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ABSTRACT

The purpose of this study was to determine if an elective environmental education course offered to students in Newfoundland and Labrador high schools (Canada) changed student attitudes towards the environment. Of 220 students surveyed for the study, 21 took the Environmental Science course. A questionnaire was used to survey four attitude components of students' attitude system toward the environment: (1) cognitions in the form of beliefs and values; (2) behavior intentions; (3) behavior; and (4) affective responses. Overall, students in both groups had positive attitudes toward the environment. The environmental science group had more positive attitudes toward the environment than the school at large, overall and within each attitude component. This was confirmed by the correlation between the scores of students taking the course and the scores in two of the attitude components, cognitions and behavior. Overall attitudes toward the environment did not change significantly over the school year, although there was some positive movement within certain areas, especially cognitions and behavior. Items that had the largest positive shift in attitude for both groups concerned recycling. There was no evidence to indicate that completion of the course was related to attitude change. The stronger pro-environmental stance exhibited by the environmental science students was probably related to their interest in the environment and therefore the reason for choosing to take the course. (Contains 69 references.) (Author/PVD)

A STUDY OF HIGH SCHOOL STUDENTS' ATTITUDES TOWARD THE ENVIRONMENT AND COMPLETION OF AN ENVIRONMENTAL SCIENCE COURSE

by

M. Ruth Simmons

Abstract

The purpose of this study was to determine if an elective environmental education course offered to students in Newfoundland and Labrador high schools, Environmental Science 3205, changed student attitudes towards the environment. Two hundred twenty students participated in this study, of which 21formed the Environmental Science 3205 group. A questionnaire, derived from two established instruments for measuring attitude towards the environment, was used to survey four attitude components of their attitude system about the environment - cognitions in the form of beliefs and values; behavior intentions; behavior, and affective responses. The blind survey was conducted in September and May of the same school year. Results were analysed to describe and compare the attitudes of students at large and the environmental science group by examining their attitudes overall responses, responses within the four components and responses to individual items. Overall, students in both groups had positive attitudes toward the environment. Even so, some attitude component areas were more positive than others. The environmental science group had more positive attitudes toward the environment than the school at large, overall and within each component. This was confirmed by correlation between scores of students taking the course and scores in two of the attitude components, cognitions and behavior. Overall attitudes toward the environment for either the school group at large or the environmental science group did not change significantly over the school year, though there was some positive movement within certain areas, especially cognitions and behavior. The items that had the largest positive shift in attitude for both groups concerned recycling. There was no evidence to

indicate that the completion of the Environmental Science 3205 course was related to attitude change. The stronger pro-environmental stance exhibited by Environmental science students was probably related to their interest in the environment and therefore the reason for choosing to take the course.

A STUDY OF HIGH SCHOOL STUDENTS' ATTITUDES TOWARD THE ENVIRONMENT AND COMPLETION OF AN ENVIRONMENTAL SCIENCE COURSE

Introduction

The State of the Environment

As Canadians, we enjoy a high standard of living, but at the expense of our environment. Perhaps due to Canada's seemingly endless supply of natural resources or maybe just the vast expanse of land that we occupy as a nation, we have become a nation of environmental exploiters. For example, The Green Plan (1990) gives a brief perspective of Canada's global synopsis:

- Canadians are the heaviest users of energy on a per capita basis;
- Canada is the fourth largest producer of carbon dioxide, a major greenhouse gas, per capita;
- The average Canadian produces almost two kilograms of solid waste a day, more than any other citizens in the world, yet less than ten percent of Canada's solid waste is recycled;
- A Canadian family of five produces, on average, more than 2000 litres of waste water each day. (The Green Plan, 1990)

The picture within the province of Newfoundland and Labrador is no exception to the Green Plan (1990) depiction of the Canada environment; in fact, in many ways the reality is considerably more bleak. For example:

- In the majority of towns and villages raw sewage is piped directly out into the Atlantic Ocean, into almost every bay, inlet and cove.
- In St. John's, the capital and largest city with a population of well over 100 000 people, there is no sewage treatment facility. Sewage is dumped directly into St. John's Harbour.
- The North Atlantic fishery has collapsed.
- Reforestation lags so far behind logging that present yields cannot supply the two pulp and paper mills.
- Several animal species have become extinct, like the Newfoundland Wolf, eliminated through a bounty-hunting program earlier in this century.
- The Newfoundland Pine Marten is presently threatened by the logging of mature forests (Murphy, Minty, and Griffith, 1993).

There is ample evidence of environmental degradation within Labrador, the setting chosen for this study. As a science teacher since 1980, it has been my passion to point out this degradation and hopefully instill in my students some incentive for change. As part of that hope it has been my pleasure to teach environmental science, a relatively new science discipline within my high school. One of the main goals environmental science is the development of positive attitudes towards the environment (Murphy et al., 1993). If future generations are to benefit from the natural environment without destroying it, attitudes towards the environment must be changed to embrace sustainable development. Many researchers agree environmental education may play a strong role in this process (e.g. Barmen,1984; Environment Council of Alberta, 1989; Gigliotti, 1990; Golley and

Hassard, 1994; Hungerford, 1987; Lewis, 1990; Majundar, Rosenfeld, Rubba, Miller and Schmaltz, 1991; Newhouse, 1990; Ramsey, Hungerford and Volk,1992).

The Role of Education in Addressing Environmental Problems

From 1984 to 1986, the World Commission on Environment and Development, a United Nations-directed body, consulted extensively. Their work culminated in the Brundtland Report, titled "Our Common Future", which stressed the need for a sustainable future In this decade, the U.N. Conference on Environment and Development adopted an action plan called Agenda 21 that cites education as the key to reaching the goal of a sustainable future:

- Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development problems.
- Both formal and in-formal education are indispensable to changing people's attitudes to help them gain the capacity to assess and address their sustainable development concerns (N.B. Dept. of Education, 1994).

Like the Brundtland Report and Agenda 21, the Canadian government produced a document that outlined plans for making its citizens more aware of environmental problems and more motivated to solve them. The result was The Green Plan: A National Challenge (1990). This document recognizes environmental education as integral to solving both Canadian and global environmental problems. The Government of Canada sees better environmental education as an essential requirement for good decision-making, "helping to translate environmental awareness into action. The object is to create an

environmentally educated population which will demand that all sectors of society meet a high level of environmental responsibility " (p. 9).

Presently there is only one course dedicated to environmental education in the Newfoundland and Labrador high school curriculum - Environmental Science 3205. In the recent revision of the course, the Newfoundland Department of Education acknowledged the increasing demands on the environment and the need for a more focused approach, rather than solely relying on the strand of environmental education infused throughout the social studies and science curriculums. They recognize the course as:

> the last opportunity that most students will have to study environmental concepts and issues prior to graduation. It is important that students develop responsible environmental behavior and leave high schools with the tools necessary to make responsible choices on good management and conservation of the environment (Murphy et al., 1993).

The goals formulated by environmental education curriculum developers accentuate issue investigation, critical thinking, values clarification and the need for a more positive environmental attitude in students (Gardella, 1990; Hungerford and Volk,1990; Majumdar et al.,1991; Neidermeyer, 1992). Such attitudes would embrace sustainable development, rather than the militant environmental attitude sometimes witnessed in the media.

There are few curricular areas where a change in attitudes can have a greater impact on the earth's future than within environmental education (Hungerford and Volk, 1990; Lewis, 1990; Orr, 1992). Canadian views, as evidenced in The Green Plan (1990), or of Newfoundland and Labrador in Finding the Balance (1993), suggest that our society

has not exhibited environmentally responsible behaviors. Some would argue that government itself contributes to environmental degradation (Orr,1992; Worster, 1989). According to Zimbardo and Lieppe (1991) the way to change behaviors is through the network of attitudes.

