one or more techniques to achieve the objectives of the study or to test the research hypotheses. These techniques are:

1. Mean and standard deviation
2. Analysis of Variance (ANOVA)
3. Frequencies and percentages
4. Multiple regression analysis
5. Correlations

6. Chi-square

7. Focus groups

Accordingly, the first section of this chapter provides an overview of sample characteristics, and the second part is concerned with the hypotheses.

Demographic Characteristics

Demographic information was collected on all subjects who participated in the survey. One purpose for the collection of this data was to provide an overview of the population that participated in the research project. Data were also collected to analyze differences between students and the regions in which they live. Demographic information from the focus group sessions will be presented in the qualitative data section of this chapter. Distribution of demographic characteristics by region is shown in **Table 5.1**.

Age/Gender

The students' ages ranged from 14 to 19. Most students 455 (58%) were 18 years old. The majority of the students 399 (50.9%) were male.

Race

Most students 499 (63.6%) were white; one hundred seventy-one (21.8%) were African American. Hispanics constituted 57 (7.3%) of the students while 42

(5.4%) were Asian. Native Americans and others constituted 15 (1.9%) of the students.

Residence Location

The majority of the students, 413 (63.9%) were urban residents. Two hundred eighteen (19.4%) were rural residents. Suburban residents constituted 153 (16.7%) of the students.

College Education of Parents

One-hundred eight (108) or 33% of Georgia's students indicated that both parents had attended college. Ninety-five (95) or 29% indicated that one parent had attended college and 122 (38%) indicated that their parents did not attend college. One-hundred twenty (120) or 31% of the Michigan students indicated that both of their parents had attended college, while 121 (32%) of the students indicated that one parent had attended college. One-hundred forty (140) or 37% indicated that their parents did not attend college.

TABLE 5.1

Respondent Demographic Characteristics by Region

		GEORGIA		MICHIGAN	
DEMOGRAPHIC CHARACTERISTICS	**LEVEL**	**NUMBER**	**PERCENT**	**NUMBER**	**PERCENT**
GENDER	MALE	174	48	225	54
	FEMALE	190	52	195	46
RACE	WHITE	249	68.5	250	59.6
	AFRICAN AMERICAN	87	23.9	84	20.0
	HISPANIC	4	1.1	53	12.6
	NATIVE AMERICAN	2	0.5	3	0.7
	ASIAN	12	3.3	30	7.1
	OTHER	10	2.7	-	-
SOURCE OF KNOWLEDGE	ENGLISH/ SOCIAL SCIENCE	80	22	73	17
	MATH/ SCIENCE	248	69	293	70
	PHYSICAL ED./ ELECTIVE/ OTHER	36	10	54	13
RESIDENCE	RURAL	181	50	37	9
	URBAN	77	21	336	80
	SUBURBAN	106	29	47	11
OBSERVED ENVIRONMENTAL PROBLEM IN CITY	YES	195	54	276	66
	NO	86	24	77	18
	DON'T KNOW	83	23	67	16
COLLEGE EDUCATION OF PARENTS	BOTH PARENTS	108	33	120	31
	ONE PARENT	95	29	121	32
	NONE	122	38	140	37

Total Sample Size = 784 (Georgia=364 Michigan=420)

Source of Knowledge

The majority of the Georgia students, 248 (69%), indicated Math and Science as the subject area that provided most of their environmental knowledge, while eighty (80) or 22% indicated English and Social Science. This was followed by 36 (10%) who indicated Physical Education/Electives/Other (work study program, etc.) as the subject area that provided them with most of their environmental knowledge.

Two-hundred ninety-three (293) or 70% of the Michigan students indicated Math and Science as the subject area that provided most of their environmental knowledge, while seventy-three (73) or 17% indicated English/Social Science. Fifty-four (54) or 13% of the students indicated Physical Education/Electives/ Other (co-op program) as the subject area that provided most of their environmental knowledge (see Table 5.1).

Observed Environmental Problem In City

The majority of the Georgia students 195 (54%) observed environmental problems in their city. Eighty-six (24%) indicated they did not observe any environmental problems and 83 (23%) reported they did not know if they had observed any environmental problems. Two-hundred seventy-six 276 (66%) of the Michigan students reported they had observed environmental problems in their city, while 77 (18%) indicated they had not observed any environmental problems. Sixty-seven 67 (16%) did not know if they had observed any environmental problems in their city (see Table 5.1).

Quantitative Data Analysis

Environmental attitudes were measured through a ten-item scale constructed by the researcher using a Likert-type response pattern of strongly agree (SA), agree (A), undecided (UD), disagree (DA), and strongly disagree (SDA). Responses were coded from one to five with five assigned as strongly

agree (or strong positive representing the high end of the scale) and one assigned as strongly disagree (or strong negative at the low end of the scale). The respondents' mean score ranged from 2.94 to 4.36. The attitude section of the questionnaire consisted of 10 items (1-10) (see Appendix A). The reliability of the attitude scale was estimated using coefficient alpha (Cronbach). The 10 item measure exhibited an alpha value of 0.77 (see Appendix E).

Knowledge level concerning global warming and other environmental issues was the second dependent variable. Knowledge levels were measured through a fifteen item scale constructed by the researcher using a true, false, and don't know response pattern. The responses were then converted into percent correct, incorrect and don't know, to present the results in this chapter. Chi-square was used to analyze differences between students' responses on global warming knowledge items. The knowledge section of the questionnaire consisted of 15 items (1-15) (see Appendix A). The reliability of the knowledge scale was estimated using coefficient alpha (Cronbach). The 15 item measure exhibited an alpha value of 0.80 (see Appendix E).

Finally, the beliefs of the students' environmental responsibility were researched using a five-item scale constructed by the researcher, using a Likert-type response pattern of strongly agree (SA), agree (A), Undecided (UD), disagree (DA), and strongly disagree (SDA). Responses were coded from one to five with five assigned to strongly agree (representing the high end of the scale) and one assigned to strongly disagree at the low end of the scale. The

respondents mean score ranged from 2.48 to 3.89. The belief section of the questionnaire consists of five items (1-5) (see Appendix A). The reliability of the belief scale was estimated using coefficient alpha (Cronbach). The five item measure exhibited the following alpha value 0.57 (see Appendix E).

H1: Students in Lansing, Michigan will have a significantly more positive attitude toward the environment than students in Valdosta, Georgia.

Oneway analysis of variance (ANOVA) was used to test the first hypothesis, which sought the difference between the students' region and students' attitudes toward the environment. Based on the overall attitude rating, the hypothesis was not supported by the data. Although both groups showed an overall positive attitude toward the environment, Georgia respondents (mean = 3.91) showed significantly more positive attitude ($F=26.52$, $P < 0.01$) toward the environment than Michigan respondents (mean = 3.71).

Results of Individual Attitude Items

Table 5.2 presents the ANOVA results of the ten attitude items for Georgia and Michigan respondents. From this table it is shown that of the ten items used to record the students' environmental attitudes, Michigan respondents (mean = 3.85) were slightly but not significantly more positive than Georgia respondents (mean = 3.80) on the item: "The media should do a better job of keeping people informed about environmental problems."

With regard to holding industry responsible for their contribution to our

environmental problems, Georgia's respondents showed a significantly more positive attitude than Michigan respondents ($F=8.13$, $P<0.01$). The mean attitude rating for Michigan respondents toward this item was also generally high. The mean values were 4.36 and 4.19 for Georgia and Michigan respondents respectively.

Georgia respondents (mean = 4.27) revealed a significantly more positive attitude toward demanding government to protect the environment ($F=13.38$, $P<0.01$). Michigan's respondents also had positive attitudes, which were indicated by a mean value of 4.04.

With regard to considering global warming one of the most serious problems facing the world, Georgia's respondents showed significantly more positive attitudes than the Michigan respondents ($F=13.38$, $P<0.01$). The mean values were 3.87 and 3.61 for the Georgia and Michigan respondents respectively.

Georgia respondents were significantly more positive than Michigan respondents when asked if water pollution should be considered one of the most serious environmental problems facing the U.S. ($F=17.21$, $P<0.01$). The mean values were 4.21 and 3.94 for the Georgia and Michigan respondents respectively.

With regards to protecting endangered species at the expense of economic growth, Georgia's respondents showed a significantly more positive attitude than Michigan respondents ($F=24.81$, $P<0.01$). The mean values were 4.00 and 3.62 for the Georgia and Michigan respondents respectively.

TABLE 5.2
Environmental Attitudes of High School Students in Georgia and Michigan

ATTITUDE ITEMS	GROUP	N	MEAN	SD	F VALUE	P VALUE
The media should do a better job of keeping me informed about environmental problems.	GA MI	364 420	3.80 3.85	.78 .92	.5899	.4427
Industry should be held responsible for their contribution to our environmental problems.	GA MI	364 420	4.36 4.19	.79 .89	8.130	.0045**
U.S. citizens must demand that the government protect the environment.	GA MI	364 420	4.27 4.04	.77 .96	13.38	.0003**
Global warming should be considered one of the most serious problems facing the world.	GA MI	364 420	3.87 3.61	.96 1.06	13.24	.0003**
Water pollution should be considered one of the most serious environmental problems facing the U.S.	GA MI	364 420	4.21 3.94	.80 .98	17.21	.0000**
Endangered species should be protected, even at the expense of economic growth.	GA MI	364 420	4.00 3.62	.94 1.12	24.81	.0000**
Stricter laws should be placed on contributors to global warming.	GA MI	364 420	3.97 3.80	.81 .95	6.57	.0105*
The students at this high school should do something to protect the environment.	GA MI	364 420	3.90 3.82	.87 .93	1.51	.2196
It should be more important to protect the environment than it is to produce energy.	GA MI	364 420	3.57 3.32	.95 .97	13.56	.0002**
We should be willing to pay for environmental protection, even if it requires a reduction in spending on social issues (crime, health, etc.).	GA MI	364 420	3.13 2.94	1.07 1.03	6.68	.0099**
ENTIRE SCALE ITEMS 1 - 10	GA MI	364 420	3.91 3.71	.51 .53	26.52	.0000**

1=Strong Negative 2=Negative 3=Neutral 4=Positive 5=Strong Positive

Total Sample Size = 784
Significant at 0.01 level ** Significant at 0.05 level *

Georgia respondents (mean=3.97) revealed a significantly more positive attitude toward stricter laws being placed on contributors to global warming ($F=6.57$, $P<0.05$). Michigan respondents also had positive attitudes, which were indicated by a mean value of 3.80.

When asked if the students at this high school should do something to protect the environment, both Georgia respondents and Michigan respondents revealed positive attitudes. The mean values were 3.90 and 3.82 for Georgia and Michigan respondents respectively.

