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ABSTRACT

The purpose of this study was to establish baseline data relating to the environmental knowledge and beliefs of fifth-year secondary students in England. The instrument developed for the survey consisted of three questionnaires, each containing a total of 45 cognitive and affective items. All items were pilot tested in nine English secondary schools. A random sample of 500 secondary schools, representing the major types of schools in England, was mailed packaged instructions including the instrument. A total of 383 schools responded, providing information from over 11,000 fifth-year students. Although the students appeared to have a poor command of factual environmental knowledge, they demonstrated a greater understanding of environmental concepts and generally expressed positive attitudes toward the environment. Significant differences in environmental knowledge were found with respect to sex, school type, sex composition of the school, school size and region. Significant differences in environmental attitude were found with respect to school type and sex composition of the school, but attitudinal differences could not be attributed to sex, school size or region. The computation of correlation coefficients revealed relationships between conceptual knowledge and attitude (r = 0.48), factual and conceptual knowledge (r = 0.44), and factual knowledge and attitude (r = 0.38). (Author/MH)

A SURVEY OF ENVIRONMENTAL KNOWLEDGE AND ATTITUDES OF FIFTH YEAR STUDENTS IN ENGLAND

By

James Malcolm Richmond, Ph. D.

The Ohio State University, 1976

Professor Robert W. Howe, Advisor

The primary purposes of this study were to establish baseline data relating to the environmental knowledge and beliefs of 5th year secondary students in England and to examine relationships that might be of interest to teachers and curriculum developers in environmental education.

The instrument developed for the survey consisted of three questionnaires (Forms A, B and C) with each questionnaire containing a total of 45 cognitive and affective items. All items were thoroughly tested in a pilot study conducted in nine English secondary schools.

A sample of 500 secondary schools was randomly selected to proportionately represent the major types of school in every region of

the country. Packaged materials were mailed to the selected schools with instructions to administer the instrument to 30 students in the 5th year. A total of 383 schools (76.6% of the sample) returned completed answer sheets, providing information from over 11,000 students. The answer sheets were machine scored, with student responses being automatically punched onto computer cards. The data were then transferred to magnetic tape and analyzed by standard computer programs.

The students appeared to have a poor command of factual environmental knowledge, however they demonstrated a greater understanding of environmental concepts and generally expressed positive attitudes toward the environment. It was noted that their attitudes tended to be positive when the object of concern did not impinge directly on their lives, but were relatively negative when some personal commitment or sacrifice was required.

In examining the relationships between variables, significant differences in environmental knowledge were found with respect to sex, school type, sex composition of the school, school size and region. Significant differences in environmental attitude were found with respect to school type and sex composition of the school, but attitudinal differences could not be attributed to sex, school size or region. More specifically, it was found that males performed significantly better than females on factual knowledge items (although significant differences in male and female attitudes were not detected); and students in secondary modern and co-educational ("mixed") schools produced significantly poorer knowledge and attitude scores than their peers in other schools. Regression analyses indicated that, of the variables under consideration, only "sex" and "secondary modern" (and to a lesser extent "mixed") accounted for an appreciable amount of the variance. Most of the observed variance was probably due to personal factors such as intelligence and home-background.

In order to reveal relationships that might exist between factual knowledge, conceptual knowledge and attitudes, correlation coefficients were computed between the total scores on the factual, conceptual and belief sections of each form. The strongest relationship was found between conceptual knowledge and attitude ($r = 0.48$), with a slightly weaker correlation between factual and conceptual knowledge ($r = 0.44$); the weakest relationship was found to exist between factual knowledge and attitude ($r = 0.38$). These results, together with inter-item correlations, support the contention that the development of sound concepts might be a productive means of leading to the establishment of positive attitudes.

When asked to identify the primary source of their environmental knowledge, over 60% selected activities that did not relate to their formal schooling, notably "reading, the radio, and TV". Students were also asked to identify the local and national environmental problems that they considered to be most serious. Although a sizeable number of respondents did not perceive any of the listed problems to be of concern in their home communities, almost all students were prepared to identify problems for the country as a whole. For the nation, societal problems such as over-crowding and crime were considered more serious than problems relating to the physical environment (e.g. water and air pollution).