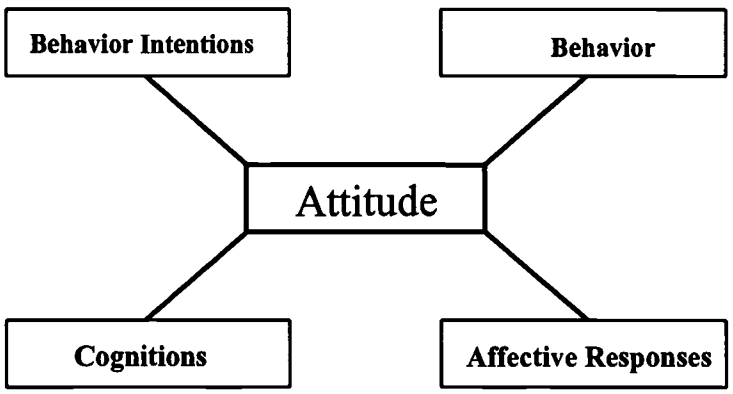
Attitude Definition

Traditionally, attitude was considered to consist of three components: cognitive , referring to beliefs, facts, principles, knowledge, or understanding; affective, referring to emotion, feeling, or emotional evaluation; and conative , referring to behavioral tendency or intent (Gray, Borden, and Weigel, 1985). Fishbein and Ajzen (1975) expanded the three classical components into four by splitting the conative component. They felt that conation should apply to behavioral intentions, whereas behavior would be observed overt acts. Zimbardo and Lieppe (1991) further refined the definition by introducing the idea of an attitude system, where attitude is affected by four interacting components: behavior, behavioral intentions, cognitions, and affective responses (See Figure 1). Attitude is considered to be an overall summary evaluation that includes the other components, producing a broad conceptual definition as an analytical position based upon cognitions, affective reactions, behavioral intentions, and past behaviors, which can affect future cognitions, affective responses, intentions and behavior (Zimbardo and Lieppe, 1991). Of the four components, cognitions and affective responses are not always defined well in studies. Cognitions have also been described as understandings (Tomsen and Disinger, 1998) or of knowledge (Gillett, Thomas, Skok, and McLaughlin, 1991; Keen, 1991;

Lucko, Disinger and Roth, 1982;). For the purpose of this study cognitions are defined as beliefs or values held by the subject. Affective responses have also been described as evaluation of, liking of or emotional response (Zimbardo, Ebbesen, and Maslach, 1977). For the purpose of this study, emotional response, in the form of feelings or concern, is applied.

Viewing attitude as a system has important implications for attitude change. As Zimbardo and Lieppe (1991) note, "the interconnectedness of attitudes, cognitions, feelings, intentions, and behaviors into organized systems...means that change in one component may lead to change in another" (p.34). Consequently, adoption of the attitude system model allowed for the selection of parts of the research instrument that concentrated on the components of the system, cognitions, behavior intentions, behavior, and affective responses, which all together interact with attitude.

Figure 1: Attitude System



Treating attitude as a system also avoids the argument of which comes first, attitude or behavior, as behavior is incorporated into the system. The argument of the

relationship between behavior and attitude between has plagued environmental education research (Hungerford and Volk, 1990). Ultimately behavior change is required to preserve environmental quality (Leeming et al, 1993).

Role of Environmental Education in Affecting Attitude

There are three major categories of learning identified in education, the cognitive domain, the psychomotor domain, and the affective domain (Murphy et al., 1993). The attitude system model utilized in this study would comprise the affective domain. The affective domain's importance to environmental education is evident in the literature (Bowyer, 1993; Gardella,1990; Gray et al.,1985; Hines, Hungerford and Tomera, 1987; Hungerford and Volk, 1990; Iozzi, 1989; Koballa and Crawley, 1992; Laforgia, 1988; Newhouse, 1990). In his meta-analysis of environmental education and the affective domain, Iozzi (1989) says that researchers in environmental education were quick to recognize that focusing on the affective domain was extremely important if programs in environmental education were to be effective in teaching positive environmental attitudes. Despite the importance of the affective domain, studies reviewed by Laforgia (1988) found that science teachers were found to place less importance on affective objectives than curriculum developers, yet there is a major need for evaluation of student outcomes in relation to affective objectives (Hines, Hungerford and Tomera, 1987; Hungerford and Volk, 1990; Leeming et al., 1993; Lucko, Disinger and Roth, 1982). Laforgia (1988) adds that traditionally teachers neglect to evaluate the affective domain.

Considerable research has been conducted in the area of the affective domain in environmental education. Journals such as Environment and Behavior and the Journal of Environmental Education reiterate the need for increased emphasis on the affective domain, especially attitude and behavior, in the area of environmental education. Some of this research is significant in reporting approaches to measuring environmental attitude, others in establishing relationships between behavior and attitude, and others parallelling the focus of this study, determining the effect of environmental education on attitudes.

While it is understood that formal environmental education would not be the only force shaping attitudinal change, it can affect this important goal. Studies have shown that education can be a powerful influence in the area of the environment. For example, in the past fifteen years, classes in school were reported to have replaced movies and television as being the most influential sources of information about specific environmental issues (Fortner and Lyon, 1985; Trisler, 1993). In a survey of a group of environmentally responsible citizens, education was found to be the second most important influence, just behind childhood experiences, toward the development of positive attitudes (Palmer, 1993).

In a review of thirty-four environmental education studies published since 1974, Leeming, Dwyer, Porter, and Cobern (1993) stated:

> Over the past two decades, interest in environmental education has produced a wealth of literature, although relatively little of the literature has provided empirical evidence of the outcomes of environment education... assessment of outcomes is critical for the identification and refinement of effective techniques" (p.8).

Many of the previous studies were designed to measure the effect of small units of environmental education on student attitude (Armstrong and Impara, 1991; Asch and Shore, 1975; Benton, 1993; Culen, 1994; deWhite and Jacobson, 1994; Fortner and Lyon, 1985; Gillett, Thomas, Skok, and McLauglin, 1991; Hess-Quimbita and Pavel, 1996; Jaus, 1985; Keen, 1991; McConney, 1993; Parker and Herring, 1994; Perdue and Warder,1981; Ramsey, 1993; Ryan, 1991). These studies fall into one of two categories, either informal education interventions, or formal environmental education interventions. The informal environmental education included television specials (Fortner and Lyon, 1985), wilderness camping trips (Gillett, Thomas, Skok, and McLaughlin, 1991; Perdue and Warder, 1981) and cooperative programs between schools and special conservation areas (deWhite and Jacobson, 1994; Keen, 1991; Ryan, 1991). Other studies were of a more formal nature, within a regular classroom or school setting.

Among the informal environmental education studies, results ranged from no significant attitudinal change, to limited goal attainment, to significant improvement in scores on attitudinal questionnaires. However, the type of intervention, in these programs limited their scope.

The main differences among the formal environmental education studies, besides the conclusions of the researchers, were the length of the environmental education intervention, the instruments used and the target study groups. Some studies exhibited favorable results (Asch and Shore, 1975; Benton, 1993; Hess-Quimbita and Pavel, 1996; Horsley, 1977; Jaus, 1984; Parker and Herring, 1994; Ramsey, 1993). However with the informal education studies, results were mixed; and, while positive results have been more

frequent, there may have been problems associated with experimental design (Leeming et al., 1993).

Problem

Much effort has gone into the development of goals for environmental education. If educators are to successfully achieve these goals, environmental education programs must be evaluated for attainment of goals within the affective domain. The main purpose of this study is to determine whether Environmental Science 3205, developed by the Department of Education in Newfoundland and Labrador changes students' attitudes towards the environment. With the literature supporting a need to evaluate the effectiveness of environmental education programs in producing attitudinal change, coupled with recent changes in the focus and scope of the only dedicated environmental education program in Newfoundland and Labrador secondary schools, the problem was investigated.

Relatively few studies have attempted to measure attitude change following a course that covers a long period of time, in the case of Environmental Science 3205, nine months. Armstrong and Impara (1991) examined knowledge and attitude after a week intervention. Hounshell and Liggett (1976) also examined knowledge and attitude following seven weeks of environmental education. Jaus's (1984) study of third grade students was based on a two-hour presentation the students received. Benton (1993) and Horsley (1977) taught and evaluated a semester-long course. Of the formal classroom interventions researched, only two studies, Asch and Shore (1975) and Ramsey (1993),

were of a longer duration. Neither of these studies were with high school students nor was the intervention or course an elective one, like Environmental Science 3205.

Whereas studies have been done regarding overall environmental attitude and/or behavior (Gigliotti, 1990; Kellert, 1985; Noe and Snow, 1989) few have studied behavior as a component of attitude. No studies have been found that treat attitude and measure it using an attitude system. In their review of the literature, Leeming et al. (1993), reported that few studies attempted to measure changes in environmentally relevant behaviors. They went on to say that many of these studies were plagued by problems of experimental design and data analysis. Their recommendations were considered in devising the methodology for this study.