Georgia respondents (mean=3.57) were slightly more positive than Michigan respondents (mean=3.32) on the item: "It should be more important to protect the environment than it is to produce energy," ($F=13.56$, $P<0.01$).

Georgia respondents were positive (neutral to positive) (mean=3.13) toward considering the reduction of spending on social issues (crime, health, etc.) for the sake of environmental protection ($F=6.68$, $P<0.01$). Michigan respondents revealed negative to neutral attitudes, which were indicated by a mean value of 2.94.

H2: Students in Lansing, Michigan will have more knowledge of Global Warming than students in Valdosta, Georgia.

Chi-square was used to test the second hypothesis, which sought the difference between the students' region and students' knowledge of global warming. Based on the net percent correct, Georgia respondents were significantly more knowledgeable than Michigan respondents ($F=10.32$, $P<0.01$). The overall means for the net percent correct were 18.08 and 13.21 for Georgia and Michigan respondents respectively. Consequently, the hypothesis can be rejected.

Results of Individual Knowledge Items

Table 5.3 presents the respondents' responses as percent correct, incorrect

and don't know for the Georgia and the Michigan respondents. In addition to the presentation of the results in precentages, the Chi-square results for the fifteen knowledge items for Georgia and Michigan respondents are presented in Table 5.4.

Ten of the fifteen items listed in the knowledge section of the questionnaire were statistically significant. In Table 5.4 it is shown that Georgia respondents were statistically more knowledgeable than Michigan respondents on eight of ten items. The ten significant items will be presented in this section.

Georgia respondents were significantly more knowledgeable than Michigan respondents when asked if acid rain is polluted rain that harms lakes, land, and kills vegetation (x^2 =25.83, P <0.01). In Table 5.4 it is shown that 89% of the Georgia respondents answered this item correctly, while 75% of the Michigan respondents answered the item correctly.

The majority of the students answered incorrectly that carbon monoxide was not a major contributor to global warming, only 15% of Georgia respondents and 11% of Michigan respondents correctly answered this item. This item was significant and found Georgia respondents more knowledgeable than Michigan respondents (x^2 =13.16, P <0.01).

Forty-seven percent (47%) of Georgia respondents knew that the sea level could rise due to global warming, while only 37% of Michigan students responded to this item correctly. This item was significant and found Georgia respondents more knowledgeable than Michigan respondents (x^2 =8.26, P<0.05).

TABLE 5.3

Percent Responses to the Knowledge Issues by Region

	GEORGIA			MICHIGAN		
KNOWLEDGE OF ISSUES	CORRECT	INCORRECT	DON'T KNOW	CORRECT	INCORRECT	DON'T KNOW
Love Canal is a place in New York that was used as a toxic waste dump before it was developed into an amusement park. F	16.0	12.0	73.0	21.0	11.0	67.0
Acid rain is polluted rain that harms lakes, land, and kills vegetation. T	89.0	6.0	5.0	75.0	14.0	11.0
Carbon monoxide is the major contributor to the global warming trend. F	15.0	68.0	18.0	11.0	61.0	28.0
The sea level could rise due to global warming. T	47.0	17.0	36.0	37.0	21.0	42.0
Scientist have predicted that fires will start as a result of global warming. F	13.0	50.0	37.0	20.0	39.0	41.0
It is predicted that global warming will cause some flooding of low-lying coastal areas. T	44.0	12.0	44.0	39.0	21.0	41.0
Some species could become extinct due to global warming. T	77.0	8.0	16.0	62.0	13.0	25.0
Global warming could cause the sun to shine brighter and hotter. F	21.0	57.0	22.0	30.0	45.0	25.0
Scientist have predicted that global warming will cause agriculture yields to change. T	66.0	9.0	25.0	50.0	13.0	36.0
Chloroflurocarbons (CFCs) use is currently restricted in the U.S. T	23.0	26.0	51.0	26.0	22.0	51.0
Deforestation is a major source of carbon dioxide emissions and accounts for about 90% of the global warming trend. F	16.0	31.0	54.0	17.0	36.0	47.0
It is predicted that regional disease patterns will change due to global warming. T	47.0	11.0	42.0	36.0	15.0	49.0
Methane and oxygen are gases that contribute to global warming. F	31.0	30.0	39.0	30.0	30.0	40.0
The U.S. produces more oil than it imports. F	47.0	18.0	35.0	47.0	21.0	32.0
Planting trees is a good way to combat global warming. T	79.0	6.0	16.0	68.0	8.0	24.0

Total Sample Size = 784 (Georgia=364, Michigan=420) (T=True, F=False)

TABLE 5.4

Chi-Square Results for the Relationship Between the Knowledge of Global Warming

KNOWLEDGE ITEMS	CHI-SQUARE VALUE	d.f	P-Value
Love Canal is a place in New York that was used as a toxic waste dump before it was developed into an amusement park.	4.27	2	.1183
Acid rain is polluted rain that harms lakes, land, and kills vegetation.	25.83	2	.0000**
Carbon monoxide is the major contributor to the global warming trend.	13.16	2	.0013**
The sea level could rise due to global warming.	8.26	2	.0160*
Scientist have predicted that fires will start as a result of global warming.	11.65	2	.0029**
It is predicted that global warming will cause some flooding of low-lying coastal areas.	11.82	2	.0027**
Some species could become extinct due to global warming.	19.16	2	.0000**
Global warming could cause the sun to shine brighter and hotter.	12.76	2	.0016**
Scientist have predicted that global warming will cause agriculture yields to change.	20.46	2	.0000**
Chloroflurocarbons (CFCs) use is currently restricted in the U.S.	2.49	2	.2867
Deforestation is a major source of carbon dioxide emissions and accounts for about 90% of the global warming trend.	3.62	2	.1636
It is predicted that regional disease patterns will change due to global warming.	9.19	2	.0100**
Methane and oxygen are gases that contribute to global warming.	.3019	2	.8598
The U.S. produces more oil than it imports.	1.09	2	.5783
Planting trees is a good way to combat global warming.	10.85	2	.0044**

Total Sample Size = 784 (Georgia=364, Michigan=420)

Significant at 0.01 level **
Significant at 0.05 level *

When asked if fires will start as a result of global warming, Michigan respondents were found significantly more knowledgeable than Georgia respondents (x^2 =11.65, P <0.01). Twenty percent (20%) of Michigan respondents and 13% of Georgia respondents answered this item correctly.

Georgia respondents were found significantly more knowledgeable than Michigan respondents when asked if global warming will cause some flooding of low-lying coastal areas (x^2 =11.82, P <0.01). Forty-four percent (44%) of Georgia respondents and 39% of Michigan respondents answered this item correctly.

Georgia respondents were found significantly more knowledgeable than Michigan respondents on the item: "Species could become extinct due to global warming," (x^2 =19.16, P <0.01). Seventy-seven percent (77%) of Georgia respondents and 62% of Michigan respondents answered this item correctly.

When asked if global warming could cause the sun to shine brighter and hotter, Michigan respondents were significantly more knowledgeable than Georgia respondents (x^2 =12.76, P <0.01). Thirty percent (30%) of Michigan respondents and 21% of Georgia respondents answered this item correctly.

Georgia respondents were found significantly more knowledgeable than Michigan respondents on the statement that predicts global warming will cause agriculture yields to change (x^2 = 20.46, P <0.01). Sixty-six percent (66%) of Georgia respondents and 50% of Michigan respondents answered this item correctly.

When asked if regional disease patterns will change due to global warming,

Georgia respondents were significantly more knowledgeable than Michigan respondents ($x^2 = 9.19$, $P < 0.05$). Forty-seven percent (47%) of Georgia respondents and 36% of Michigan respondents answered this item correctly.

Georgia respondents were found significantly more knowledgeable than Michigan respondents when asked if planting trees is a good way to combat global warming ($x^2 = 10.85$, $P < 0.01$). Seventy-nine percent (79%) of Georgia respondents and 68% of Michigan respondents answered this item correctly.

H3: Students in Lansing, Michigan will have significantly more positive beliefs of environmental responsibility than students in Valdosta, Georgia.

Oneway analysis of variance (ANOVA) was used to test the third hypothesis, which sought the difference between the students' region and the students' beliefs of environmental responsibility. Based on the overall beliefs rating, the hypothesis, was not supported by the data. Both groups showed that overall they do not have strong beliefs of responsibility. The mean values were 3.18 and 3.23 for Georgia and Michigan respondents respectively.

Results of Individual Belief Items

Table 5.5 presents the ANOVA results of the five belief items for Georgia and Michigan respondents. In this table it is shown that Georgia respondents (mean=3.89) have significantly stronger beliefs than Michigan respondents (mean=3.62) on the item: "Should the U.S. government be responsible for cleaning up the environment?" ($F=14.13$, $P < 0.01$). Michigan respondents

(mean=2.73) have significantly stronger beliefs than Georgia respondents (mean=2.48) on the item: "Should the U.S. government spend less of its budget on environmental protection?" (F= 10.02, P <0.01). The remaining three items were not found to be significant.

TABLE 5.5

ANOVA Results for the Difference in Environmental Beliefs between Regions

BELIEF ITEMS	GROUP	N	MEAN	SD	F-VALUE	P-VALUE
Should air pollution control cost be reduced for the sake of economic growth?	GA	364	3.10	1.11	.9460	.3310
	MI	420	3.18	1.07		
Should crime be considered the biggest problem facing the United States?	GA	364	3.62	1.09	.3167	.5738
	MI	420	3.66	1.05		
Should the U.S. government be responsible for cleaning up the environment?	GA	364	3.89	.97	14.1354	.0002**
	MI	420	3.62	1.00		
Should the U.S. government spend less of its budget on environmental protection?	GA	364	2.48	1.11	10.0277	.0016**
	MI	420	2.73	1.09		
Should jobs come first and the environment second?	GA	364	2.82	1.12	2.0890	.1488
	MI	420	2.94	1.16		
OVERALL	GA	364	3.18	.64	.9934	.3192
	MI	420	3.23	.59		

1=Strongly Disagree 2=Disagree 3=Undecided 4=Agree 5=Strongly Agree

Total Sample Size = 784

Significant at 0.01 level **
Significant at 0.05 level *

H4: There will be a significant difference in students' attitudes toward the environment between Georgia and Michigan, when the effects of demographic variables (gender, race, residence, college education of parents, region) are controlled.