A SURVEY OF THE ENVIRONMENTAL KNOWLEDGE AND ATTITUDES OF FIFTH YEAR STUDENTS IN ENGLAND

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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1976

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Perspective

In recent years there has been a growing world-wide concern for the future of mankind in the face of a rapidly deteriorating human environment. Attention has been focused on the effects of pollution, the exponential growth of populations in many countries, shortages of food and widespread famines, and the serious depletion of natural resources resulting from spiralling demands for energy and consumer products. These well-publicized environmental problems have produced an increasing awareness that our survival and prosperity are dependent upon the finite resources and delicate life-support systems of "space-ship earth". The United Nations reflected the global nature of this awareness and concern when, in 1972, it called the international Conference on the Human Environment in Stockholm and charged its members to "define what should be done to maintain the earth as a place suitable for human life not only now, but also for future generations." (138, p. 25)

Britain, as a highly industrialized and densely populated country, has not been spared the deleterious environmental effects that commonly accompany "progress". The beautiful countryside has been encroached upon by motorways, airports, power pylons, mining operations, and the continuous spread of cities and towns. The people have been subjected to crowding and urban blight, the discomfort and health hazards of air pollution, excessive noise, traffic congestion, and the unsightliness of derelict land and litter. In addition, the population has outstripped the supportive capacity of domestic agriculture with the result that Britain is dependent upon other countries for about one-half of its food supply as well as many industrial raw materials.

But these unfortunate side-effects tend to creep upon people slowly and for the most part are reluctantly accepted as the price to be paid for prosperity. More dramatic occurrences are often necessary to stimulate widespread concern and action. Perhaps events such as the notorious London smog that was responsible for about 4000 deaths in 1952, the tragedy of Aberfan on 21st October, 1966, in which 20 adults and 116 children died under an avalanche of coal sludge from a mining tip, and the wreck near the Cornwall coast of the Torrey Canyon with its 117,000 tons of crude oil in March 1967, were the catalysts required to generate a general public awareness of the disasterous environmental consequences that can result from inadequate stewardship.

Growing public interest in environmental matters during the 1960s gave rise to a variety of institutions and bodies whose prime concern was environmental conservation. These included the Countryside in 1970 movement which was instigated by the Duke of Edinburgh in 1963, the Conservation Society (1966), the Countryside Commission set up under the Countryside Act of 1968, the Committee for Environmental Conservation (1969), Friends of the Earth (1971) whose objective was to restore environmental quality through political and legislative action, The Royal Commission on Environmental Pollution (1971), and the Department of the Environment which was created by the government in 1971 to assume responsibility for all functions which affect the physical environment.

Public statements also began to stress the need for action to reverse the trend of environmental degradation. In its first report in February 1971, The Royal Commission on Environmental Pollution stated that

> Failing deliberate measures to control pollution and to repair past damage, there is likely to be a substantial deterioration of the environment in the years ahead and the quality of life in Britain will be correspondingly impoverished, despite an appearance of greater affluence...
>
> (Quoted by R.W. Colton *et al.*, 36, p. 7)

And Prime Minister Edward Heath is reported as saying in September 1969,

> The protection of our lovely countryside and our glorious coast, the prevention of pollution of our rivers and of the air we breathe, must be one of the highest priorities of the seventies. It is essential for any decent sort of living, it is vital for proper recreation.
>
> (Quoted by R.W. Colton *et al.*, 36, p. 6)

It is now generally accepted that environmental education can, and should, play an important role in developing a sense of environmental concern and responsibility. Ideally, environmental education should aim "at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems, and motivated to work toward their solution."(122, p. 10) At the international level, the importance of world-wide environmental education was recognized in the Final Report of the International Working Meeting on Environmental Education in the School Curriculum, organized in 1970 by IUCN in cooperation with UNESCO. In its recommendations it stated that

> The Working Meeting,
>
> Considering the appropriate education being a necessary pre-requisite for improvement of the total critical environmental situation,

Being aware of the urgent need for environmental teaching and adequate training of teaching personnel,

Suggests to the Governments and their responsible educational authorities as well as to the national education organizations:

1) that through a reform of the total curriculum, the environmental education be introduced as an obligatory and integrated component of the school educational system at all levels;

2) that appropriate pre- and in-service teachers training be organized through obligatory environmental conservation courses in teacher training colleges, universities and other educational establishments involved in teachers training...

(Quoted by R.W. Colton et al., 36, p. 12)

Similarly at the national level, much sentiment has recently been expressed for effective environmental education in the schools. Terence Gregory, the City Architect and Planning Officer of Coventry, said

> There is a continuing and deepening need to emphasize the importance of education in relation to conservation and the environment. People must be encouraged to have a real understanding of the causes and the implications of environmental change, and an understanding of the likely effects of an inadequate or negative policy towards conservation. Education will assist in enabling people to understand the consequences of the actions of individuals and of society as a whole, and should generate a keen respect for the environment. (41, p. 169)

The Recent Growth of Environmental Education in England

The use of the local environment for teaching children about their surroundings and for specific learning activities has long been the practice in British schools. Such activities have usually been associated with recognized school subjects such as biology and geography; with occasional excursions, such as "nature walks" and visits to historical or industrial sites, being organized as a relief from classroom confinement. However environmental education as we now know it, involving analytical and evaluative activities on topics and concerns ranging from rural to urban and local to global, is a relatively recent phenomenon.