Methodology

This study is a survey of high school students' attitudes towards the environment over one school year using a questionnaire modified from two well-known environmental attitude instruments, the NEP (Dunlap and Van Liere, 1981) and CHEAKS (Leeming, Dwyer and Bracken, 1995). The instruments were chosen to measure one or more components of the attitude system model. The NEP measured in the cognitions component, scaling beliefs and values, while the three sections of CHEAKS measured behavior intentions, behavior, and affective responses.

Participants

The students who participated in this study attended a high school in Labrador, a peninsula just east of Quebec, which comprises the mainland portion of the province of Newfoundland and Labrador. Labrador is a geographically isolated area which can be accessed by a 600 kilometre road north from Baie Comeau, Quebec to Labrador West, or by a seasonal ferry from the island of Newfoundland to Happy Valley-Goose Bay, Labrador. Both of these approaches connect with the Trans-Labrador Highway, which links Labrador West to Happy Valley-Goose Bay.

The school had a population of approximately 650 students grades 7 through 12, but only the high school population was surveyed, about 360 students. In this population there were two classes of Environmental Science 3205 totalling thirty-one students. Both the school board and the administration were contacted for permission to conduct the survey.

Since the research dealt with senior high school students, neither the school board nor the administration required a letter home to parents asking for permission. Following the examination of the questionnaire, they decided the nature of the information accumulated and the procedures outlined were fair and ethical. Questionnaires were administered in a blind survey. Students were not aware of the researcher's identity until after the second administration, in May. No names were used on the surveys; students were identified only as numbers, which were used only for the purpose of matching scores from one administration to the other. In addition, the survey instructions gave students the option of not completing the questionnaire.

The Questionnaire

A survey questionnaire was chosen to gather the majority of the data for the following reasons: Instruments had to be appropriate for a high school classroom setting. Since many students would be studied, the instruments would have to collect a maximum amount of information in a relatively short amount of time, so as not to intrude on regular class time. A relatively high response rate was required. Since attitude was being measured, it was necessary to force respondents to take a stand on the issues in question. Of course it was also essential that the instrument be valid and reliable in measuring the components of the attitude system. A questionnaire is recommended for this type of investigation (Kerlinger, 1973; Laforgia, 1988; Oppenheim, 1992; Swann and Stapp, 1974).

In order to increase validity, triangulation was achieved through the measure of attitude across two different groups, the school group at large and the sample group of Environmental Science 3205 students, and across two different instruments to measure attitude. Validity was also enhanced by the use of a blind review of survey questionnaires and the use of instruments with a record of success in attitude measurement.

Established instruments were studied in detail and then selected, rather than the development of one especially for this study, due to the growing amount of recent literature supporting this practice (Benton, 1993; Gray, et al. 1985; Leeming et al., 1993; Lucko et al.,1982). Gray et al.(1985) recommend "For the sake of efficiency, comparability, and quality, future researchers should feel the responsibility to use and

further develop inventories already in existence" (p.36). In using proven instruments, meaningful comparisons may be made.

The main survey instrument (see Appendix A) consisted of two different Likert-scaled questionnaires, the NEP (Dunlap and Van Liere, 1981) and the CHEAKS (Leeming et al., 1995). The two instruments chosen for this study deserve special attention.

Maloney and Ward (1973) pioneered ecological assessment of populations with the development of their ecology scale, which was later revised by Maloney, Ward, and Braucht, (1975). Despite the age of the scale, their instrument has been used successfully in other studies (Benton, 1993; Borden, 1985; Borden and Schettino, 1979), and has been modified for use with children (Leeming, Dwyer, and Bracken, 1995). This most recent modification for use with children resulted in CHEAKS (Leeming et al.,1995), the version utilized in this study. In terms of the attitude system, the three sections of CHEAKS chosen for this survey correspond with three of the components of the system, behavior intentions, behavior, and affective responses.

Cognitions, the fourth component of the attitude system is measured through the use of another old, but still widely used instrument, the New Environmental Paradigm, (NEP), developed by Dunlap and Van Liere (1978). Like the scale originally developed by Maloney, Ward and Braucht (1975), it was recommended by Gray et al.(1985). The NEP has been used by researchers who wish to measure the adoption of a belief or value that sees humans as being a part of nature and dismisses a more anthropocentric view. The NEP examines balance of nature, and limits to growth, as well as the relationship

between humans and nature. The beliefs chosen by the students fulfilled the cognitions component of the attitude system.

The NEP has been modified for other studies (Albrecht, Bultena, Hoiberg, and Nowak, 1982; Geller and Lasley, 1985; Gigliotti, 1992; Hallin, 1995; Kuhn and Jackson, 1989; Noe and Snow, 1989; Noe and Snow,1990; Sheppard,1995;). The version of the NEP used for this study was adapted for Canadian use by Kuhn and Jackson (1989). Because of its continued use, the NEP has been well-documented as to both validity and reliability.

Following the examination of the inventories by several teachers, modifications for this study included changing the wording of more of the statements in an attempt to achieve a balance between negatively and positively worded statements, and the making of a few of the questions more suited to high school students in the study area. These included changing " I would be willing to ride the bus to more places in order to reduce air pollution" to " I would be willing to cut down on car or snowmobile use in order to reduce air pollution" due to the lack of public transportation and these being the two most common means of transportation for high school students in the area. "I often read stories that are mostly about the environment" was changed to "I often watch television shows about the environment" to incorporate the other major influence in the adolescent world. The final change was " I have put up a bird house near my home" to " I have fed wildlife near my home or cabin", as many of the students have access to cabins (cottages) during all times of the year.

The modified survey was then subjected to a pilot by several high school students from a neighboring school to ensure all sections used uncomplicated language suitable to their age levels. No problems in comprehension were reported by the pilot sample.

The survey questionnaire consisted of three parts. Part One: Demographic Information; Part Two: Cognitions (The New Environmental Paradigm, NEP); Part Three: Scales for Behavior Intentions, Behavior and Affective Responses (CHEAKS). For the ease of reproduction and administration, the subsections comprising the NEP were split, putting the final subsection on the last page, following the Affective Responses Scale for CHEAKS. The major focus of each section is summarized in Table 1.

Table 1 **Topic Focus of the Environmental Attitude Inventory**

Instrument Section	Source	Attitude System Component	Sub-section Title
I	NEP	Cognitions	Negative Consequences of Growth and Technology
II	NEP	Cognitions	Quality of Life
III	NEP	Cognitions	Limits to the Biosphere
IV	CHEAKS	Behavioral Intentions	
V	CHEAKS	Behaviour	
VI	CHEAKS	Affective Responses	
VII	NEP	Cognitions	Relationship Between Mankind and Nature

Data Collection

The survey was photocopied and distributed in September and again in May. Despite the fact the researcher was a teacher at the school during the time of completion, students were not aware of any connection to the researcher. Surveys were distributed and collected through the school office, with the cooperation of homeroom teachers. Students at the school often complete instruments for outside groups and had assumed this was a similar situation. They were informed of the nature of the study following the May administration. The Demographic Information was necessary to match up student identification numbers for the September and May survey completions. This was essential to ensure the only data analysed originated from students who completed surveys during both administrations. Dates were needed to indicate whether the information gathered was during the September or May administration. The course listings checklist was to establish students as Environmental Science 3205 students, or as students of other courses with an environmental education component.

The entire high school population, 360 students, were surveyed twice during the school year, once in September and again in May, with the combination NEP/CHEAKS instrument. The Environmental Science 3205 students completed the second instrument in January, at the year's midpoint. All students were subject to observations throughout the entire school year.

Data Analysis

Only students who completed both the September and May questionnaires were subject to data analysis. This constituted a total of 199 students in the main school population, and 21 Environmental Science 3205 students, the sample group. The reason for the drop in number from the original estimations was due to problems with many students being on vacation with their parents at the beginning of the school year as well as a high absentee rate in May.

In analysing the data, examinations were made of the total scores, as well as scores for the cognitions component, the NEP, and for the three CHEAKS sections of behavioral intentions, behavior and affective responses. Mean scores were calculated, along with standard deviation, minimum scores, maximum scores, possible minimum scores, possible maximum scores. In addition, each Likert-scaled statement was examined as to the frequency and percentage of students choosing an anti-environmental stance designated by a score of either 1 or 2, or pro-environmental stance denoted by a score of 3 or 4. Several statements were reverse scored in cases where agreement to the statement denoted an anti-environmental attitude. This ensured that only pro-environmental responses received a score of 3 or 4.

Results from the May survey were subjected to the same statistical analysis as the September administration This allowed for examination of any changes in mean, score range, and frequency of response, as well as percentage change of each attitude component.