The hierarchical regression analysis approach was used to determine the extent to which region predicts environmental attitudes of high school students, while controlling for the respondents' demographic characteristics. The regression approach was implemented hierarchically in a two-step process. At the first stage, demographic characteristics were entered into the regression model and region was entered in the second step. **Table 5.6** presents results of the regression analysis. **Table 5.6** also demonstrates that demographic characteristics alone accounted for 4 percent of the variance in environmental attitudes of Georgia and Michigan high schools. By including region in the model, the proportion of variance explained increased to 7.1 percent. Region (Beta = 0.198, $P < 0.05$) was a significant predictor of environmental attitudes, which indicated that Georgia respondents on average were predicted to be 0.198 standard deviations more positive than Michigan respondents. Other demographic variables that were significant at stage two were Mother's education (Beta = -0.134, $P < 0.05$), Race (Hispanic) (Beta = 0.296, $P < 0.05$) and Gender (Beta = 0.091, $P < 0.05$). The findings suggested that respondents, whose mothers had no college education, were on average 0.134 standard deviations more positive than those whose mothers had college education; Hispanics on average were 0.296 standard deviations more positive than non-Hispanics; and female respondents were on average -0.091 standard deviations more positive than males.

TABLE 5.6

Regression Results for the Prediction of Environmental Attitudes of Georgia and Michigan High School Students by Their Demographic Characteristics

BLOCK	PREDICTOR	STANDARDIZED REGRESSION COEFFICIENT	P-VALUE	R^2
1	**EDUCATION**			
	Mother	-0.141	0.0005*	0.040
	Father	0.078	0.0538	
	RESIDENCE			
	Rural	0.056	0.1405	
	Suburban	0.083	0.0324*	
	RACE			
	White	-0.029	0.7144	
	African American	-0.101	0.3216	
	Hispanic	0.168	0.1929	
	Asian	-0.001	0.9778	
	GENDER (1=Male, 2=Female)	-0.107	.0043*	
2	**EDUCATION**			
	Mother	-0.134	0.0008*	0.071
	Father	0.078	0.0512	
	RESIDENCE			
	Rural	0.001	0.9796	
	Suburban	0.025	0.5233	
	RACE			
	White	-0.115	0.1608	
	African American	-0.173	0.0882	
	Hispanic	0.296	0.0228*	
	Asian	0.037	0.5670	
	GENDER	-0.091	0.0144*	
	REGION (1=GA, 0=MI)	0.198	0.0000*	

Total Sample Size=784

*Significant at 0.05 level

At the first stage Suburban (Beta = 0.083, P < 0.05) was a significant predictor of attitudes but ceased to be significant at the second stage (Beta = 0.025, P > 0.05). Thus, Suburban was a significant predictor of attitudes only when region was not taken into account. On the other hand, Hispanic was not significant at the 1st stage (Beta = 0.168, P > 0.05) emerged as a significant predictor at the second stage (Beta = 0.296, P < 0.05). The significance of Hispanic as a predictor of attitudes indicates that when region is controlled for, Hispanics were predicted to be on average 0.296 standard deviations more positive than non-Hispanics. No other demographic characteristics were significant at the 0.05 level. Since region was a significant predictor of attitude after controlling for the respondents' demographic characteristics. The research hypothesis was supported.

H5: There will be a significant difference in students' knowledge of Global Warming between Georgia and Michigan when the effects of the demographic variables (gender, race, residence, college education of parents) are controlled.

To address this issue, a hierarchical regression analysis was used to determine the extent to which region predicts high school students' knowledge of global warming, while controlling for the respondents' demographic characteristics. Regression analysis was hierarchically implemented in a two-step process. In the first step demographic characteristics were entered into the regression model and region was entered in the second step. **Table 5.7** presents results of the regression analysis.

TABLE 5.7

Regression Results for the Prediction of Knowledge Level of Georgia and Michigan High School Students by Their Demographic Characteristics

BLOCK	PREDICTOR	STANDARDIZED REGRESSION COEFFICIENT	P-VALUE	R^2
1	**EDUCATION**			
	Mother	0.009	0.8062	0.047
	Father	0.001	0.9628	
	RESIDENCE			
	Rural	0.012	0.7467	
	Suburban	0.107	0.0055*	
	RACE			
	White	0.253	0.0019*	
	African American	-0.243	0.0171*	
	Hispanic	-0.063	0.6228	
	Asian	0.117	0.0741	
	GENDER (1=Male, 0=Female)	0.064	0.0832	
2	**EDUCATION**			
	Mother	0.013	0.7326	0.058
	Father	0.001	0.9672	
	RESIDENCE			
	Rural	-0.020	0.6014	
	Suburban	0.073	0.0691	
	RACE			
	White	0.202	0.0149*	
	African American	-0.286	0.0053*	
	Hispanic	0.012	0.9222	
	Asian	0.140	0.0327*	
	GENDER	0.075	0.0460*	
	REGION (1=GA, 0=MI)	0.118	0.0043*	

Total Sample Size=784

*Significant at 0.05 level

Table 5.7 indicates that demographic characteristics alone accounted for 4.7 percent of the variance in the level of global warming knowledge held by Georgia and Michigan high school respondents. By including region in the model, the proportion of variance explained increased to 5.8 percent.

Region (Beta = 0.118, $P < 0.05$) was a significant predictor of global warming knowledge, which indicated that Georgia respondents on average were 0.118 more knowledgeable than Michigan respondents. Other demographic variables that were significant at stage two were Race (White) (Beta = 0.202, $P < 0.05$), African American (Beta = -0.286, $P < 0.05$), Asian (Beta = 0.014, $P < 0.05$), Gender (Beta = 0.074, $P < 0.05$) and Region (Beta = 0.118, $P < 0.05$).

Thus the findings indicate that white respondents were on average 0.202 standard deviations more knowledgeable than non-White respondents; African Americans on average were -0.286 standard deviation less knowledgeable than non-African Americans; Asians on average were 0.140 standard deviations more knowledgeable than African Americans and Hispanics; and male respondents were on average 0.074 standard deviations more knowledgeable than females. No other demographic characteristics were significant at the 0.05 level. Region was a significant predictor of global warming knowledge after controlling for demographic characteristics of respondents. Thus, the research hypothesis was supported.

H6: There will be a significant difference in students' beliefs of who is responsible for environmental protection between Georgia and Michigan, when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

The extent to which region predicts the beliefs of environmental responsibility in high school students was determined using a hierarchical regression approach, while controlling for effects of their demographic characteristics. The regression approach was implemented in a two-stage process. Only demographic characteristics were entered into the regression model in the first stage and region in the second stage. **Table 5.8** presents results of the regression analysis.

Table 5.8 illustrates that demographic characteristics alone accounted for 6.6 percent of the variance in the beliefs of environmental responsibility in Georgia and Michigan high schools. By including region in the model, the proportion of variance explained increased to 6.7 percent. Region (Beta = 0.040, $P > 0.05$) was not a significant predictor of environmental beliefs of responsibility. Other demographic variables that were significant at stage two were Race (White) (Beta = -0.454, $P < 0.05$) and Gender (Beta = 0.090, $P < 0.05$). The data indicated that White respondents' beliefs of responsibility were on average -0.454 standard deviations weaker than non-White; and male respondents' beliefs of responsibility were on average 0.090 standard deviations stronger than females. No other demographic characteristics were significant at the 0.05 level. Region was not a significant predictor of beliefs after controlling for the demographic characteristics of the respondents. Thus, the research hypothesis was not supported.

TABLE 5.8

Regression Results for the Prediction of Beliefs of Responsibility of Georgia and Michigan High School Students by Their Demographic Characteristics

BLOCK	PREDICTOR	STANDARDIZED REGRESSION COEFFICIENT	P-VALUE	R^2
1	**EDUCATION**			
	Mother	0.019	0.6238	0.066
	Father	0.055	0.1677	
	RESIDENCE			
	Rural	-0.018	0.6285	
	Suburban	-0.048	0.2025	
	RACE			
	White	-0.436	0.0000*	
	African American	0.190	0.0597	
	Hispanic	0.195	0.1258	
	Asian	0.112	0.0847	
	GENDER (1=Male, 0=Female)	0.086	0.0191*	
2	**EDUCATION**			
	Mother	0.020	0.6010	0.067
	Father	0.055	0.1683	
	RESIDENCE			
	Rural	-0.029	0.4537	
	Suburban	-0.060	0.1312	
	RACE			
	White	-0.454	0.0000*	
	African American	0.175	0.0856	
	Hispanic	0.221	0.0894	
	Asian	0.120	0.0669	
	GENDER	0.090	0.0153*	
	REGION (1=GA, 0=MI)	0.040	0.3244	

Total Sample Size=784 * Significant at 0.05 level

H7: There will be a significant positive relationship among students' attitudes toward the environment, their beliefs of responsibility, and knowledge of global warming.

The Pearson correlation coefficient was used to test the relationship between attitudes and beliefs, attitudes and knowledge and knowledge and beliefs. The correlation matrix for this analysis is presented in **Table 5.9**. The results illustrate that beliefs were significant, but negatively correlated with both attitudes (r=-0.131, P <0.05) and knowledge (r=-0.258, P <0.05).

Table 5.9

Matrix of Correlation Coefficients

VARIABLES	ATTITUDES	KNOWLEDGE	BELIEFS
ATTITUDES	1.0000 (784) P=.		
KNOWLEDGE	.2048 (784) P=.000	1.0000 (784) P=.	
BELIEFS	-.1314 (784) P=.000	-.2579 (784) P=.000	1.0000 (784) P=.

Note: 784 valid cases.

However, knowledge was significantly and positively related to attitudes (r=0.205,

P <0.05). Thus, the relationship between beliefs and both attitudes and knowledge did not support the hypothesis. However, the relationship between knowledge and attitudes supported the hypothesis.

Focus Group Analysis

Sixty-one (61) students participated in focus group sessions. Twelve sessions were held, six sessions in each state. Thirty-one (31) students in Georgia and 30 students in Michigan participated in the focus groups. **Tables 5.10** and **5.11** display demographic characteristics of the focus groups held by the two regions. As shown in **Table 5.10**, the average size of the focus groups in Georgia was five students and the average age was 17. Most of the students (18) were female. Nineteen of the students were white, ten students were African American and two were Asian. **Table 5.11** illustrates the demographic characteristics of the Michigan students. Sixteen or 51% of the participants were female. Eighteen of the students were white, 10 were African American and two were Hispanic. The average size of the focus group sessions was five students and the average age was 17.

Focus group sessions generated additional information about students' environmental attitudes, beliefs and knowledge. Information gained through the focus groups added to information gained from the survey. Focus group questions centered on responsibility, the role of government in environmental protection and willingness to sacrifice (**See Appendix B**).

TABLE 5.10

Demographics of Georgia Focus Groups

GROUP	NUMBER	GENDER	RACE	AGE
1	5	Females	White	17-18
2	5	Females	African American	17
3	5	3 Males; 2 Females	White	17-18
4	5	Males	White	17-18
5	5	Males	African American	17-18
6	6	Females	1 African Am.; 3 Whites; 2 Hispanics	17-18

TABLE 5.11

Demographics of Michigan Focus Groups

GROUP	NUMBER	GENDER	RACE	AGE
1	5	Females	White	17
2	5	Males	White	17-18
3	5	1 Female; 4 Males	White	17
4	5	Females	African American	17-18
5	5	Males	African American	17
6	5	Females	2 Hispanic ; 3 White	17-18

Description of the Findings

Regarding the focus group data, the use of open-ended questions in the focus groups resulted in data that formed a conversational style of narrative. Often a participant related a story or incident to explain his or her point.