As with most educational innovation in England, environmental education emerged in response to public interest and social demand. Paralleling the changing public attitudes of the late 1960s, educators became increasingly aware of the need to deal with environmental concerns in the school curriculum. The emergence of professional organizations such as The Society for Environmental Education (1968) and The National Association for Environmental Education (1971), reflected the rapid increase in interest and activity in this field.

It should be noted that the results of a survey conducted in 1973 by The Conservation Society indicated that by that time 25% of the secondary schools in the United Kingdom had established definite courses in Environmental Studies (13, p. 4). Of the remaining schools, the majority claimed that they included environmental topics within the traditional subject areas such as geography, biology and rural studies. However the recent development of public examination syllabuses at both "O" and "A" levels of the General Certificate of Education should be an additional incentive for schools to offer specific environmental courses.

Need for the Study

The demand for school courses and examination syllabuses in this essentially new field of study has brought with it the need for extensive efforts in curriculum development. This in turn has raised such basic questions as "What topics should be included in the course syllabus?" and "What do the students at this level already know, and what are their attitudes toward environmental issues?" This latter question, which is important in establishing the starting point and scope of the course, for the most part has not been answered objectively by testing students in the target population. Rather, educators involved in environmental curriculum development have tended to be subjective in deciding the content and methods most suitable for their programs.

Richard F. Morgan, Deputy Director of Project Environment, commented on the somewhat intuitive approach employed in developing this ambitious national program:

> Project Environment saw the answer to the problem of motivation as one of selecting examples in which pupils could see how the issues affected their personal position so that they understood what they had to gain or lose. Great emphasis was placed on this approach, and this may be seen as an attempt to pragmatically begin studies at a baseline appropriate to the pupils' pattern of past ideas and experiences. At best this was achieved by trial and error whereby baselines were arrived at subjectively, their accuracy being tested on the basis of success at motivating or failure to motivate the pupils. However this was probably the first time a major programme of curriculum development in environmental education had sought, directly or incidentally, a baseline of previous experience.
>
> (Personal communication. April, 1976)

In the same communication he expressed the need for establishing "baseline information for developing future national and regional curricula. Information about children's knowledge of and attitudes toward environmental matters will offer a starting point for devising programmes towards achieving the aims so well documented in philosophical explorations."

A number of other researchers in the field of environmental education have expressed similar sentiments regarding the need for establishing baseline data as a prerequisite to curriculum development. For example, Towler and Swan wrote that

> As a first step toward creating such an environmental education program we must know what base we can build upon, what is the status of students' knowledge and attitudes about the environment? Unfortunately this question has not received much attention from researchers. (130, p. 245)

And Eyers stated that

> Prior information about general environmental knowledge and attitude structures seems of real importance, especially in a situation in which coordinated or national curriculum planning is contemplated. (53, p. 10)

Following from the preceding discussion, there is clearly a need for baseline data that will be useful in developing effective regional and/or national environmental education programs in England. Providing this information is a primary objective of the present study.

It is also anticipated that the information gathered in the survey might be beneficial in other ways. Having established the baseline, any changes in knowledge and/or attitudes may be measured by using the same instrument at some later time, thus providing an indication of the effectiveness of new environmental education programs. In addition, an analysis of the data might well establish correlations between environmental knowledge and attitudes that have program implications.

Looking beyond the scope of this report, the survey data may well be of value in follow-up studies. By using items from similar instruments already applied in the United States and Australia, it will be possible to compare the relative environmental knowledge and attitudes of American, Australian and English students. As other countries are surveyed, more extensive cross-cultural comparisons can be made. This may then provide some insight into the "exportability" of existing environmental education curricula.

Also, in looking to the future, the data generated by this study and by similar surveys in a number of other countries could provide the basis for developing models for an international environmental education curriculum. Such a curriculum would be in keeping with the recommendation of the United Nations Conference on the Human Environment

> ...that the Secretary-General, the organizations of the United Nations system, especially the United Nations Education, Scientific and Cultural Organization, and other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education... (133, p. 9)

Statement of the Problem

The purposes of this study were to establish baseline data relating to the environmental knowledge and beliefs of 5th year secondary students in England, and to ascertain whether significant relationships exist

(a) between the environmental knowledge of students and selected variables,

(b) between the environmental attitudes of students and selected variables, and

(c) between the environmental knowledge level of students and their attitude toward the environment.