In reporting on individual items in each attitude component measure, only those with increases of 10% or more were examined in detail. This constituted a conservative estimate of attitude change. In analysing the attitude changes in this study, some upward movement was expected in certain areas, due to events in the community, namely a new recycling program. Treating those as expected aberrant changes, the other percentages changes were closely examined. The vast majority were small shifts of a few percentage points either up or down, and would not serve to provide a picture of change. Few items witnessed a change of 10% or more. This value of 10% was therefore chosen to represent a significant change. In the school group this would translate to 19 students out of 199 changing from one category to another; anti-environmental attitude (a 1 or 2 score) to a pro-environmental attitude (3 or 4 score), denoted by a positive change, or the opposite, with a negative change. In the sample group, a change of 10% would, of course, reflect a much smaller change in frequency, of only 2 students. For a small group however, this was considered significant.

In addition, a series of crosstabs was conducted using the SPSS for Windows statistical package. Only those correlations of scores and Environmental 3205 students showing a significance at the .01 level or lower were considered for discussion.

Finally, the researcher conducted a questioning session for member checking with the sample group of environmental science students. This member checking was done late in the school year, after the completion of the May survey, so as not to prejudice the final administration results.

Assumptions

Despite careful selection of instruments, there were a number of assumptions that were made in conducting this study. It was assumed that the instruments adapted for the study measured the students' attitudes towards the environment adequately, realizing that reliability cannot always be guaranteed when only parts of an instrument are utilized. This is the case in using the CHEAKS instrument, which had a section that measured knowledge in the instrument used by Leeming et al. (1995). For this study the cognitions component of the survey emphasized beliefs, rather than knowledge, which would be too closely related to the content of the course, and not applicable to the main population. It was also assumed that the students would answer the questions honestly, and that the responses of the sample of students accurately reflected the environmental attitudes of high school students in the area.

Findings

The findings suggest students of the sample Newfoundland and Labrador High School exhibit more positive than negative attitudes towards the environment. The most positive areas of the attitude system were behavior intentions and affective responses. While their overall attitudes did not change very much over the year, there was some movement towards a more positive attitude within the individual attitude components of cognitions and behavior and within certain categories of items. Students in the Environmental Science 3205 classes began and ended the school year with more positive

attitudes in every attitude component measure than the school at large. Their overall attitude measure, however, did not change as much as the full school group.

Attitudes Towards the Environment of Students Representing the School at Large

An overall positive attitude is shown by the scores summarized in Table 2. The students scored 159.5, with the theoretical mean on the full instrument set at 142.5. The minimum score by a student was 97, well above the theoretical minimum of 57. The maximum score of 205 reached by a student in the population at large, however, did not attain the theoretical maximum of 228.

Table 2 Research Instrument Total Scores

	n=199 (School - Sample Group)			n=21 (E.S. 3205)		
	Mean	S.D.	Range	Mean	S.D.	Range
September	159.6	22	97 - 205	177	20.1	131 - 221
May	162	23.3	90 - 212	177	22.9	138 - 213

Further evidence of a pro-environmental attitude by the students at large can be found in an examination of the results for each attitude component. Not only did patterns become evident, but areas with more positive or less positive attitudes were identified along with any parts of the instrument that produced surprising results.

Students presented slightly pro-environmental attitudes according to the scores summarized in Table 3, Cognitions. Their mean score was 59.68, compared to a theoretical mean of 52.5. Even taking standard deviation into account, these scores would still be considered positive. The range of response shows that the minimum student score,

39, was nearly twice the theoretical minimum of 21. The maximum score of 80 was also quite close to the possible maximum of 84.

Table 3: Cognitions Scale

Cognitions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change	#Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change
I-1	Science and technology often do as much harm as good.	124 (62)	75 (38)	133 (67)	66 (33)	+9 (+5)	12 (57)	9 (43)	14 (67)	7 (33)	+2 (+10)
I-2	More emphasis should be placed on teaching people about nature than on teaching them about science and technology.	95 (48)	104 (52)	108 (54)	92 (46)	+13 (+7)	14 (67)	7 (33)	15 (71)	6 (29)	+1 (+5)
I-3	When humans interfere with nature it often produces disastrous consequences.	166 (83)	33 (17)	173 (87)	26 (13)	+7 (+4)	20 (95)	1 (5)	19 (90)	2 (10)	-1 (-5)
I-4	We cannot keep counting on science and technology to solve mankind's problems.	137 (69)	62 (31)	149 (75)	50 (25)	+12 (+6)	20 (95)	1 (5)	18 (86)	3 (14)	-2 (-10)

Cognitions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change	#Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change
I-5	Mankind is severely abusing the environment.	185 (93)	14 (7)	183 (92)	16 (8)	-2 (-1)	21 (100)	0	21 (100)	0	0
I-6	Rapid economic growth often produces more problems than benefits.	152 (76)	47 (24)	148 (74)	51 (26)	-4 (-2)	19 (90)	2 (10)	19 (90)	2 (10)	0
I-7	Canadians are going to have to reduce their consumption of material goods over the next few years.	162 (81)	37 (19)	164 (82)	35 (18)	+2 (+1)	18 (86)	3 (14)	20 (95)	1 (5)	+2 (+10)
I-8	In general, the Canadian people would be better off if the nation's economy stopped growing.	77 (39)	122 (61)	66 (33)	133 (67)	-11 (-6)	11 (52)	10 (48)	10 (48)	11 (52)	-1 (-5)

Cognitions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change	#Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change
II-1 **	We can continue to raise our standard of living through the application of science and technology.	22 (11)	177 (89)	23 (12)	176 (88)	+1 (+1)	6 (29)	15 (71)	4 (19)	17 (81)	-2 (-10)
II-2 **	Economic growth improves the quality of life for all Canadians.	36 (18)	163 (82)	46 (23)	153 (77)	+10 (+5)	6 (29)	15 (71)	5 (24)	16 (76)	-1 (-5)
II-3 **	In the long run, there are no limits to the extent to which we can raise our standard of living.	74 (37)	125 (63)	99 (50)	100 (50)	+25 (+13)	10 (50)	11 (50)	10 (50)	11 (50)	0
II-4 **	Most problems can be solved by applying more and better technology.	56 (28)	143 (72)	82 (41)	117 (59)	+26 (+13)	11 (50)	10 (50)	12 (57)	9 (43)	+1 (+5)
III-1	The earth is like a spaceship with limited room and resources.	182 (91)	17 (9)	182 (91)	17 (9)	0	20 (95)	1 (5)	21 (100)	0	+1 (+5)

Cognitions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change	#Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change
III-2	There are limits to growth beyond which our industrialized society cannot expand.	151 (76)	48 (24)	165 (83)	34 (17)	+14 (+7)	17 (81)	4 (19)	18 (86)	3 (14)	+1 (+5)
III-3	We are approaching the limit to the number of people the earth can support.	155 (78)	44 (22)	155 (78)	44 (22)	0	17 (81)	4 (19)	20 (95)	1 (5)	+3 (+14)
III-4	The balance of nature is very delicate and easily upset.	180 (90)	19 (10)	186 (93)	13 (7)	+6 (+3)	19 (90)	2 (10)	21 (100)	0	+2 (10)
VII-1 **	Humans don't need to adapt to the environment because they can remake it to suit their needs.	112 (56)	87 (44)	131 (66)	68 (34)	+19 (+10)	12 (57)	9 (43)	11 (52)	10 (48)	-1 (-5)
VII-2 **	Humans have the right to change the environment to suit their needs.	141 (71)	58 (29)	149 (75)	50 (25)	+8 (+4)	16 (76)	5 (24)	16 (76)	5 (24)	0

Cognitions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change	#Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	Change
VII-3 **	The positive benefits of economic growth far outweigh any consequences.	117 (59)	82 (41)	143 (72)	56 (28)	+26 (+13)	12 (57)	9 (43)	15 (72)	6 (28)	+3 (+14)
VII-4 **	Mankind was created to rule the rest of nature.	149 (75)	50 (25)	138 (69)	61 (31)	-11 (-6)	16 (76)	5 (24)	20 (95)	1 (5)	+4 (+20)
VII-5	Humans must live in harmony with nature in order to survive.	177 (89)	22 (11)	183 (92)	16 (8)	+6 (+3)	20 (95)	1 (5)	20 (95)	1 (5)	0
Overall Cognition Scale $\overline{X}$ (SD)		59.68 (7.19)		61.15 (7.6)		+1.47 (+0.41)	65.0 (9.33)		65.7 (7.1)		+0.7 (-2.23)
Range of Response		39 - 78		42 - 80			50 - 80		52 - 78		

* **Roman Numeral = Instrument Section, Arabic Numeral = Instrument Item**

** **Item was inversely scored**

Since the cognitions component was divided into four sub-sections on the instrument it was possible to see which areas of cognitions showed a stronger or weaker support for the students' overall pro-environmental attitude. The subsection producing the most positive environmental attitude was Section III, "Limits to the Biosphere". Here 76-91% of the students at large chose a pro-environmental response. Other areas demonstrating this pro-environmental attitude from all subsections dealt with humans abusing the environment (93%) and interfering with nature. Lowest frequencies of pro-environmental response were found on items in Section II, "Quality of Life", on economic growth, technology and the standard of living, In Section II, no item received over 50% of students choosing a pro-environmental stance, instead, frequencies ranged from 63-89% anti-environmental stance. Other individual items dealing with similar topics in the cognitions component exhibited similarly low scores.