However, the strategy used in describing data was to convey the viewpoint of the majority of participants. Therefore, the researcher decided not to include long quotations, but to provide composite statements reflecting perspectives of the participants. According to Krueger (1994) there are three models or styles for reporting focus group results. For this research the summary description model was chosen. This style of reporting begins with a summary paragraph and then includes illustrative comments. Comments selected are intended to help the reader understand the way in which respondents answered the question (Krueger, 1994, p.169).

Analysis of Questions

1. Let's talk about sources of information here in your school. Where do you go for information about the environment?

Probes: What type of information did you receive?

What were your impressions of the information you received?

Was the information current?

Was it accurate or biased?

Was it practical and useful?

In each focus group session, participants cited several sources of environmental information with two sources mentioned most frequently. These were their physical science classes and social science classes. Other sources

included the library, teachers, and vocational classes. Participants felt that the information received was accurate, practical and current to the best of their knowledge. None of the participants felt they were extremely knowledgeable about the environment, or that they sought environmental information frequently. In both regions participants revealed that their contact with environmental issues within their school was limited to what was being covered in class that day.

Typical comments by these students included:

> Environmental issues are important and should be included in our curriculum. (Groups 1,3, Georgia; Groups 1,4, Michigan)
>
> The environmental information we received was boring and did not keep the interest of the students. (Groups 2,4, Georgia; Group 2, Michigan)
>
> Recycling is the issue discussed most frequently in my school. (Groups 2,5, Michigan)
>
> The only source of environmental information in my school is my science teacher. (Groups 4,5, Georgia; Group 2,3, Michigan)
>
> The information we received about conserving electricity during a career fair was interesting and informative. (Groups 2,6, Georgia)
>
> I don't have time to learn about the environment, I have too many other things to worry about (getting in college, sports, boyfriends/girlfriends and work). (Groups 2,5, Georgia; Group 5, Michigan)

2. What can or should your school do to provide better quality environmental information?

In each session, the participants revealed several interesting ideas on how their schools can provide better quality environmental information. Three ideas were consistently mentioned, the creation of an environmental education class,

environmentally related field trips, and inclusion of environmental information into current classes. Participants were candid and very comfortable in expressing their opinions about improving the quality of environmental education in their schools. **Typical comments by these students included:**

> A class that focuses on environmental issues would help students become aware of environmental issues. (Groups 1,3,5,6, Georgia; Groups 2,4,5,6, Michigan)
>
> I think the quality of environmental education could improve in this school by including interactive environmental experiments to our classes. (Groups 1,6, Georgia; Groups 1,5, Michigan)
>
> Field trips are a good way to expose students to environmental issues. (Groups 1-6, Georgia; Groups 1-6, Michigan)
>
> The creation of an environmental organization in the school could serve as a source of environmental information to the students. (Groups 3,5, Michigan)

3. What can or should the government do to provide better quality environmental protection?

The most significant suggestion participants made regarding this question was that government should take a more aggressive stance toward polluters. The majority of participants reported that "the government was too lenient and allowed big business to get away with polluting the environment." Many participants could provide lengthy explanations of why they responded this way and what they would do differently.

Typical comments by these students included:

> The government could increase the amount of environmental education. (Groups 1,6, Georgia; Groups 4,5, Michigan)

Higher fines for polluters are a good way to improve the quality of environmental protection. (Groups 4,5, Georgia; Groups 2,3, Michigan)

More environmental regulations would help decrease the amount of pollution currently found in the environment. (Groups 2,4,5, Georgia; Groups 2,3,5, Michigan)

The government is responsible for environmental protection and should be held responsible for letting so many polluters get away with polluting the environment. (Groups 1,2,3,4,6, Georgia; Groups 1-6, Michigan)

4. If you could change one thing about the environment, what would it be?

Probe: What makes this area of the environment so important to you?

Most participants chose air pollution as the one thing about the environment they would change. Two other issues were mentioned almost as much as air pollution, they were water pollution and solid waste. When asked why these issues are so important to them, participants mentioned that "these issues affected everyone and our quality of life."

Typical comments by these students included:

Clean air is essential for everyone and extra attention should be devoted to this issue. (Groups 2,6, Michigan)

If I could change one thing about the environment it would be cleaner air, everyone has the right to breathe clean air. (Groups 1,2,4, Georgia; Groups 1,6, Michigan)

Air pollution is important to me, because we have an egg-like odor in our air caused by a local paper mill company. (Groups 1-6, Georgia)

The environment is delicate and we don't have a replacement for it. (Groups 1,5, Georgia; Groups 1,6, Michigan)

If I could change one thing about the environment it would be to create some type of technology to reduce the amount of waste we produce. (Group 5, Georgia)

Our water needs to be cleaned so we can enjoy the beaches, fishing and drinking clean water. (Groups 2,3,5, Georgia; Groups 1,2,4, Michigan)

5. To what extent do you see the media as a valuable source of environmental information?

Probes: To what extent do you see your parents as a valuable source of environmental information?

To what extent do you see your peers as a valuable source of environmental information?

Most participants reported that the media was the best source of environmental information for students, particularly the television. Consistently, participants said "that most of their environmental knowledge comes from the television." They reported that the "media did a good job of informing them of the current environmental hazards [oil spills, global warming and air pollution were mentioned] and events [Earth Day]." When asked if their parents were a valuable source of environmental information, almost consistently all participants said, "no." When they were probed, the majority said, "environmental issues rarely come up at home." Peers also were not seen as a valuable source of environmental information by most students. Some participants did mention some positive environmental experiences with peers, but did not feel they were a source of information.

Typical comments by these students included:

> Media does a good job of keeping me informed of environmental issues and problems. (Groups 1,3,4,6, Georgia; Groups 2,4,5,6, Michigan)
>
> The television is the best source of environmental information. (Groups 1,3,4,5,6, Georgia; Groups 1-6, Michigan)
>
> Parents don't have time to discuss environmental issues. They have more important things to do when they get home from work. (Groups 2,5, Georgia; Groups 2,3, Michigan)
>
> They now have all kinds of environmental information on television (commercials, cartoons, programs and news). (Groups 2,3,5, Georgia; Groups 1,4,6, Michigan)
>
> Radio stations could do a better job of including environmental public service announcements when most students listen to the radio. (Groups 4,5, Michigan)

6. How do you feel about environmental pollution?

Probes: How should we hold polluters responsible?

In most of the sessions participants expressed concern and some compassion for the status of the environment. Participants were adamant that they wanted a clean environment and polluters should be held responsible. However, most participants were not willing to admit or accept any blame for their part in polluting the environment. Most participants' responses revealed that environmental pollution is a problem, but they did not think they could do anything about it. Participants were critical of the governments' role in protecting the environment and stated that "environmental pollution should be a higher priority among government officials." When asked how should we hold polluters

responsible, participants overwhelmingly suggested "stronger regulations and higher fines."

Typical comments by these students included:

> Environmental pollution is important and something should be done to keep the environment clean for future generations. (Groups 1,4,6, Georgia; Groups 1,2,3, Michigan)
>
> Environmental polluters should have to pay steep fines; the money then could be used for environmental cleanup. (Group 3,4,5, Georgia; Groups 2,3, Michigan)
>
> The government could create new regulations to protect the environment. (Groups 1,2, Georgia; Groups 4,6, Michigan)
>
> We as students can't do anything to protect the environment from polluters, but the government can. (Groups 5,6, Georgia; Groups 4,5, Michigan)
>
> If we stop allowing big companies to pollute, our environment would be clean. (Group 1, Georgia; Groups 1,5, Michigan)
>
> It cost too much to stop environmental pollution, so we must create new ways to produce what we need. (Group 3,4, Georgia; Group 2, Michigan)
>
> When we graduate from high school and get jobs, people will pay attention to what we think is important about the environment.

7. Are you willing to sacrifice some economic growth to protect endangered species?

Probes: Should jobs be sacrificed for the protection of endangered species?

> **Should all citizens make sacrifices for the environment?**
>
> **What should be done to get people like yourself to make sacrifices for environmental protection?**

In all sessions, participants expressed a willingness to sacrifice some economic growth to protect endangered species. Participants stressed a desire to preserve biodiversity and the importance of this preservation effort. However, some participants expressed a concern for loss of jobs due to the protection of endangered species. These participants reported that a balance between endangered species protection and economic growth would be the best desired outcome. Most participants agreed that jobs should not be lost for the protection of endangered species. When probed the students' ideas of economic growth did not include their lives or their parents' lives. For example, most participants were not willing to turn down a good paying job for the protection of endangered species. However, participants did feel that all citizens should make sacrifices for the environment. Some sacrifices participants were willing to make included walking or riding a bicycle when possible, conserving electrical energy and reducing the amount of waste they create. When participants were asked what would it take to get people like themselves to make sacrifices, most participants suggested "increasing the amount of environmental education within the school." They said, "The students would then realize the importance of making sacrifices for the environment."

Typical comments by these students included:

> Jobs are more important than endangered species and should not be sacrificed. (Groups 4,5, Georgia; Groups 1,2,3,5,6, Michigan)
>
> All citizens can play a role in protecting the environment. It just

depends if they think it is important enough. (Group 1, Georgia; Groups 1,4, Michigan)

Endangered species are very important because they will become extinct if we don't protect them. (Groups 1,2,6 Georgia; Group 4, Michigan)

The majority of the students at this high school don't know how important it is to protect endangered species. (Group 6, Georgia)

It is only the rich who don't want to protect endangered species so they can get richer. (Groups 2,5, Georgia; Group 6, Michigan)

8. What do you know about global warming?

Probes: Will global warming affect you or your family?

Where did you first hear about global warming?

How serious is global warming?

Do you feel you have sufficient knowledge about global warming?

What is global warming?

The majority of the participants had very little knowledge of global warming. All of the participants were familiar with certain aspects of global warming. For example, they related several topics such as CFCs, ozone depletion, greenhouse effect, and carbon dioxide to global warming. None of the participants could relate global warming to their personal lives or to members of their family. All participants considered global warming a serious problem, and the majority based their decision on the amount of attention the media had given the topic. Some participants revealed that what they had learned about global

warming had mostly come from the television. In every session participants were asked what is global warming and if they felt they had sufficient knowledge of global warming. A few participants did attempt to define global warming, but their definitions were limited and insufficient.