More specifically, the study was designed to collect data that might assist in providing answers to the following questions:

1. What is the current environmental knowledge level of 5th year students in England?

2. What is the current affective position of 5th year students in England toward environmental concerns?
3. What do 5th year students currently perceive as the most serious local and national environmental problems?
4. Are there significant relationships between environmental knowledge and sex of student, type of school attended, sex composition of school, school size and region of school attendance?
5. Are there significant relationships between attitude toward the environment and sex of student, type of school attended, sex composition of school, school size and region of school attendance?
6. Are there significant relationships between student perception of environmental problems (both local and national) and sex of student, type of school attended, sex composition of school, school size and region of school attendance?
7. Are there significant relationships between student perception of "source of environmental knowledge" and the level of environmental knowledge or attitude toward the environment?

8. Is there a significant relationship between the level of environmental knowledge and attitude toward the environment?

Null Hypotheses [1]

The following null hypotheses were posited for testing:

1. There are no significant relationships between the level of environmental knowledge and
   (a) sex;
   (b) type of school attended;
   (c) sex composition of the school;
   (d) school size; and
   (e) region of school attendance.

2. There are no significant relationships between expressed attitudes toward the environment and
   (a) sex;
   (b) type of school attended;
   (c) sex composition of the school;
   (d) school size; and
   (e) region of school attendance.

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1. Results of testing the null hypotheses may be found on p. 177.

3. There are no significant relationships between student perception of environmental problems (both local and national) and

   (a) sex;

   (b) type of school attended;

   (c) sex composition of the school;

   (d) school size; and

   (e) region of school attendance.

4. There are no significant relationships between student perception of "source of environmental knowledge" and level of environmental knowledge or attitude toward the environment.

5. There is no significant relationship between the level of factual environmental knowledge and expressed attitude toward the environment.

6. There is no significant relationship between the level of conceptual environmental knowledge and expressed attitude toward the environment.

Definition of Terms

Environment

Although the environment may be defined as all the conditions and influences that affect the life and development of an individual, this study focuses upon some of those aspects of the human environment that are commonly called "environmental concerns". These have been identified and categorized under the headings of pollution, population, natural resources, land use, energy, environmental health/safety, ecological relationships and social/political/economic influences.

Environmental knowledge

This term refers to a knowledge, awareness or understanding of facts and concepts that relate to the "environmental concerns" discussed above. "Factual knowledge" is used to indicate a knowledge of events that have occurred or conditions that exist that can be readily verified. "Conceptual knowledge" refers to a knowledge or understanding of concepts, generalizations or "big ideas" involving relationships that have authoritative support in the literature.

Environmental beliefs and attitudes

For the purposes of this study the definitions of belief and attitude presented by Shaw and Wright are acceptable. The term "belief" is defined as "some level of acceptance of a proposition regarding the characteristics of an object or event" (118, p. 4), while an "attitude" is a "relatively enduring system of evaluative, affective reactions based upon and reflecting the evaluative concepts or beliefs which have been learned about the characteristics of a social object or class of social objects." (118, p. 3)

All belief statements presented in the instrument relate to the "environmental concern" categories described above. The beliefs expressed by the individual about these environmental concerns are seen as indicative of his or her attitude toward the environment. As stated by Shaw and Wright:

> The set of beliefs that the individual holds about the object and the associated evaluations determine the individual's attitude toward that object. They lead to an enduring system of affective reactions regarding that object. The nature and strength of this system is determined by the number and strength of the evaluative concepts or beliefs formed. (118, p. 12)

Environmental Education

Environmental education is the process which develops knowledge, understanding, attitudes and the formation of personal responsibility with regard to man's relationship with his socio-cultural and biophysical surroundings.

This definition is based upon ideas which include those set out in the Belgrade Charter (134, p. 1), those adopted by the International Union for the Conservation of Nature and Natural Resources (13, p. 21), and those contained in the Environmental Education Act passed by the Congress of the United States (52).

Local Education Authority (LEA)

Local Education Authorities form part of the metropolitan and non-metropolitan county units of local government administration. They have responsibility for providing education, within the broad principles laid down by central government, at the primary, secondary and higher levels.

> The education authorities plan the arrangement of schooling in their areas, subject to the Secretary of State's approval, and decide how children should be allocated between schools. They build most of the schools, pay teachers and provide equipment and materials. (26, p. 12)

There are 97 LEAs in England (see listing on p. 62)

Maintained and Non-maintained Schools

"Maintained" schools refer to those schools that are maintained by local education authorities from public funds. Although a variety of school types are maintained by LEAs, the majority of secondary schools may be categorized as "comprehensive", with non-selective admission, and "grammar" and "secondary modern" with selection by ability.

"Non-maintained" refers to schools that are not financially supported or controlled by the local education authorities. These include the "direct grant" schools which are supported by the Department of Education and Science (and are schools with selective admission), and "independent" schools which receive no public funds.

Headteacher

The headteacher (either headmaster or headmistress) is the equivalent of the principal in American schools.