The behavior intentions component, summarized in Table 4, shows positive environmental attitude, similar overall results to the cognitions component. This is evidenced in the mean score of 35.35, as compared to theoretical score of 30. There was slightly more dissension shown in this component by the score range, as the minimum score was only 14, 2 points above the possible low score, and the maximum possible score of 48 was reached.

Table 4: Behavior Intentions Scale

Behavior Intentions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
IV-1	I would be willing to stop buying some products to save animals' lives.	180 (90)	19 (10)	174 (87)	25 (13)	-6 (-3)	21 (100)	0	21 (100)	0	0
IV-2 **	I would **not** be willing to save energy by turning off lights when they're not needed.	179 (90)	20 (10)	181 (91)	18 (9)	+2 (+1)	20 (95)	1 (5)	20 (95)	1 (5)	0
IV-3	To save water, I would be willing to use less water when I take a bath or shower.	158 (79)	41 (21)	163 (82)	36 (18)	+5 (+3)	21 (100)	0	21 (100)	0	0
IV-4 **	I would **not** give $15 of my own money to help the environment.	140 (70)	59 (30)	140 (70)	59 (30)	0	17 (81)	4 (19)	18 (86)	3 (14)	+1 (+5)

Behavior Intentions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
IV-5	I would be willing to cut down on car or snowmobile use in order to reduce air pollution.	119 (60)	80 (40)	108 (54)	91 (46)	-11 (-6)	20 (95)	1 (5)	17 (81)	4 (19)	-3 (-14)
IV-6 **	I would **not** be willing to separate my families trash for recycling.	146 (73)	53 (27)	168 (84)	31 (16)	+22 (+11)	20 (95)	1 (5)	19 (90)	2 (10)	-1 (-5)
IV-7	I would give $15 of my own money to help protect wild animals.	159 (80)	40 (20)	147 (74)	52 (26)	-12 (-6)	20 (95)	1 (5)	18 (86)	3 (14)	-2 (-10)
IV-8	To save energy, I would be willing to use dimmer light bulbs.	168 (84)	31 (16)	165 (83)	34 (17)	-3 (-2)	20 (95)	1 (5)	21 (100)	0	+1 (+5)
IV-9	To save water, I would be willing to turn off the water while I wash my hands.	164 (82)	35 (18)	165 (83)	34 (17)	+1 (+1)	19 (90)	2 (10)	20 (95)	1 (5)	+1 (+5)

Behavior Intentions		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
IV-10	I would go from house to house to pass out environmental information	93 (47)	106 (53)	76 (38)	123 (62)	-17 (-9)	15 (71)	6 (29)	14 (67)	7 (33)	-1 (-5)
IV-11	I would be willing to write letters asking people to help reduce pollution.	98 (49)	101 (51)	85 (43)	114 (57)	-13 (-7)	14 (67)	7 (33)	13 (62)	8 (38)	-1 (-5)
IV-12	I would be willing to go from house to house asking people to recycle.	78 (39)	121 (61)	64 (32)	135 (68)	-14 (-7)	12 (57)	9 (43)	11 (52)	10 (48)	-1 (-5)
Behavior Intentions Scale $\bar{X}$ (SD)		35.35 (7.34)		35.04 (7.15)		-0.31	40.86 (4.89)		40.57 (5.58)		-0.29
Range of Response		14 - 48		12 - 48			33 - 48		28 - 48		

* **Roman Numeral = Instrument Section, Arabic Numeral = Instrument Item**

** **Item was inversely scored**

Even though students were slightly positive overall, there were certain items that produced more positive results than others. The most positive scores, 79- 90%, were seen on several items concerned with saving energy or water, and consumer awareness concerning animal products. The only exceptions to the general positive trend were in response to reduced snowmobile or car use (60%), willingness to write letters (47%), and to go door to door to pass out information (49%) or ask people to recycle (39%). It was interesting to note some confusion with two items; 70% of students would give $15 to help the environment, but 80% would donate the same amount of money to protect wild animals.

Contrary to all other components, students were not considered pro-environmental with respect to behavior. Table 5 shows a mean of only 28.69 on a section with a theoretical mean of 30. Not surprisingly given the lower mean, this section produced the lowest minimum score of 13. Even the maximum score was only 43 out of a possible 48.

Table 5 Behavior Scale

Behavior		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
V-1 **	I have **not** written someone about a pollution problem.	39 (20)	160 (80)	40 (20)	159 (80)	+1 (1)	4 (20)	17 (80)	5 (24)	16 (76)	+1 (+5)
V-2	I have talked with my parents about how to help with environmental problems.	69 (35)	130 (65)	79 (40)	120 (60)	+10 (+5)	10 (48)	11 (52)	12 (57)	9 (43)	+2 (+10)
V-3	I turn off the water in the sink while I brush my teeth to conserve water.	123 (62)	76 (38)	119 (60)	80 (40)	-4 (-2)	17 (81)	4 (19)	12 (57)	9 (43)	-5 (-24)
V-4	To save energy, I turn off lights at home when they are not in use.	176 (88)	23 (12)	171 (86)	28 (14)	-5 (-3)	20 (95)	1 (5)	18 (86)	3 (14)	-2 (-10)

Behavior		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
V-5	I have asked my parents **not** to buy products made from animal fur.	91 (46)	108 (54)	89 (45)	110 (55)	-2 (-1)	10 (48)	11 (52)	11 (52)	10 (48)	+1 (+5)
V-6	I have asked my family to recycle some of the things we use.	86 (43)	113 (57)	148 (74)	51 (26)	+62 (+31)	9 (43)	12 (57)	16 (76)	5 (24)	+7 (+33)
V-7	I have asked others what I can do to help reduce pollution.	58 (29)	141 (71(	53 (27)	146 (73)	-5 (-3)	10 (48)	11 (52)	10 (48)	11 (52)	0
V-8	I often watch television shows that are mostly about the environment.	76 (38)	123 (62)	81 (41)	118 (59)	+5 (+3)	11 (52)	10 (48)	9 (42)	12 (58)	-2 (-10)
V-9	I do **not** let a water faucet run when it is not necessary.	163 (82)	36 (18)	163 (82)	36 (18)	0	19 (90)	2 (10)	17 (81)	4 (19)	-2 (-10)
V-10	I leave the refrigerator door open while I decide what to get out.	45 (23)	154 (77)	46 (23)	153 (77)	0	6 (29)	15 (71)	7 (33)	14 (67)	+1 (+5)

Behavior		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
V-11	I have fed wildlife near my home or cabin.	144 (72)	55 (28)	163 (82)	36 (18)	+19 (+10)	19 (90)	2 (10)	17 (81)	4 (19)	-2 (-10)
V-12 **	I do **not** separate things at home for recycling.	42 (21)	157 (79)	117 (59)	82 (41)	+75 (+38)	7 (33)	14 (67)	14 (67)	7 (33)	+7 (+33)
Behavior Scale $\bar{X}$ (SD)		28.69 (6.20)		30.75 (6.37)		+2.06 (+0.17)	31.67 (6.29)		32.00 (7.64)		+0.33 (+1.35)
Range of Response		13 - 43		14 - 44			18 - 46		18 - 46		

* **Roman Numeral = Instrument Section, Arabic Numeral = Instrument Item**

** **Item was inversely scored**

Despite the lower mean there were some areas where students demonstrated pro-environmental attitudes. These included an 88% pro-environmental response to saving electrical energy of lights, two items on conserving water and one on feeding wildlife. Items such as writing or talking to others about pollution, leaving the refrigerator door open, and recycling were responsible for much of the lower mean, as 70-80% of these scores were either 1 or 2. The contradictory responses of leaving the refrigerator door open, but turning off lights when not in use was interesting to note.