Typical comments by these students included:

> Global warming was not taught in my school. (Groups 3,4,5, Georgia; Groups 1,2,5,6, Michigan)
>
> Global warming will not affect me or my family. (Groups 2,4,5, Georgia; Groups 1,2,3,6, Michigan)
>
> The television has provided me with the little knowledge I have about global warming. (Group 1,3,4 Michigan)
>
> Global warming is not as serious as the media makes it out to be. (Group 5, Georgia; Groups 2,3,6, Michigan)
>
> We don't have time in school to learn about every environmental issue. (Group 3,5, Michigan)
>
> Global warming is the heating up of the atmosphere and is caused by pollution. (Group 1,4,6, Georgia)
>
> CFCs are the cause of global warming. (Groups 2,3,4, Georgia; Groups 1,4, Michigan)
>
> Scientists are going to solve the problem of global warming before it affects me or my family. (Groups 1,5, Georgia; Group 2, Michigan)
>
> The government should work harder to educate the public about global warming and do more to protect us from this environmental hazard. (Groups 3,6, Georgia; Group 2, Michigan)

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter includes a summary of the purpose, objectives and methodology of the study. This is followed by conclusions drawn from data analysis. Recommendations are then made for additional research that relates to the problem.

SUMMARY

Over the past two decades, no regional studies have been conducted on high school students' attitudes, knowledge and beliefs toward a specific aspect of the environment, especially using twelfth grade students and global warming as focal points of the study. The purpose of this study was to compare environmental attitudes, knowledge and beliefs held by two regionally separated populations. More specifically, this study assessed twelfth grade students' knowledge of global warming, attitudes toward the environment, and beliefs of environmental responsibility. The importance and distribution of environmental information varies by region, therefore a critical examination and evaluation of our environmental education efforts in specific regions is needed.

Previous studies have shown that the social demographic basis of

environmental concern (attitudes, knowledge and beliefs) varies by social class, age, gender, residence and political affiliation and ideology. According to studies conducted in the 1970s and 80s there is a high level of concern among high school students (Ramsey and Rickson, 1976; Perkes, 1973; Bohl, 1976; Alaimo and Doran, 1980). Prior studies were general, and did not examine regional differences in high school students' attitudes, knowledge and beliefs for a specific environmental issue. This study found both regions to possess positive attitudes, but their level of knowledge and strength of beliefs were weak (low) to moderate. Furthermore, this study found statistically significant regional differences in the respondents' attitudes and knowledge.

A number of theories have been developed to explain the attitudes, knowledge and beliefs held by high school students. The most prominent theories include: (1) social learning theory, (2) cognitive dissonance theory, and (3) operant conditioning theory. Other factors that contribute to the attitudes, knowledge and beliefs of environmental issues (i.e. global warming) are socio-demographic variables such as gender, race, region, residence, and college education of parents. Each variable mentioned above contributed to the general attitudes, knowledge and beliefs of the respondents being investigated.

The primary purpose of this study was to assess twelfth grade students' attitudes, knowledge and beliefs toward environmental issues and global warming. The secondary purpose was to determine if there is a regional difference in the attitudes, knowledge and beliefs held by regionally separated students. Four

objectives served as a basis for this study:

Objective I - To assess the attitudes twelfth grade students hold toward environmental issues.

Objective II - To assess how knowledgeable twelfth grade students are about global warming.

Objective III - To assess twelfth grade students' beliefs of environmental responsibility: conservation, management and protection.

Objective IV - To assess if regionally separated twelfth grade students differ in environmental attitudes, knowledge and beliefs.

In achieving the objectives seven hypotheses were stated for analysis purposes:

H1: Students in Lansing, Michigan will have significantly more positive attitudes toward the environment than students in Valdosta, Georgia.

H2: Students in Lansing, Michigan will have significantly more knowledge of Global Warming than students in Valdosta, Georgia.

H3: Students in Lansing, Michigan will have significantly stronger beliefs of environmental responsibility than students in Valdosta, Georgia.

H4: There will be a significant difference in students' attitudes toward the environment between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H5: There will be a significant difference in students' knowledge of Global Warming between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H6: There will be a significant difference in students' beliefs of environmental responsibility between Georgia and Michigan when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

H7: There will be a significant positive relationship among students' attitudes toward the environment, their beliefs of responsibility and knowledge of global warming.

Population and Sample

The population selected for this study was from four high schools, two in Lansing, Michigan and two in Valdosta, Georgia. Seven hundred eighty-four (784) twelfth grade students (Everett High School, 220; Eastern High School, 200; Lowndes High School, 175; Valdosta High School, 189) participated in this study during Spring semester 1995.

All of the twelfth grade students enrolled in their respective schools were asked to participate in the study. A stratified sample design was used to draw the final research sample. Students participated in the study by completing a five-page questionnaire. Twelve hundred twenty (1220) questionnaires were distributed for data collection, 989 questionnaires were returned, but only 784 were used for the research sample.

Following the analysis of the questionnaires, twelve focus groups were developed to discover why and how students have formed the attitudes and beliefs they hold. Focus groups also served as means to gain an understanding of where students have obtained their knowledge of global warming. Sixty-one students

participated in the focus group sessions via parental consent (see Appendix D), six sessions in each region.

Design of the Survey Instrument

A 48-item questionnaire based on the most prevalent global warming and environmental issues facing the nation was designed to obtain students' attitudes, knowledge and beliefs. Items were divided into four functionally defined areas: (1) environmental attitudes, (2) knowledge of global warming, (3) beliefs of environmental responsibility, and (4) demographic information. On each item participants were asked to indicate their attitudes, knowledge or beliefs about the issue presented. Responses were indicated on a five point scale. The .05 level of confidence was used to determine statistical significance, however, in those instances where significant differences in attitudes and beliefs among comparison groups were found at .01 level of confidence, the difference was also reported.

Design of the Focus Groups

Focus group questions were centered on three themes: (1) responsibility, (2) the role of government in environmental protection, and (3) willingness to sacrifice. Participants were asked to respond to eight open-ended questions that probed the three themes mentioned above. The average size of the focus groups was five, and the average age of participants was 17. Information gained through the focus groups was reported for the purpose of strengthening the total research

project. The style of reporting chosen for this study was the summary description model; This style of reporting begins with a summary paragraph and includes illustrative comments of participants.

Quantitative Data Analysis

In achieving the objectives of this study, responses to the questionnaire were reported and analyzed by one or more of the following techniques: (1) frequencies, (2) analysis of variance, (3) correlations, (4) regression analysis, (5) Chi-square, and (6) descriptive statistics (mean and standard deviation). Most results were presented in table form to make them relatively easy to comprehend and interpret.

CONCLUSIONS

There were four research objectives for this study. The first research objective was to assess the attitudes twelfth grade students hold toward environmental issues. According to Bohl (1976) and Richmond (1976), high school students hold positive attitudes toward the environment. Results of the quantitative data and qualitative data of this research are consistent with earlier studies of environmental attitudes. Another study conducted by Alaimo and Doran (1980) found all students (seventh to twelfth) to have positive attitudes for the environment, with eight and twelfth graders the most positive. Although this research included other grades (seventh to twelfth), the research is consistent with

the findings of this study, which found twelfth grade students to possess positive attitudes. A ten-item attitudinal scale was used to assess the students' environmental attitudes in this study. The quantitative (ANOVA) results on this scale indicated that the respondents' possess significantly positive attitudes ($F=26.52$, $P<0.01$). The mean values were 3.91 (Georgia) and 3.71 (Michigan). The qualitative data also provided valuable insight into the attitudes held by the participants. The focus group sessions served two purposes: first, they corroborate the findings of the survey data, and second, they provided the students the opportunity to explain why they hold a particular attitude. The focus group sessions revealed that the majority of the participants possess positive environmental attitudes. Participants consistently suggested ways to improve environmental education in their schools, recommended holding polluters responsible and expressed a concern for the future of the environment.

The second objective of this study was to assess how knowledgeable twelfth grade high school students are about global warming. Prior studies have not assessed twelfth grade students' knowledge of global warming. Perkes (1973) found tenth and twelfth grade students to be knowledgeable of environmental issues that were affecting their own communities. He also found students were not knowledgeable of general environmental facts and concepts. A similar study by Bohl (1976) found high school students to have a limited amount of environmental knowledge. The quantitative and qualitative data of this study also found the respondents to lack knowledge of general environmental issues, as well

as global warming. A fifteen-item scale was used to assess the students' knowledge of global warming. Students were asked to respond to a set of items that reflect the current and most prevalent global warming issues facing the nation. Participants' responses were converted from a true, false and don't know response pattern into a percent correct, incorrect and don't know pattern for the presentation of the results. Chi-square was used to determine statistical significance of participants' responses. Results of the quantitative data revealed that the participants lacked knowledge of global warming ($F=10.32$, $P<0.01$). The means for the net percent correct was 18.08 and 13.21 for Georgia and Michigan respondents respectively. The findings are consistent with a study conducted by Richmond (1976). He found students demonstrated a good understanding of environmental concepts, although they responded poorly to factual knowledge items.

The qualitative data provided insight into why twelfth grade students' knowledge of global warming is low. Focus group sessions revealed that there are some environmental education opportunities being missed in the respective schools. Participants revealed a high level of concern for the environment and a desire to learn more about the environment. In addition, participants expressed concerns about environmental materials being presented in their respective schools. Although none of the schools currently have an environmental education course in their curriculum, some teachers have incorporated some environmental issues into their lectures. The focus groups allowed this researcher the

opportunity to explore why there is a gap in knowledge, when concern for the environment is certainly present.

Through the focus group sessions participants revealed the environmental education problems (needs, materials and method) that they recognized in their respective schools. They also provided the researcher with their sources of global warming knowledge, and how they feel about the information they had received.

The third research objective of this study was to assess twelfth grade students' beliefs of environmental responsibility (conservation, management and protection). A study conducted by Bohl (1976) concluded that the average high school student does not possess firm beliefs. A similar study by Alaimo and Doran (1980) found that twelfth grade students believe they can affect change. The quantitative results of this study found twelfth grade students lack beliefs of responsibility. A five-item belief scale was used to assess the students' beliefs of responsibility in this study. The quantitative results of this scale indicated that the participants do not possess strong beliefs of responsibility ($F=.9934$, $P > 0.05$). The mean values for the two groups were 3.18 (Georgia) and 3.23 (Michigan).

The quantitative findings of this study were partially supported by the qualitative data. The focus group sessions revealed that the participants do possess moderate-to-strong beliefs of responsibility, but the beliefs are currently being masked by a sense of powerlessness. The participants expressed in several sessions that they did not have the power or merit to make a difference but did believe they should participate in environmental conservation, management and

protection. In addition to the sense of powerlessness being revealed through the focus groups, it was very apparent through their comments that the participants hold the government responsible beyond all others including themselves. The focus group sessions on this topic helped clarify the relationship of students to their beliefs of responsibility. Two points emerge from the focus group analysis that support the somewhat inconsistent findings of the survey. First, the extent to which the students' beliefs of responsibility is a function of where they stand in life (e.g. out of school, working). Second, the students' beliefs of responsibility can sometimes be masked by a sense of powerlessness. The focus group data confirmed the findings of the survey and provided insight about the meaning and interpretation of the results. The depth and breadth gained through the triangulation of methods proved to be essential in assessing the respondents' beliefs of responsibility.