Assumptions

The following assumptions were made relative to the study:

1. There was a need to obtain accurate and relevant information about the environmental knowledge and attitudes of 5th year students in England.
2. This information could best be obtained by mailing a survey instrument to a randomly selected sample of secondary schools.

3. The sample selected was representative of the population of 5th year students in the various types of secondary schools in England.

4. Cooperating schools selected their sample of students and administered the instrument in accordance with the instructions.

5. Student responses on this instrument were honest and objective, and provided a reliable measure of their knowledge and attitudes relating to environmental concerns.

6. The period between 15 January, 1976 and 15 May, 1976 represented a reasonable time span that was not too extensive for the collection of data.

7. Appropriate statistical methods were used in all analyses of the data.

Delimitations

The following statements represent parameters imposed upon the study by its design:

1. The study was limited to 5th year students attending secondary schools in the counties and metropolitan districts of England, and excluded Wales, Scotland and Northern Ireland.

2. The maintained secondary schools used in the sample selection procedure were limited to those included on a computerized listing provided by the Department of Education and Science. Non-maintained schools (independent and direct grant) were limited to those listed in the Education Committees Yearbook 1974-75 (132).

3. All data used in the sample selection procedure were limited to those presented in the pre-publication manuscript of Statistics of Education. 1974 Schools. Vol. 1 (44).

Limitations

The following statements represent limitations to the study:

1. The environmental knowledge and attitudes of English students examined in this study were limited to those revealed by the survey instrument.

2. The data collected in the survey were intended to serve as a baseline of cognitive and affective information for future studies, and were not intended for the evaluation of existing environmental education programs.

3. While the sampling procedures were designed to produce a sample truly representative of the population of 5th year students, the lack of cooperation by some Local Education

Authorities and selected schools may have reduced the representativeness of the sample.

4. The target population in the survey was 5th year students, and the information gathered does not necessarily indicate the environmental knowledge and affective position of school leavers. School programs in subsequent years may produce significant changes in knowledge and attitudes among students remaining at school.

Design of the Study : An Outline

The Instrument

The instrument developed for the survey consisted of three questionnaires, Forms A, B and C. Part 1 of each form contained factual knowledge and perceptual questions, Part 2 dealt with conceptual knowledge, and Part 3 presented 15 statements of belief for student reaction. There were a total of 45 items on each form, with 14 common items providing the means for comparing response patterns on the three questionnaires. The instrument was thoroughly tested in a pilot study in English secondary schools, and test/retest procedures were used to establish the instrument's reliability.

The Population

The target population consisted of all 5th year students enrolled in the secondary schools of England. The 5th year was chosen since it represents the last year of formal schooling for a large proportion of secondary students.

The Sample

A sampling procedure was used that would ensure proportional representation of the major types of school (viz. comprehensive, secondary modern, grammar, direct grant, independent, and "other secondary") in every region of the country. A total of 500 secondary schools was selected in the sample, and within each participating school the instrument was administered to a sub-sample of about 30 pupils in the 5th year.

Administrative and Data Collecting Procedures

It was decided that the most effective method for collecting data would be to mail the testing materials directly to schools selected in the sample, with a carefully worded letter of explanation to the headteacher. In the case of maintained schools, permission was received from the respective Chief Education Officers before approaching schools with a request to participate in the survey.

Each package contained a personal letter to the headteacher, 30 questionnaires with answer sheets enclosed inside, 30 sharpened pencils, a set of instructions for the cooperating teacher, a form requesting brief information about the school, and a stamped, addressed envelope for the return of completed answer sheets.

The majority of schools were prompt in responding to the request, and two follow-up letters helped in eliciting the cooperation of many of the remainder. Completed answer sheets returned in the mail were checked for accuracy, coded, and machine scored. The data were automatically punched onto computer cards and later transferred to magnetic tape.

Analysis of Data

A number of standard computer programs were employed to analyze the data. The program STATPACK was used in the item analysis of pilot data, and BMD 03D provided test/retest correlations for establishing the reliability of the instrument. The remaining analyses utilized various subprograms from the Statistical Package for the Social Sciences (100). Subprogram FREQUENCIES provided frequency distributions and descriptive statistics, while CROSSTABS presented the number of responses (and percent response) on the alternatives to each item. Relationships between variables were examined by means of the subprograms CROSSTABS (for chi-square analyses), ONEWAY (for analysis of variance), PEARSON CORR (for Pearson product-moment correlations between all items) and SCATTERGRAM (for correlations between scores on different parts of the instrument). Regression analyses were performed using subprogram REGRESSION.