Student attitudes in the affective responses section were considered to be pro-environmental. These scores were more pro-environmental than behavior, but less so than behavior intentions. Table 6 shows the mean of 35.07 was above the theoretical of 30. The minimum score of 15 was higher than both behavior and behavior intentions. Affective response also marked the second component where the maximum score was reached by a member of the school population at large.

Table 6 Affective Responses

Affective Responses		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
VI-1	I am frightened to think people don't care about the environment.	167 (84)	32 (16)	144 (72)	55 (28)	-23 (-12)	19 (90)	2 (10)	16 (76)	5 (24)	-3 (-14)
VI-2	I get angry about the damage pollution does to the environment.	155 (78)	44 (22)	147 (74)	52 (26)	-8 (-4)	20 (95)	1 (5)	15 (71)	6 (29)	-5 (-24)
VI-3	It makes me happy when people recycle used bottles, cans and paper.	165 (83)	34 (17)	165 (83)	34 (17)	0	20 (95)	1 (5)	18 (86)	3 (14)	-2 (-10)
VI-4	I get angry when I think about companies testing products on animals	171 (86)	28 (14)	166 (83)	33 (17)	-5 (-3)	20 (95)	1 (5)	19 (90)	2 (10)	-1 (-5)

Affective Responses		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
VI-5	It makes me happy to see people trying to save energy.	181 (90)	18 (10)	169 (85)	30 (15)	-12 (-6)`	19 (90)	2 (10)	16 (76)	5 (24)	-3 (-14)
VI-6 **	I am **not** worried about running out of water.	114 (57)	85 (43)	115 (58)	84 (42)	+1 (+1)	11 (52)	10 (48)	14 (67)	7 (33)	+3 (+14)
VI-7 **	I do **not** worry about environmental problems.	151 (76)	48 (24)	148 (75)	51 (25)	-3 (-2)	20 (95)	1 (5)	19 (90)	2 (10)	-1 (-5)
VI-8 **	I am **not** worried about the effects of pollution on my family.	152 (76)	47 (24)	149 (75)	50 (25)	-3 (-2)	19 (90)	2 (10)	20 (95)	1 (5)	+1 (+5)
VI-9	I get upset when I think of the things people throw away that could be recycled.	120 (60)	79 (40)	107 (54)	92 (46)	-13 (-7)	16 (76)	5 (24)	17 (81)	4 (19)	+1 (+5)

Affective Responses		n=199 (School - Sample Group)					n=21 (E.S. 3205)				
		Sept.		May			Sept.		May		
		# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)	# Pro (%)	# Anti (%)	# Pro (%)	# Anti (%)	# Change (%)
VI-10	It makes me sad to see houses being built where animals used to live.	134 (67)	65 (33)	130 (65)	69 (35)	-4 (-2)	17 (81)	4 (19)	15 (71)	6 (29)	-2 (-10)
VI-11	It frightens me to think of how much energy is wasted.	133 (67)	66 (33)	128 (64)	71 (36)	-5 (-3)	16 (76)	5 (24)	15 (71)	6 (29)	-1 (-5)
VI-12	It upsets me when I see people use too much water.	101 (51)	98 (49)	99 (50)	100 (50)	-2 (-1)	14 (67)	7 (33)	11 (52)	10 (48)	-3 (-14)
Affective Response Scale $\bar{X}$ (SD)		35.07 (7.08)		35.85 (7.14)		+0.78 (+0.06)	39.33 (5.87)		38.52 (8.82)		-0.81 (-2.95)
Range of Response		15 - 48		12 - 48			26 - 48		21 - 48		

* **Roman Numeral = Instrument Section, Arabic Numeral = Instrument Item**

** **Item was inversely scored**

Highest percentages of positive response were found on energy conservation, disagreement with animal testing, disagreement with environmental apathy, and recycling. Lowest scores, but still in the fifty percentile, were associated with water.

Attitudes Towards the Environment
Representing Environmental Science 3205 Students

Students enrolled in the Environmental Science 3205 course were more pro-environmental than the school group at large. They began the school year with a more positive environmental attitude than their colleagues. This was first evidenced in Table2, which shows the sample group mean total score was 176.9, as compared to 159.6 in the full school group. Minimum score was much higher than the school group, 131 as compared to 97. Maximum score of 221 was closer to the theoretical maximum of 228 than any of the students at large.

The display of more pro-environmental attitude was also confirmed by higher mean scores for each attitude component measure. According to Table 3 through 6, every one of the four components, including behavior, saw scores above the theoretical mean. Minimum scores were also higher in each section and in three of the four components the possible maximum scores were reached. Only the behavior component failed to reach the possible maximum with 46 out of 48 the top score.

In the cognitions section, students demonstrated more positive environmental attitudes for items in all subsections than the school at large. The mean score for the sample group was more than 5 points higher, and the minimum score was 50, compared to

39 in the school group. The majority of environmental science students scored a 3 or 4 on 19 of the 21 items. Most positive attitudes were seen on the sub-section "Limits to the Biosphere". This was also an area showing positive attitude in the larger group, but the sample group were even more positive, with the lowest percentage at 81%. While the second section, dealing with economic growth and standard of living saw the least positive responses, due to the lowest scores, results were still higher than for the school group. Two of the items received a 50/50 split, while the other two were the only items in this section to witness an anti-environmental response by the majority of the sample group students. Other items dealing with economic growth within other sub-sections also received lower scores but still saw greater than 50% of the sample group choose the pro-environmental response.

Within the behavior intentions component, the sample group again demonstrated more positive attitudes about the environment. This was seen in the difference between means of the school group at large, 35.35, and the sample group, 40.86. Of the three attitude component sections originally from the CHEAKS inventory, this component witnessed the widest discrepancy between the two mean scores. The minimum score was also greater than twice the large group minimum, at 33 compared to 14. Most positive responses were seen on two items that saw 100% of the group score either a 3 or 4, and six items in the 90-99% range. These responses covered such topics as saving animals, recycling, limiting vehicle use, energy and water conservation. Lowest scores, indicating least positive attitudes, were in response to writing letters and going door-to-door, but none of these were lower than 57%.

While the behavior section showed more pro-environmental behavior than the school group at large, the results showed only slightly positive attitude. Table 5 shows the mean was above the theoretical mean, but at 31.67, it was lower than for behavior intentions and affective responses. Lower minimum scores were also seen, as well as the only component where the maximum score was never reached by an environmental science student. There were still bright spots where a more positive attitude was shown. 95% of the group turned lights off at home when not in use, and 90% did not let water faucets run when not necessary. Seven of the twelve statements in the section produced results where less than fifty percent of the sample group respondents chose a pro-environmental response as compared to zero of twelve in the behavior intentions. These seven included writing someone about a pollution problem, talking with parents about a pollution problem or products made from animal fur, asking others what to do about pollution problems, and leaving the refrigerator door open when deciding what to take out. The other remaining two statements that received low percentages in the group both dealt with recycling.

The final section attitude component surveyed was affective response. Again, environmental science students were more strongly positive than the full school group. The means and minimum scores were both higher than the school group at large, as seen in Table 6. Evidence for the positive environmental attitude was the selection of positive responses on all twelve items in the section. Strongest positive attitude was discovered in the items about the effects of pollution and animal testing. Weakest positive attitude was found on items dealing with water.

Changes in Attitude Towards the Environment

There was little overall change in student attitudes in either group over the school year. The students retained overall positive attitudes in the May administration of the survey according to the scores shown in Table 2. The full school group raised their mean score slightly, from 159.6 to 162, while the sample group's overall total mean dropped 0.1. Some movement occurred in score range for each groups. The school group at large saw a decrease of 7 in minimum score but an increase of 7 in maximum score. The sample group of environmental science students had an increase of 7 in minimum score, but decrease of 8 in the maximum score. These changes were not sufficient to shift the overall classification of positive attitude from the beginning of the school year.

There were very slight positive changes in attitude for both groups in the components of cognitions and behavior. According to Tables 3 and 5, scores increased in those sections by 1.47 (large group), 0.7 (environmental science group), and 2.06 (large group), 0.33 (environmental science group) respectively. These, however were only minor shifts. All other response change for both groups in the other two components was less than 1.0 point.