The final objective of this study was to assess if regionally separated twelfth grade students differ in environmental attitudes, knowledge and beliefs. Oneway analysis of variance (ANOVA) was used to test for regional differences of students' attitudes toward the environment. The results revealed that the Georgia respondents and the Michigan respondents both possess positive attitudes toward the environment. However, Georgia respondents (mean=3.91) revealed a significantly more positive attitude ($F=26.52$, $P<0.01$) toward the environment than Michigan respondents (mean=3.71).

Chi-square was used to test for the significance of regional differences in

the participants' responses on the global warming knowledge items. The participants' responses were reported as net percent correct, incorrect and don't know. Results revealed that Georgia respondents were significantly more knowledgeable than Michigan respondents ($F=10.32$, $P<0.05$). The overall means for the net percent correct were 18.08 and 13.21 for Georgia and Michigan respondents respectively.

Oneway analysis of variance (ANOVA) was used to the test for regional differences of the students' beliefs of environmental responsibility. Results revealed that both groups do not have strong beliefs of responsibility. The mean values were 3.18 and 3.23 for Georgia and Michigan respondents respectively. No significant regional differences in beliefs of responsibility were found between Georgia and Michigan respondents.

Tests of Research Hypotheses

Statistical techniques were applied in testing the research hypotheses posed in Chapter IV. The specific tests chosen were based on the nature of data collected and the needs of the hypothesis statements. Additional statistics were used where they might add substance to the test statistic. In comparisons and tests of relationships and differences, a critical value at 0.05 significance was chosen to maintain the power of the tests.

Research Hypothesis 1:

Students in Lansing, Michigan will have significantly more positive attitude toward the environment than students in Valdosta, Georgia.

This hypothesis was not supported by the findings. Both groups revealed positive environmental attitudes, but those respondents in Michigan did not possess significantly more positive attitudes toward the environment. The results indicated that the environmental attitudes of the Georgia respondents were significantly more positive.

Research Hypothesis 2:

Students in Lansing, Michigan will have significantly more knowledge of Global Warming than students in Valdosta, Georgia.

This hypothesis was not supported by the findings. Respondents in Michigan were not found significantly more knowledgeable of global warming than respondents in Georgia. However, the results indicated that the level of knowledge does differ among the regions, and found Georgia respondents significantly more knowledgeable of global warming. Although Georgia respondents were more knowledgeable of global warming, the level of global warming knowledge among the two regions was low.

Research Hypothesis 3:

Students in Lansing, Michigan will have significantly stronger beliefs of

environmental responsibility than students in Valdosta, Georgia.

This hypothesis was not supported by the findings. Respondents from Michigan were not found to have significantly stronger beliefs of environmental responsibility. The quantitative findings suggest that the respondents from both regions do not possess strong beliefs of environmental responsibility.

Research Hypothesis 4:

There will be a significant difference in students' attitudes toward the environment between Georgia and Michigan, when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

This hypothesis was supported by the findings. Region was a significant predictor of respondents' environmental attitudes. The results revealed that Georgia respondents' attitudes were significantly more positive than Michigan respondents. Other demographic variables that were found significant were race, gender, and mother's college education.

Research Hypothesis 5:

There will be a significant difference in students' knowledge of Global Warming between Georgia and Michigan, when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

This hypothesis was supported by the findings. Region was a significant predictor of the respondents' knowledge of global warming. The results revealed

that Georgia respondents were more knowledgeable of global warming than Michigan respondents. Other demographic variables that were found significant were race and gender.

Research Hypothesis 6:

There will be a significant difference in students' beliefs of environmental responsibility between Georgia and Michigan, when the effects of demographic variables (gender, race, residence, college education of parents) are controlled.

This hypothesis was not supported by the findings. Region was not a significant predictor of the respondents' beliefs of environmental responsibility. The results revealed that after controlling for the demographic characteristics of the Georgia and Michigan respondents, region was not a significant predictor of beliefs of environmental responsibility.

Research Hypothesis 7:

There will be a significant positive relationship among students' attitudes toward the environment, their beliefs of responsibility and knowledge of global warming.

This hypothesis was not supported by the findings. Knowledge was significantly and positively related to attitudes. However, the relationship between beliefs and both attitudes and knowledge was negatively related, therefore the hypothesis was not supported.

Discussion of Qualitative Findings

It should be noted, that focus groups can never claim to represent a much larger inferential population than surveys obtain through random sampling methods (Morgan, 1988). However, it is the researchers' intention to present the focus group data as a means to strengthen the quantitative data obtained through the survey. The interaction of the participants in the focus group sessions allowed them to discuss, debate and confer on the attitudes, knowledge, and beliefs held by them and their peers. The richness gained through combining two research methods proved to be valuable in assessing the students' attitudes, knowledge and beliefs in this study.

Environmental Attitudes

The quantitative results of the attitudinal section of the questionnaire found the Georgia respondents to possess significantly more positive environmental attitudes than the Michigan respondents. The focus group sessions revealed that both groups have positive attitudes toward the environment. However, an explanation of why the attitudes of Georgia respondents were significantly more positive was not clearly evident. This researcher will present two possible explanations of why there is a statistically significant difference between regions. First, the majority of the Georgia participants have had a "first hand" experience with a local environmental problem. The Georgia respondents mentioned they had lived with the offensive smell of a paper mill all of their lives.

This experience apparently had not negatively affected the respondents' attitudes toward the environment, it has possibly enhanced their awareness and concern of environmental issues. The classical conditioning theory suggest that associations are formed between stimuli that continually occur together. For example, the offensive smell of the paper mill serves as stimuli for the respondents, thus they form positive attitudes toward the environment. A study conducted by Tremblay and Dunlap (1978) found that exposure to poor environmental conditions leads to environmental concern. This research supports the findings of this study, but it should be noted that the respondents from Georgia do not consider their environmental conditions to be poor.

Second, most of the Georgia respondents recorded they were from rural areas, while the majority of the Michigan respondents recorded they were from urban areas. A study conducted by Leftridge and James (1980) found the variable residency as a significant predictor of environmental attitudes. Their study concluded that rural students were statistically more perceptive (positive) of environmental issues than urban students. These findings are consistent with the quantitative and qualitative results of this study, but inconsistent with other studies that found urban students to possess the more positive environmental attitudes. The two explanations above are provided as a possible basis to account for the significantly more positive attitudes of the Georgia respondents.

Knowledge of Global Warming

The quantitative findings of the knowledge section of the questionnaire found the Georgia respondents more knowledgeable than the Michigan respondents. The social learning theory provides a possible explanation of why quantitative and qualitative findings found Georgia respondents more knowledgeable of global warming than Michigan respondents. The social learning theory suggests that environmental knowledge comes from observing, interpreting, responding in social settings, and through receiving reinforcements. It was revealed in the focus group sessions that the paper mill in the Georgia community serves as a constant reminder (reinforcement) of environmental problems particularly air pollution (e.g. global warming). Overwhelmingly, the Georgia respondents mentioned global warming as one of the most urgent issues facing the United States. Although their factual knowledge of global warming was not consistent with their concern for the issue, they were found to be significantly more knowledgeable than the Michigan respondents. The social learning theory serves as a possible explanation of why the Georgia respondents were found to be significantly more knowledgeable of global warming.

Beliefs of Environmental Responsibility

The quantitative results of the beliefs section of the questionnaire revealed that the respondents from both regions lack strong beliefs of environmental responsibility. A study conducted by Bohl (1976) concluded that the average high

school student does not possess firm beliefs of environmental responsibility. The qualitative data of this study contradicts Bohl's findings, but supports the findings of Alaimo and Doran (1980), who found that twelfth grade students believe they can affect change. The focus group sessions revealed that the respondents from both regions do possess moderate-to-strong beliefs of responsibility. This researcher believes that the beliefs are being masked by a sense of powerlessness. The focus group participants expressed in several sessions that they currently do not have the power or merit to make a difference in environmental protection. This researcher believes that the respondents' beliefs of environmental responsibility is a function of where they stand in life (e.g. out of school, working). For example, most respondents revealed that they would be environmentally empowered only after finishing school and joining the work force. In addition, some of the descriptive phrases or words used by the respondents in the focus group sessions led this researcher to conclude that the respondents' beliefs are currently being masked. In addition to the sense of powerlessness being revealed through the focus group sessions, it was very apparent that the students held the government responsible for the environment beyond all others, including themselves.

Implications of the Current Study

The results of the findings in this study show that there is a greater need for quality environmental education in secondary high schools. Several possible

explanations were discussed previously for the lack of positive attitudes, lack of strong beliefs of responsibility and lack of global warming knowledge. Other possible explanations include the possibility that the materials and techniques provided in the classroom were not of sufficient quality. Also, the infusion of environmental education into the existing curricula for a few hours during the school year may not be of sufficient duration or intensity to produce marked changes in the students' attitudes, beliefs and knowledge. In addition, the problem of inadequate motivation from teachers and school personnel could provide another explanation for the lack of attitudes, beliefs and knowledge. Teachers may particularly have difficulty motivating students regarding the more complex environmental issues such as incorporating factual global warming information into the curricula. More research is needed in each of the above areas before particular environmental education strategies can be implemented.

Implications for Environmental Education

The future development of environmental education will require the application of new concepts, new methods, and new techniques as part of a complete effort of teaching environmental education in secondary schools. Other constrains affecting the successes of environmental education programs are: inflexible scheduling, resistance and apathy by the community, administrators, teachers, reinforcement of parents, and youth oppression (powerlessness). Knowing that students are not exposed to environmental issues sufficiently in the

classroom, we should stress the personal and social uses of environmental education in everyday life.

Implications for Students

The focus group sessions revealed that the current teaching methods and materials used to educate the students about the environment was not comprehensive nor did it connect classroom learning to everyday life. The sessions revealed that the students do want to participate in their learning. This researcher believes that this type of commitment could be the starting point of successful environmental education in secondary schools. As mentioned earlier, the focus group sessions revealed that the respondents felt their opinions and ideas toward the environment were not regarded as having merit. If the students are empowered to participate in their own environmental education they could possibly feel empowered to speak confidently and authoritatively for the environment. For example, this researcher found that the students' belief of environmental responsibility is being masked by a sense of powerlessness, therefore, it is important to build the students' confidence and allow them to participate in their education. Environmental stakeholders are all humans, including students, so every effort must be made to empower their silent voice. Empowering the students will enable them to use scientific knowledge to design courses of action that will enable them to respond to environmental problems confidently as a responsible environmental citizen. The respondents in the

present study are students who are not currently encouraged to internalize environmental problems and critically think about solutions in their classes, therefore, they are less likely to have strong beliefs of environmental responsibility. However, once out of school, the respondents revealed that their beliefs of responsibility will change, but this researcher believes that the students will have missed the opportunity to learn and internalize the importance of environmental issues.