CHAPTER II

A REVIEW OF RELATED LITERATURE

Overview

The purpose of this chapter is to examine research and literature relating to the present study. This review will be organized under the headings of: (1) Studies Relating to Attitudes, Attitude Change and Behavior; (2) Studies Relating to Environmental Knowledge and Attitudes; and (3) Literature Relating to Environmental Education in England.

Studies Relating to Attitudes, Attitude Change and Behavior

The literature in the social sciences abounds with research dealing with attitudes, attitude change and the relationship between attitudes and behavior. In previous large-scale surveys of environmental knowledge and attitudes (to be discussed in the following section), Perkes (104), Bohl (18) and Eyers (53) presented extensive and thorough literature reviews of these topics. To avoid unnecessary repetition, the research described by these authors will not be presented in detail in this chapter. Instead, some of the more relevant studies that they examined will be listed and followed by a brief summary of the salient outcomes.

A number of studies dealing with direct relationships between existing attitudes and knowledge were described by Bohl. These included Irle (76), Swan (127), Eaton (49), Rosenberg (112), Semmel (116), Rosen[illegible]rg and Oltman (113), Brown (22), and Infante (74). These studies (with the exception of Swan's, which used a limited sample) support the contention that there is a relationship between cognitive structure and attitudes, and indicate that an increase in information may result in stronger and more distinct attitudes.

In examining the changes in attitude that may result from altering cognitive information, Bohl reported the findings of George (63), Brown (23), Lyons (88), Green (66), Leslie and Berry (86), Fitzsimmons (57), Hemmer (69), Madden (89), Kleg (79), Shock (120), Atman (8), and Render (110). These studies were consistent in their support of a direct relationship between knowledge and attitude. Bohl noted that all the

> ...studies reported a positive relationship between cognitive and affective components of attitudes. The studies reporting significant correlations identified conceptual items correlating with attitude items while those studies reporting low correlations between cognitive and affective components of attitudes did not

> identify the type of (informational) cognitive item. No studies were found that did not report a positive relationship between cognitive and affective components of attitudes. (18, p. 33)

In addition to reviewing literature on attitudes and attitude change, Perkes addressed himself to the complex area of behavior change and its relationship to attitudes. He found that although "some researchers have been able to find evidence to support the assumption of a relationship between behaviors and attitudes, others have found difficulty in determining the nature of these relationships." (104, p. 20) Inconsistencies in the findings of research dealing with this relationship are reflected in studies by DeFleur and Westie (43), Blatt (15), La Piere (84), Kutner, Wilkins and Yarrow (82), Fleishman, Harris and Burtt (58), Festinger (55), Strong (124), and Tittle and Hill (129). In summary Perkes stated that

> It is generally agreed that behavioral change should be pre-empted by a change in attitudes; that attitudes are reflected in behavior; and that attitude change should result from rational decision-making. But it has been shown that such a simplistic correspondence does not exist. (104, p. 26)

After reviewing a number of studies on the attitude-behavior relationship, Eyers similarly concluded that "little consistency can be expected between expressed attitude and subsequent specific behaviors related to that attitude." (53, p. 41)

Summary

Some generalizations may be gleaned from the literature reviews conducted by Perkes, Bohl and Eyers. A relationship clearly exists between attitudes and knowledge, with greater knowledge usually associated with more positive attitudes. Further, attitudes appear to be more closely correlated with conceptual rather than factual knowledge. Although relationships have been demonstrated between attitudes and behavior, stated attitudes are by no means consistently predictive of overt behavior.

Studies Relating to Environmental Knowledge and Attitudes

A review of the literature indicates that, prior to the present survey, the only existing large-scale baseline studies relating to environmental knowledge and attitudes of secondary students were those conducted by Perkes (104) and Bohl (18) in the United States in 1973 and by Eyers (53) in Australia in 1974. Although a number of smaller local studies have investigated this topic, they will not be reported here since (1) the present study is concerned with national baseline data and regional differences in knowledge and attitudes rather than local community differences; (2) most local studies have utilized very small samples and are of questionable validity; and (3) local studies have frequently been concerned with attitudes and knowledge but have rarely attempted to relate the two.

In the American study Perkes and Bohl were responsible for surveying the environmental knowledge and attitudes of tenth and twelfth grade students in different regions of the country. Perkes sampled 119 secondary schools in 11 states of the Great Lakes and Far Western regions, while Bohl collected data from 272 schools in 22 states of the Midwestern, Southwestern, and Plains and Mountain regions. Schools in the remaining states were also sampled and this data will be presented in a future joint report. The instrument used in the study was developed by the staff of the ERIC Clearinghouse for Science, Mathematics and Environmental Education at The Ohio State University in association with selected consultants. It consisted of three inventories, each of 40 items, dealing with environmental facts, concepts, beliefs and perceptions.