The clearest picture of attitude change was provided by studying the more significant shifts on an item-to-item basis; those items with a 10% or more. Significants shifts in attitudes about the environment occurred in fifteen general areas. There were few incidences where a significant shift occurred for both groups at one time; more than likely it was a case of one group or the other.

The full school group saw significant shifts towards a more positive attitude in the areas of standard of living/technology/economic growth, role of humans in nature, recycling, and feeding wildlife. A significant negative shift occurred in only one area, fear of environmental apathy.

The Environmental Science 3205 students witnessed more significant shifts in attitude. Some of these shifts were towards a more positive attitude, but many were negative shifts. Positive shifts occurred in standard of living/technology/economic growth, limits to population, balance of nature, role of humans in the ecosystem, talking to parents about pollution, recycling, and worry about water supply. There were decreases in pro-environmental attitude in the areas of science/technology/standard of living, vehicle use, donating money, water conservation, energy conservation, environmental television shows, feeding wildlife, fear of apathy about the environment, anger at pollution, and habitat destruction.

Both groups were in agreement in their pro-environmental shifts in three areas: standard of living/technology/economic growth, role of humans in nature, and especially recycling. The latter witnessed the largest increases in environmental attitude, as shown by increase of pro-environmental score by more than 30%.

Discussion

Student Attitudes Towards the Environment

A number of important ideas emanated from this study. One of the most promising discoveries was the overall concern the entire high school population seemed to have for the environment. Their scores on cognitions, behavior intentions, and affective responses, and the entire instrument in September, as well as the total and all sections in May, showed pro-environmental attitude. Even though not all sections or items showed the same strength of response, the bottom line scores were considered fairly good.

Both the full school group and the sample group classify as exhibiting overall positive environmental attitudes. Scores on the instrument are designated only slightly positive, as they were fairly close to the theoretical mean, especially on particular components. The nature of the study using two different instruments within one survey, and the age group of the sample made it difficult to compare results with other studies. These results do, however, confirm the general consensus made in a recent study of American youth conducted by the Roper Institute (1994); it is apparent that young people do care about the natural environment.

By examining the results on an item-to-item basis, it is evident that particular attitude components are more strongly positive than others. Both behavior intentions and affective responses were more positive than the behavior component. These results were also noted in a study by Benton (1993). Items dealing with economic growth and the standard of living in the cognitions section evoked stronger anti-environmental stances.

However these were the exceptions; the majority of items in the cognitions component measure saw students choose pro-environmental responses.

Particular areas within the components stood out as exhibiting either more positive or more negative environmental attitudes. Attempted explanations are needed in these particular areas. Since the attitudes were positive overall, it was worthwhile to locate items that did not fit this pattern and infer possible reasons for deviation. Each of the attitude component sections: cognitions, behavior intentions, behavior, and affective responses, contained items which produced dissimilar results, either anti-environmental or every strongly pro-environmental.

Within the cognitions section, several items saw choices well into the high percentages of pro-environmental attitude acceptance, from 76% to a high of 91% in agreement to the statements by the school group, and 81% to 95% by the environmental science students. The statement that produced the most pro-environmental response in both groups was in reference to, "The earth is like a spaceship with limited room and resources". This is a topic in the Environmental Science 3205 textbook, and is also covered in several other courses, as well as being the subject of a video in the school library, "Spaceship Earth". Students may have been exposed to this idea before, as knowledge, not necessarily as belief.

Dissimilar item responses showing less positive environmental attitude revolved around standard of living, economic growth, and more and better technology. The survey respondents live in a company town, with primary industry employees receiving high average salaries, making the sample area a fairly affluent one. This would probably reflect

their faith in technology and the pursuit of economic growth, because they see how it has affected their families' lives to the better. Their parents' standard of living has increased through technology and the economic viability of the setting. This most likely resulted in fewer students, both in the school group and the environmental science group, choosing the pro-environmental stance. The lower scores in these types of cognitions items show a need to increase emphasis on the complex relationship between economic growth and the environment, more towards the idea of a sustainable development.

In comparing the behavior intentions and behavior sections, the difference between the two was noteworthy for both groups of students. The mean for behavior was much lower than the mean for behavioral intentions, even considering the higher means for the environmental science group. Considering the nature of these two aspects of behavior, this was not surprising, as an even greater discrepancy was noted in results found in the study by Benton (1993).

The behavior intentions component showed that for the most part, the school group respondents' behavioral intentions were pro-environmental, with only four exceptions. The item on decreasing car or snowmobile use in order to reduce air pollution"was agreed to by only 60% of the school group of respondents. The sample group of environmental science students scored much higher in September, but still dropped considerably in May. This lower score is probably indicative of the lifestyle of the students in the sample area. Snowmobiling is not just a major method of transportation during the six winter months, but is a favorite past-time of young people in the area, especially those younger than seventeen; too young to drive a car. In the case of

the environmental science students, several students in May had recently obtained their license. As a rite of passage in the setting, as in many areas with a young population, the urge for students to pass their driver's test and have a valid license for the summer is quite strong. This undoubtedly had an effect on the numbers for this statement, dropping from 95% pro-environmental to 81%.

The other three statements with the lowest pro-environmental percentages dealt with willingness to write letters, go door-to-door to pass out information or ask people to recycle. The school group scored very low on these items in both September and in May, while the environmental science students began the school year with higher percentages than the large group, but also dropped slightly by May. In the case of the September survey, perhaps the extremely cold winter climate may have played a part in the lower results on these two of these questions, rather than apathy. In the case of the further drop on the May survey, this may have been related to the closeness of the summer season, and the unwillingness to give up their valued vacation to campaign for the environment. Still the environmental science students demonstrated a much higher willingness to spread ideas about helping save the environment.

From research, the fact that overall percentages of behavior were lower than behavior intentions, did not surprise the researcher. The difference with respect to numbers of items exhibiting less than positive percentages between the two were surprising, however. In September, eight of the twelve statements in the section produced results where less than fifty percent of the school group respondents chose a pro-environmental response, as compared to only three of twelve in the behavior intentions.

By May the large group saw a reduction of two, with six items less than 50% acceptance of pro-environmental attitude. Environmental science students had seven statements with percentages less than 50 in September, but by May this was reduced to only four. While the percentages may not have increased significantly, this was encouraging movement.

The eight items with low scores included writing someone about pollution problem, talking with parents about a pollution problem or products made from animal fur, asking others what to do about pollution problems, watching television shows about the environment, and leaving the refrigerator door open when deciding what to take out. With the exception of television shows about the environment, these were the same items with low scores for the environmental science students. Since the environment science students chose to take the course as an elective, it was not surprising this item received a higher percentage acceptance.

The remaining two statements in the behavior component receiving low scores in September both dealt with recycling, "I have asked my family to recycle some of the things we use" and a negatively stated one, "I do not separate things at home for recycling". A major difference was expected during the May survey in both groups as there was no local recycling depot in position in September. Recycling, played a huge role in the differences from September to May. The two statements had positive increases of over 30% for both the school group and the environmental science group, more than any other statement in the entire instrument. The event most thought to influence this increase was the opening of the area's first recycling depot in January of 1997. The only recycling done previous to January, 1997 was by a few groups and individuals who made arrangements

with a local trucking company to carry out aluminum cans and some paper to a recycling facility in Quebec.

The two items on recycling accounted for changes in the large group, but the environmental science students had a positive change from below 50% to above on two other items besides the recycling, while dropping one item to lower than 50%. Increases were seen on "I have talked to my parents about how to help with environmental problems" and "I have asked my parents **not** to buy products made from animal fur". The sharing of ideas on the environment with their families was encouraging. Palmer (1993) said that childhood experience was an important factor in the development of positive environmental attitudes. When the environmental science students talk about issues at home, pro-environmental attitudes may also be adopted by siblings or even by the parents. The surprising drop on one item for the environmental science students concerned television shows about the environment. Perhaps by May, they had seen enough videos on the environment through school lessons to desire a change at home.

All twelve items in the affective responses component section received positive reactions, but the lowest for each group dealt with the same topic, water. In the setting, residents are blessed with cold, clean water that requires very little treatment. No chlorine taste can be noted, though some is used. The surrounding wilderness around the towns, no other community exists within a three-hour drive, is littered with a myriad of lakes. It would not be surprising then, that respondents would not be very concerned with running out of water, or be upset when they see water wasted. Even the gains from September to May seen on the surveys of environmental science students contradicted each other on the

water statements. Perhaps there was some degree of confusion in the measurement of the attitude component, as there were several drops in pro-environmental response in ten out of twelve statements for the large group and nine for the sample group. This was totally unexpected. Affective response was expected to be the most stable. Perhaps the feelings associated with the environment can be affected by other feelings the respondents may have been experiencing at the time of review for final exams. All items in the section dealt with feelings and emotions, and traditionally the end of the school year is a time of emotional drain for students.