Implications for Secondary School Teachers

Teaching practices known to turn students away from environmental issues should be abandoned and replaced by approaches that encourage environmental learning. One approach that was repeatedly criticized by the respondents in the focus group sessions was the introduction of environmental issues without the opportunity to discuss, explore and experience the environmental phenomena. The respondents talked about the boring and meaningless hours of class time devoted to dissecting other issues but not environmental issues. Furthermore, the teachers who use this approach tend to assume there is one perspective on environmental issues. They do not give enough consideration to the students' idiosyncratic interpretations, a sure method to silence students and to make them feel powerless toward environmental issues. The respondents emphasized the need for very well prepared teachers, well designed programs, and adequate facilities to achieve environmental education and objectives. They also suggested

that environmental education should be taught not only in science and social science curricula but in all school curricula. Existing programs should be reorganized to allow the development and implementation of teaching strategies and techniques of environmental education that would be suitable for the secondary school setting. Because environmental problems are comprehensive the education programs should be effective enough to draw the students' attention to contemporary environmental problems and dangers for all humankind. Consequently, most teachers are unfamiliar with the interdisciplinary approaches directed toward solving environmental problems. Teachers should present environmental education in connection with the students' own experiences and interests, frequently using hands-on experiences that are integral to the instructional process. All of the students viewed field trips as important environmental educational opportunities and felt that this would be an effective method of teaching environmental education. The teaching strategies should incorporate a holistic approach and encompass the various natural, social, cultural and economic aspects of the environment. Because of the interdisciplinary nature of environmental problems, a comprehensive approach to the teaching and implementation of environmental education materials must be incorporated.

Students should be challenged and encouraged to express themselves and provide input on what they are learning and required to learn. Teachers should be familiarized and trained to handle values in classrooms to develop students' awareness of the environment. This could be essential in helping students to

realize their underlying values as determinants of environmental attitudes and beliefs.

Local environmental problems should be studied in teacher training programs. That is, the development of problem solving skills in teachers is essential if they are to help develop the same skills in their students. Teachers should be trained in ways to make use of local environmental field studies to help their students gain direct learning experiences.

In addition, developing environmentally related workshops committed toward the interdisciplinary perspective, teaching methods and techniques should be modified to help students acquire the knowledge, attitudes and beliefs needed for comprehending, identifying, analyzing and proposing solutions to environmental problems. Also, further research is needed to obtain the actual situation regarding the use of environmental education teaching methods in secondary schools.

Implications for Parents

In stressing the importance of environmental education in secondary schools, we should simultaneously persuade parents to use their influence on children to incorporate environmental issues into their daily lives. The parental influence over a child's attitudes and beliefs has been suggested by some researchers as a major determinant of their individual characteristics (environmental attitudes and beliefs) (Bloom, 1964; Dave, 1963; Hanson, 1972;

Wolf, 1966). Children model themselves after the adults in their lives and when those adults are lacking environmental sensitivity, the opportunity to influence environmental attitudes and beliefs are lost. Those adults include parents, family friends, teachers and school administrators. When adults incorporate environmental issues into their children's lives, they are bound to improve or influence their own environmental attitudes and beliefs and help their children develop positive environmental attitudes and strong beliefs of responsibility.

Implications for Decision Makers

We need to discuss with students, other educators, and the public what we know about the problems that exist in environmental education dissemination in secondary schools. It is important to attend to students' explanations of their environmental attitudes, beliefs and knowledge. As I have explained earlier in this chapter, their answers coincide with other researchers explanations about the possible causes of poor environmental attitudes, beliefs and knowledge. As educators, we should be concerned about the evidence that points to poor attitudes, weak beliefs and lack of knowledge as hidden failures of environmental education and our teaching practices. At the same time, I believe that it is useful for educators to be aware of the demographic forces that have helped shape the environmental attitudes and beliefs of students as we know them today. This knowledge will help us better understand some root causes of our environmental education problems and perhaps keep us from unnecessarily castigating ourselves

for our failures. A knowledge of environmental education history will also help us identify the weaknesses and flaws in our goals and methods and lead us to seek solutions.

School authorities and others responsible for choosing textbooks and materials for the classroom need to be aware of the effects of these books and materials on students. This study has shown the harmful effects of dull, poorly delivered lectures on students' environmental attitudes and beliefs. The focus group sessions revealed that the students' lose interest in learning because of having to listen to boring lectures, they also tend to blame themselves for their lack of interest in environmental issues. They also think the inadequacy lies in them rather than the educator and the materials. They develop a self-concept that they do not like environmental issues and they do not possess positive environmental attitudes and beliefs. This self-concept leads to weak beliefs and poor attitudes toward the environment because they avoid learning and experiencing the environment and the cycle goes on. Because books are our main vehicles for teaching, we must make it our primary consideration to choose books that would appeal to our students. Our textbooks, materials and teaching methods must promote environmental learning, not discourage it.

As educators, we should find effective methods of increasing interest in environmental issues outside the school. An approach that I would put at the head of the list of recommended methods is the use of independent reading programs. This approach would allow students to choose what issues they want to

learn about from a set of prepared environmentally related reading materials. In the focus group sessions, it was revealed that most of the respondents have positive attitudes toward environmental issues and a desire to learn more about the environment. In Chapter V, I revealed some comments by the respondents, these comments revealed the importance of students participating in their environmental learning and the type of materials and methods they want for this process. We need to stress that members of the next generation may be influenced by today's environmental problems.

It is encouraged that the national environmental education program be designed in large part to respond to the above concerns. This program would be designed to respond to several probable weaknesses of the current strategies used to carry out environmental education in secondary schools. This study found that both regions (Georgia and Michigan) do not have specific environmental education mandates for their secondary schools. It is encouraging to note that the Lansing school district is implementing a mandatory global issues class for its ninth grade students starting Fall 1997. This class will focus on the interrelationships between humans and the environment.

The above situations throw light on important areas to be pursued in further research. They also lend support to policy makers, environmental educators and environmental activist, who can probably ascertain where education, political relations, and financial resources are needed.

Finally, the findings in this study offer a reasonable opportunity for

teachers and administrators to understand that social factors affect environmental attitudes, beliefs and knowledge. How the student responds to the environment now or in the future could depend on the type of environmental education that he or she receives while in high school.

RECOMMENDATIONS

The findings of the study suggest the need for environmental education curriculum development and additional research to bridge the gap between what we know about high school students and their environmental education needs. Recommended are the following:

1. Design a national environmental education curricula suitable for the various types of secondary school students that exist in society. The curricula should be designed with input from those (students) who will benefit from its development. It should be interactive, yet structured for experiential learning.
2. Include complex environmental issues and processes as an objective of the environmental education curricula.
3. Include critical thinking techniques and problem solving into environmental education curricula. This is important because students should be empowered to solve problems and critically think through environmental issues.

4. Emphasize the learning of complex scientific processes and provide explanations of natural processes and environmental changes.
5. Emphasize the use of environmentally related field trips.
6. Include "essential learning" as an objective of the environmental education curricula.
7. Include tradeoff costs and environmental impacts into the environmental education curricula.
8. Emphasize the complex relationships between technological and socioeconomic development and improvement of the environment.
9. Emphasize development of the students' knowledge of historical, societal and international efforts to solve environmental problems.
10. Include development of skills required to investigate, understand, and seek solutions for environmental problems.
11. Emphasize integration of a multi-disciplinary approach to environmental education.

Future Research

Through the triangulation of methods, the researcher sought to answer some specific questions regarding twelfth grade students and global warming. Answers to those questions were presented in this document. The following suggestions for future research were formulated during various stages of this

investigation:

1. Investigate secondary high school educators' environmental attitudes, knowledge and beliefs.
2. Evaluate and research environmental education policies found in various regions of the United States.
3. Research the use of financial resources in relation to environmental education.
4. Research the dissemination of environmental educational materials within secondary school systems.
5. Research beyond the school setting. Research needs to be focused on the interactive systems of teachers, parents and peers with students.
6. Evaluate the extent to which teachers or parents reflect the environmental attitudes and personal actions of the students.
7. Research the effectiveness of environmental experiential learning on secondary school students.
8. Replicate this study using secondary school students in two different regions, in order to determine their environmental attitudes, knowledge and beliefs and compare results.
9. Investigate the effectiveness of different teaching methods for environmental problem solving.
10. Investigate the effectiveness of mass-media on students' participation in

pro-environmental behavior and environmental knowing.

11. Investigate the effectiveness of the triangulation of methods to research other environmental issues and students.

APPENDICES

APPENDIX A

APPENDIX A

ENVIRONMENTAL SURVEY

This questionnaire is designed to get your reaction to **GLOBAL WARMING**. Please read each statement carefully, and then circle the answer that best describes your point of view. This is not a test. **THERE ARE NO "RIGHT OR WRONG" ANSWERS** to the questions. **DO NOT WRITE YOUR NAME ON THE QUESTIONNAIRE.** Your answers will be kept **COMPLETELY CONFIDENTIAL. FILLING OUT THE QUESTIONNAIRE IS ENTIRELY VOLUNTARY**, you can indicate your voluntary agreement to participate by completing and returning this questionnaire.

THANK YOU VERY MUCH.

SECTION A: ATTITUDES TOWARD THE ENVIRONMENT

Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), Strongly Disagree (SDA)

Please circle the number of your answer that reflects how you feel about the statement.

	SA	A	UD	DA	SDA
1. THE MEDIA SHOULD DO A BETTER JOB OF KEEPING ME INFORMED ABOUT ENVIRONMENTAL ISSUES.	1	2	3	4	5
2. INDUSTRY SHOULD BE HELD RESPONSIBLE FOR THEIR CONTRIBUTION TO OUR ENVIRONMENTAL PROBLEMS.	1	2	3	4	5
3. U.S. CITIZENS MUST DEMAND THAT THE GOVERNMENT PROTECT THE ENVIRONMENT.	1	2	3	4	5
4. GLOBAL WARMING SHOULD BE CONSIDERED ONE OF THE MOST SERIOUS PROBLEMS FACING THE WORLD.	1	2	3	4	5
5. WATER POLLUTION SHOULD BE CONSIDERED ONE OF THE MOST SERIOUS ENVIRONMENTAL PROBLEMS FACING THE U.S.	1	2	3	4	5
6. ENDANGERED SPECIES SHOULD BE PROTECTED, EVEN AT THE EXPENSE OF ECONOMIC GROWTH.	1	2	3	4	5
7. STRICTER LAWS SHOULD BE PLACED ON CONTRIBUTORS TO GLOBAL WARMING.	1	2	3	4	5
8. THE STUDENTS AT THIS HIGH SCHOOL SHOULD DO SOMETHING TO PROTECT THE ENVIRONMENT.	1	2	3	4	5
9. IT SHOULD BE MORE IMPORTANT TO PROTECT THE ENVIRONMENT THAN IT IS TO PRODUCE ENERGY.	1	2	3	4	5
10. WE SHOULD BE WILLING TO PAY FOR ENVIRONMENTAL PROTECTION, EVEN IF IT REQUIRES A REDUCTION IN SPENDING ON SOCIAL ISSUES (crime, health care, etc.).	1	2	3	4	5

SECTION B:KNOWLEDGE OF ISSUES

Please circle the number 1 if you think the statement is true and number 2 if you think the statement is false and the number 3 if you don't know if the statement is true or false.