The response patterns and outcomes of the two studies were very similar and some common generalizations can be made regarding their findings. For the most part students did not display a high level of factual knowledge on environmental matters, but responded with considerably more success on conceptual knowledge items.

Student attitudes tended to be favorable toward the environment, especially when they involved little personal commitment or sacrifice. Some significant differences were noted with respect to sex, grade level and size of community. Males scored significantly higher than females on factual knowledge items, while on many conceptual items females exhibited more knowledge than the males. Twelfth graders performed better than pupils in the tenth grade on conceptual items, but did not display a clear superiority on factual knowledge. Slight attitudinal differences were evident with regard to sex and grade level, although these were not considered to be of practical significance. Community size did not relate to knowledge of environmental facts or concepts, however they did relate to student perceptions of the environmental problems in their community. State of residence was also found to be a significant factor in the identification of environmental problems in the community. For example, Perkes found that California respondents expressed concern about air pollution, those in Wisconsin selected water pollution, while students in Hawaii considered land use to be the major local problem.

In a later analysis of the survey data, Perkes randomly selected 100 students from those scoring in the top ten percent on knowledge, and

100 students from those scoring in the bottom ten percent. He then compared the environmental attitudes of the two groups using chi-square analyses. In a paper entitled "The Relationship Between Environmental Knowledge and Attitudes" (105), Perkes concluded that:

> (a) There are significant differences in some attitude responses of high knowledge and low knowledge scorers. In general, high scorers tended to have more positive environmental attitudes than low scorers.
>
> (b) High knowledge scorers were less variable in their responses than low knowledge scorers.
>
> (c) General environmental attitudes which do not indicate an eventual behavioral change tend to be viewed more positively than those items which require personal commitment and behavioral adjustment.
>
> (d) Low knowledge scorers were less interested in participation in environmental decision-making than high knowledge scorers. (105, p. 1)

In the other large-scale survey, Eyers selected items from the American inventory and modified them to suit Australian conditions. His instrument, which consisted of 40 knowledge, belief and perceptual items, was administered to 4821 tenth grade students in 160 Australian secondary schools. The results of this study were in most respects similar to those of Perkes and Bohl. He reported a number of areas of knowledge inadequacy, however the composite environmental attitude was considered to be positive and supportive of measures designed to preserve the species Homo sapiens. Some differences in knowledge were noted with respect to state of residence, type of school, and region (metropolitan versus non-metropolitan), however these were not large enough to be considered of practical significance. On the other hand, sex differences were very pronounced, with males having more environmental knowledge than females. These results contrasted with the attitude section in which differences were associated with type of school and region, but not with state of residence or sex.

A perceptual item devised by Eyers asked students to identify the source of most of their knowledge about the environment. The majority (59.9%) selected "out of school" sources such as the media and discussion with parents and friends, while only 4.2% felt that they had gained most of their information from special environmental education courses at school. While this response pattern may be indicative of deficiencies in the environmental curricula in schools, it also highlights the importance of newspapers, radio and television as educational tools. Since "the findings suggest that media sources do influence environmental knowledge, and perhaps attitudes," Eyers suggested that we capitalize on this by making efforts "to improve the coverage given to such matters by the media." (53, p. 116)

Several other studies relating to environmental knowledge and attitudes are worthy of discussion. Hounshell and Liggett (71) developed an Environmental Knowledge and Opinion Survey (EKOS) which consisted of 35 knowledge items and 30 items for measuring attitudes. After field testing, the instrument was administered to approximately 2500 sixth grade students in North Carolina. An analysis of the results revealed that the girls scored significantly higher than the boys on the attitude sub-test (at the .001 level), but there were no significant differences between the sexes on the knowledge sub-test. Urban students performed better (at the .05 level) than rural students on the knowledge items although significant differences were not observed in their attitudes. In addition, a correlation coefficient of 0.6 was found between all participants' scores on the knowledge and attitude sub-tests. This relatively strong correlation led the authors to postulate that

> ...one viable approach to creating constructive environmental attitudes appears to be through providing knowledge about man's environment and his role in the environment to the student. This would lead one to believe that a well-structured, well-planned approach

> to environmental education will yield positive attitudinal changes. (71, p. 30)

Cohen (29) attempted to ascertain whether a relationship exists between environmental attitudes and the amount of environmental information possessed by students. A 75 item instrument, containing an equal number of cognitive and affective questions, was administered to 454 students in seven Indiana high schools. On the basis of scores on the knowledge section, 84 students were identified as having high environmental knowledge or content (High E.C.) and 116 were categorized as having low environmental content (Low E.C.). The attitude responses of the High E.C. and Low E.C. groups were then compared. Although statistical tests of significance were not applied, the author concluded from an examination of the data that a relationship exists between environmental information and environmental attitude. Not only did the group with more information have different attitudes from the Low E.C. group, but they were also more willing to express their attitudes on environmental matters.