There were few major shifts, greater than 10%, in attitude change over the course of the year. The largest shift towards a more positive environmental attitude was in the area of recycling. The 30% increases on items dealing with recycling proved that. Not only were the attitudes towards recycling improving, but since there were family situations discussed, this particular attitude change affected the entire community, not just a few students. It was clear that the government's introduction of a beverage container deposit and recycling program and the contracting of a recycling depot in the area, has had the desired effect on the citizens. The connection of community concerns with environmental issues seems to produce the greatest amount of change. This was also concluded in Newhouse (1990).

Does Environmental Science 3205 Change
Student Attitudes Towards the Environment?

The Environmental Science 3205 students began and ended the year with an overall positive attitude towards the environment, but their attitudes did not change from September to May. This would lead to the conclusion that there was no attitude change as a result of the course. However, there were some particular characteristics of the environmental science students' attitudes that need to be addressed, by comparing an overall portrait of the environmental science students to the students in the general population.

Environmental Science 3205 students had much more positive attitudes towards the environment than the student group at large. This was concluded from the difference in scores. The first major difference noted was in the mean scores in every attitude component section. Invariably, in both September and in May, these scores were 4-10 % higher. Since the majority of these students voluntarily signed up for Environmental Science 3205, this initial higher score probably indicates they already had an interest in, and therefore a stronger bias towards, a more pro-environmental stance. This interpretation was also confirmed by a quick examination of the minimum scores on the September survey. The lowest score on each instrument would be the most anti-environmental stance. On the September cognitions section, minimum score for the school population was 39, within the sample group it was 50. For behavior intentions, it was more than doubled, 33, compared to14 in the general population. Within behavior the

difference was not as great, but minimum score was 18, compared to 13. Affective response saw a 26 minimum with a 15 in the school group.

Results were similar in May. Even when there was a drop in minimum score for the environmental science group, there was also a drop in the general population, so the distance between the minimum scores was fairly constant. The maximum score recorded for cognitions on the September survey was identical to that of the maximum for the entire population. In other words, no one student in the entire population scored higher than at least one of the environmental science students. There was only one section on both the September and May administrations combined where an environmental student did not achieve the maximum score for the population. On the May survey, the maximum score for cognitions in the sample group was 78, compared to 80 for the population. This, however, is only a slight discrepancy.

There was only one area where environmental science student attitudes improved more than the general population, in behavior intentions. This was shown as both groups saw a drop in score on this attitude component but the environmental science students dropped less than the larger group, -0.29 compared to -0.31. This was not considered to be a major downward change.

Perhaps one of the reasons the environmental science students did not improve their overall scores as much as the entire population, could have been related to their September scores. Since the scores of the environmental science students were substantially higher at the beginning, there was not the same room for improvement as with the total population.

There were particular areas where this was evident in each of the four attitude component measures. In cognitions, teaching people about nature was given much higher priority, as were two questions on technology and economic growth contributing to problems in the environment. In behavior, environmental students were more likely to talk to others, including their parents, about pollution problems. Within affective responses, worry about pollution effects on the environment and their families was given almost 20% higher frequency of positive response.

The area where the greatest overall differences occurred was in the behavior intentions section. In ten of twelve items, the percentage of students choosing a pro-environmental response was 10% to 35% greater than with the general population. Environmental science students were more willing to give money, cut down on vehicle use, separate trash for recycling (even before the recycling depot opened), write letters about environmental problems or go door-to-door.

In comparison to the entire population's percentages of pro-environmental response to anti-environmental response, there were a number of questions where the sample group responded on a greatly increased level of environmentalism. In September, three different questions saw 100% of the focus group choose the pro-environmental stance. This number increased to five questions by May. In one section of cognitions, only the environmental science students delegated greater than fifty percent pro-environmental response to any of the four items in that section.

It can be concluded that the attitudes of the Environmental Science 3205 students were already more pro-environmental than the general population, and that this probably

predisposed them to voluntarily register for the course. With their strong pro-environmental attitudes, they may not have seen the same increase in attitude toward the environment as the total population, but this may have been due to a lower ceiling; not as much room for improvement. This confirms the finding of Parker and Herring (1994), that there is a relationship between willingness to enroll in environmental science courses and a positive environmental attitude.

In addition to the comparisons of the student population at large and the environmental science students, statistics of scores on each of the four attitude components were cross tabulated with September and May scores The results are summarized in Table 7.

Table 7 Correlation Results for Environmental Science Students

p<0.01	Cognition	Behaviour Intentions	Behaviour	Affective Responses
September	0.21	0.222	0 (p=0.04)	0 (p=.03)
May	0.172	0.227	0 (p=0.4)	0 (p=0.04)

Strong correlations were neither expected nor seen in this study. The study never implied causal relationships, as any number of factors are constantly at work shaping student attitudes. The statistics did, however, confirm some of the overall discussion, as well as reveal some interesting relationships within certain areas of the attitude system.

Correlations were discovered on both the total September and total May scores. September totals showed higher correlation of r =.228 than the May totals, r =.184. This

confirms the general observation that the sample group began with higher mean scores in September than the total population.

The total on just the cognitions section showed a correlation at r =.210. The correlation of the environmental science students and the May cognitions section scores had decreased to r =.172. Only one of the three CHEAKS sections, behavior intentions, showed any correlation. The other two sections saw p>.01. In September, r = .222. In May the correlation between the environmental science students and the behavior intentions scores had increased to r = .227, but there was still no correlation between environmental science students and either the behavior or affective responses sections.

The correlations between environmental education students and scores on both the September and May surveys while not strong, were none the less promising. With so much else influencing the lives and shaping the attitudes of adolescents, the fact that there were significant correlations at all was favorable. Yet since the course is elective, these promising results may persist in only those who choose to take the course. Perhaps the environmental science course should be made compulsory, or at least more widely encouraged for all students.

What was especially encouraging, was the correlation between the behavior intentions and the completion of the Environmental Science 3205. Even though it would have been more beneficial to the environment to increase scores and find correlations between course completion and the behavior section, the correlations found represent a starting point. It would be up to teachers and curriculum developers to build on these

results, finding ways to increase correlation between the other components and the completion of the course by future students.

Conclusions and Recommendations

It can be concluded from the survey results that high school students in the Labrador school studied had overall positive attitudes towards the environment. The sample group of Environmental Science 3205 students had even more positive environmental attitudes. Although there was little overall change in attitude for either group during the course of the school year, there were some positive shifts in the components of cognitions and behavior in each group. Some item areas saw large shifts, especially in the area of recycling. Shifts toward a more positive attitude was not dependent on the completion of Environmental Science 3205. There were, however, some correlations between environmental science students and scores in two components of attitude, cognitions and behavior intentions.

There are different directions this study could have taken that may be pursued by this researcher or others. Already built in to this study are several different avenues to pursue. Correlations could be sought between attitude and the completion of other courses with infused environmental education. Since age was also listed in the demographic information, relationships may be studied between attitude scores or attitude change and the age of the student, especially since in general observation, more students in the junior high section of the school recycled soft drink cans than the high school group surveyed.

Another possibility for future research would be a follow-up survey of a more longitudinal nature to determine whether or not attitudinal changes were permanent or temporary. This would be difficult to do without compromising the anonymity of the participants, but it could be done.

One area that was not pursued in the demographic information, but may have been interesting to investigate was attitude and gender. Several other researchers have previously studied this issue with mixed results.

Other possibilities for research of this type, some of which may be pursued by this researcher include expanding the survey for comparisons among several other local groups. An interesting comparison may be made between the present results of high school students with the families of those high school students. Since the researcher had already noticed a difference in recycling behavior between the junior and senior high school students , perhaps these two groups could be compared, either on the basis of education level received, or as an extension of an age study.

Since this study was conducted on high school students at one Labrador school, it may be worthwhile to survey other high school students in Labrador and then expand the survey to other schools teaching the Environmental Science 3205 course in the province.

It is through survey work like this, that advancements in environmental attitude change can be identified. If this information can then be used to improve environmental education, the entire planet may benefit.

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