	TRUE	FALSE	DON'T KNOW
1. LOVE CANAL IS A PLACE IN NEW YORK THAT WAS USED AS A TOXIC WASTE DUMP BEFORE IT WAS DEVELOPED INTO AN AMUSEMENT PARK.	1	2	3
2. ACID RAIN IS POLLUTED RAIN THAT HARMS LAKES, LAND AND KILLS VEGETATION.	1	2	3
3. CARBON MONOXIDE IS THE MAJOR CONTRIBUTOR TO THE GLOBAL WARMING TREND.	1	2	3
4. THE SEA LEVEL COULD RISE DUE TO GLOBAL WARMING.	1	2	3
5. SCIENTIST HAVE PREDICTED THAT FIRES WILL START AS A RESULT OF GLOBAL WARMING.	1	2	3
6. IT IS PREDICTED THAT GLOBAL WARMING WILL CAUSE SOME FLOODING OF LOW-LYING COASTAL AREAS.	1	2	3
7. SOME SPECIES COULD BECOME EXTINCT DUE TO GLOBAL WARMING.	1	2	3
8. GLOBAL WARMING COULD CAUSE THE SUN TO SHINE BRIGHTER AND HOTTER.	1	2	3
9. SCIENTIST HAVE PREDICTED THAT GLOBAL WARMING WILL CAUSE AGRICULTURE YIELDS TO CHANGE.	1	2	3
10. CHLOROFLUROCARBONS (CFCs) USE IS CURRENTLY RESTRICTED IN THE U.S.	1	2	3
11. DEFORESTATION IS A MAJOR SOURCE OF CARBON DIOXIDE EMISSIONS AND ACCOUNTS FOR ABOUT 90% OF THE GLOBAL WARMING TREND.	1	2	3
12. IT IS PREDICTED THAT REGIONAL DISEASE PATTERNS WILL CHANGE DUE TO GLOBAL WARMING.	1	2	3
13. METHANE AND OXYGEN, ARE GASES THAT CONTRIBUTE TO GLOBAL WARMING.	1	2	3
14. THE U.S PRODUCES MORE OIL THAN IT IMPORTS.	1	2	3
15. PLANTING TREES IS A GOOD WAY TO COMBAT GLOBAL WARMING.	1	2	3

SECTION C:BELIEFS

Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), Strongly Disagree (SDA)

Please circle the number of your answer that reflects your BELIEFS about the statement.

	SA	A	UD	DA	SDA
1. SHOULD AIR POLLUTION CONTROL COST BE REDUCED FOR THE SAKE OF ECONOMIC GROWTH?	1	2	3	4	5
2. SHOULD CRIME BE CONSIDERED THE BIGGEST PROBLEM FACING THE U.S?	1	2	3	4	5
3. SHOULD THE U.S GOVERNMENT BE RESPONSIBLE FOR CLEANING UP THE ENVIRONMENT?	1	2	3	4	5
4. SHOULD THE U.S. GOVERNMENT SPEND LESS OF ITS BUDGET ON ENVIRONMENTAL PROTECTION THAN IT DOES NOW?	1	2	3	4	5
5. SHOULD WE THINK OF JOBS FIRST AND THE ENVIRONMENT SECOND?	1	2	3	4	5

BACKGROUND INFORMATION

1. What is your age? (Circle the number of your answer)

14.....1
15.....2
16.....3
17.....4
18.....5
19 or OVER.....6

2. What is your sex? (Circle the number of your answer)

Male.....1
Female.....2

3..What is your race? (Circle the number of your answer)

African American.....1
White.....2
Hispanic.....3
Native American.....4
Asian.....5
Other.....6 Please Specify:_____

4. What is your grade level? (Circle the number of your answer)

9th grade.....1
10th grade.....2
11th grade.....3
12th grade.....4

5. How long have you lived in this state? (Circle the number of your answer)

All of your life.....1
15 or more years.....2
10 or more years.....3
7 or more years.....4
5 or less years.....5
3 or less years.....6

6. How long have you attended this school? (Circle the number of your answer)

1 year.....1
2 years.....2
3 years.....3
4 years.....4
5 years.....5
6 or more years.....6

7. Which of the following subject areas provides you with most of your environmental knowledge. (Circle the number of your answer)

English.....1
Social Science (History, Government, Etc.).....2
Math.....3
Science.....4
Physical Education.....5
Electives (Music, Cooking, Etc.).....6
Other.....7 Please Specify:_____

8. Do you plan to attend college? (Circle the number of your answer)

Yes.....1
No.....2

9. Where do you acquire most of your environmental knowledge? (Circle the number of your answer)

At Home.....1
At School.....2
On the Radio.....3
On the Television.....4
From Newspapers/Magazines.....5
Parents.....6
Peers.....7
Other.....8 Please Specify:_____

10. What do you see as the most urgent Environmental Problem facing the U.S. today? (Circle the number of your answer)

Water Pollution.....1
Toxic Waste.....2
Global Warming.....3
Air Pollution.....4
Acid Rain.....5
Ozone Depletion.....6
Greenhouse Effect.....7
Trash/Garbage.....8
Other.....9 Please Specify:_____

11. What best describes your family's living quarters? **(Circle the number of your answer)**

House.....1
Apartment.....2
Mobile Home.....3
Duplex.....4

12. What best describes where your residence is located? **(Circle the number of your answer)**

Rural.....1 (Rural: farm, outside city limits, etc.)
Urban.....2 (Urban: city, town, etc.)
Suburban.....3 (Between town and country, all houses)

13. With whom do you live? **(Circle the number of your answer)**

Both Parents.....1
Mother Only.....2
Father Only.....3
Other.....4 Please Specify:_____

14. **What best describes how often you travel outside of this state?**
(Circle the number of your answer)

1 time in a year.....1
3-5 times a year.....2
6 or more times a year.....3
none.....4

15. **Do you belong to any environmental organizations? (Circle the number of your answer)**

Yes.....1
No.....2

16. **Have you observed any environmental problems in your city?**
(Circle the number of your answer)

Yes.....1
No.....2
Don't Know.....3

17. **Did your father attend college? (Circle the number of your answer)**

Yes.....1
No.....2
Don't Know.....3

18. **Did your mother attend college? (Circle the number of your answer)**

Yes.....1
No.....2
Don't Know.....3

THANK YOU FOR YOUR HELP! WE APPRECIATE THE TIME AND EFFORT YOU HAVE GIVEN IN THIS SURVEY.

IF YOU HAVE ANY FINAL COMMENTS, PLEASE USE THE SPACE ON THE BACK.

APPENDIX B

APPENDIX B

FOCUS GROUP QUESTIONS

1. Let's talk about sources of information here in your school. Where do you go for information about the environment?

Probes: What type of information did you receive?

What were your impressions of the information you received?

Was the information current?

Was it accurate or biased?

Was it practical and useful?

2. What can or should your school do to provide better quality environmental information?

3. What can or should the government do to provide better quality environmental protection?

4. If you could change one thing about the environment, what would it be?

Probe: What makes this area of the environment so important to you?

5. To what extent do you see the media as a valuable source of environmental information?

Probes: To what extent do you see your parents as a valuable source of environmental information?

To what extent do you see your peers as a valuable source of environmental information?

6. How do you feel about environmental pollution?

Probes: How should we hold polluters responsible?

7. Are you willing to sacrifice some economic growth to protect endangered species?

Probes: Should jobs be sacrificed for the protection of endangered species?

Should all citizens make sacrifices for the environment?

What should be done to get people like youself to make sacrifices for environmental protection?

8. What do you know about global warming?

Probes: Will global warming affect you or your family?

Where did you first hear about global warming?

How serious is global warming?

Do you feel you have sufficient knowledge about global warming?

What is global warming?

APPENDIX C

APPENDIX C

Regional Characteristics

	VALDOSTA	LANSING
TOTAL POPULATION	75,981	127,321
MEDIAN HOUSEHOLD INCOME (DOLLARS)	23,295	26,398
PER CAPITA INCOME (DOLLARS)	10,919	12,232
MEDIAN FAMILY INCOME (DOLLARS)	28,007	31,576
SCHOOL ENROLLMENT		
Persons 3 years and over enrolled in school	22,514	37,857
Percent High School Graduate	69.8	78.3
Percent Bachelor's Degree or higher	16.3	18.3
PERSON 16 TO 19 YEARS	5,588	6,617
MEAN WAGE AND SALARY INCOME	28,842	31,084

Source: 1990 Census Data

APPENDIX D

APPENDIX D

Parental Consent Form

This consent form is asking your permission to allow your child to participate in an environmental focus group. The purpose of the focus group is to gain a better understanding of the environmental attitudes, and beliefs held by secondary school students in your child's school. The group facilitator will ask indepth questions pertaining to how, where, and why, the students have obtained the environmental attitudes, knowledge, and beliefs they hold. It is estimated their participation in the focus group will take 25 to 30 minutes. The focus group will consist of 5 to 6 students, and the group will meet during the student's lunch period or after school. Their participation in the focus group is **completely confidential** and **anonymous** and all participants will remain anonymous in any report of the research findings. Furthermore, your child has the final decision on his or her participation in the study, since participation in the study is **completely voluntary**. You can indicate your voluntary agreement to allow your child to participate by completing and returning this consent form. Any questions concerning this study please contact me at the phone number provided below.

Thank You,

James Fason

_____
Parent's Signature

_____
Child's Name

Michigan State University
Department Resource Development
517-353-1608

APPENDIX E

APPENDIX E

Alpha Reliability Coefficients of the Three Scales

	GEORGIA	MICHIGAN	ALL
ATTITUDE	.79	.74	.77
KNOWLEDGE	.78	.81	.80
BELIEF	.58	.56	.57

Note: GEORGIA = 364 cases
MICHIGAN = 420 cases
ALL = 784 cases

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