The Syracuse Environmental Awareness Tests were developed in 1971 by Kleinke and Gardner (80) for measuring the knowledge of and concern for man's environment among high school students and adults. The inventory consisted of four forms. Forms A and B, each containing 56 multiple-choice items, were equivalent forms constructed to provide measures of knowledge about environmental problems. Forms C and D each consisted of 105 affective items designed to assess attitudes toward environmental issues. The inventory was extensively field tested in the northeastern United States and norms were established. Scores on the test can be used to produce an individual student's cognitive and affective profile relative to environmental issues. Suggestions of how to evaluate student scores and plan remedial action are provided in the Administrative Handbook for the SEAT Tests (62).

Summary

Although relatively few studies have been conducted relating to environmental knowledge and attitudes, some patterns appear to be evident. For the most part knowledge about environmental problems and issues is rather limited, while expressed attitudes tend to be quite positive. Although it does not hold true in all cases, most studies indicate that boys have greater environmental knowledge than girls; however sex differences in attitude toward the environment are not readily apparent. Significant correlations between environmental knowledge and attitudes have also been reported, with conceptual knowledge correlating with the affective component more strongly than factual knowledge.

Literature Relating to Environmental Education in England

With the recent upsurge of interest in environmental matters and the development of environmental education courses in England, one might expect to find a wealth of literature and research reports having direct bearing and impact upon environmental education programs. However British literature in this area is still somewhat limited, and in examining the shelves of bookstores and university libraries, one is struck by the number of volumes of American origin dealing with ecology and environmental concerns.

A number of British publications, of value as reference materials in environmental courses, have been included in the bibliography. These include Robert Arvill's Man and Environment (7), A Blueprint for Survival (65) by the editors of The Ecologist, Kenneth Mellanby's Pesticides and Pollution (93), Diamant's The Prevention of Pollution (47), The Environmental Revolution (99) by Max Nicholson, and Can Britain Survive? (64) edited by Edward Goldsmith.

Several organizations have been active in producing pamphlets and printed resource materials for use in environmental education. Eminent among these is the Council for Environmental Education which produces a Directory of Environmental Literature and Teaching

Aids (DELTA), a periodical Review of Environmental Education Developments (REED), as well as newsletters and information sheets. Other organizations in this category include The Conservation Society/ Conservation Trust, the Workers' Educational Association (WEA), the National Association for Environmental Education, the Society for Environmental Education and the Town and Country Planning Association. The Workers' Educational Association has developed a series of Background Notes on Social Studies (141) dealing with such topics as air pollution, noise pollution, population of the United Kingdom, and uses and abuses of the countryside. And The Conservation Society has produced a number of free materials to enrich primary, middle and secondary school environmental education. These include booklists, suggested course outlines, and study guides on such topics as conservation, ecology, population and pollution. In addition, the Cambridge University Branch of The Conservation Society and the Cambridgeshire Education Committee jointly produced a paperback entitled Environmental Issues (139) which concisely covers major areas of environmental concern.

Other literature relating to environmental education is the product of curriculum innovation and development efforts at the national, regional and local levels. The most ambitious projects in this area have been instigated by the Schools Council. The Council has listed 23 national projects which contribute to studies of the environment, however only two ("Environmental Studies" and "Project Environment") are solely concerned with environmental education. "Environmental Studies" (68) was developed between 1967 and 1971, and was designed to help teachers systematically use the environment in developing skills and concepts in primary school children. "Project Environment" (1970-73) explored multidisciplinary approaches to environmental education for the age range of eight to eighteen years. The project team placed a major emphasis on "education <u>for</u> the environment" and upon chiefly affective objectives. Published materials include <u>Education for the Environment</u> (32), <u>Learning from Trails</u> (33), <u>The School Outdoor Resource Area</u> (34), and <u>Ethics and Environment</u> (35).

Most activity at the regional and local levels is centered upon groups of teachers working to develop curriculum materials that will be of direct and specific use to them in their schools. These materials range from programs of field study to the development of examination syllabuses. Since the syllabuses of the various examining boards define the parameters of the subject matter to be examined, they exert considerable influence upon the contents of the curriculum. The development of an "A" level syllabus for the Joint Matriculation Board by a group of teachers from Manchester and Cheshire is described by R. F. Morgan in The Development of an "A" Level Syllabus in Environmental Science (95). A similar process conducted by Hertfordshire teachers for the University of London Examination Board is discussed in Environmental Studies: The Construction of an "A" Level Syllabus (24).

To aid in the process of environmental curriculum development, the Leverhulme Trust funded a three year research project under the direction of Dr. R. W. West of the University of Sussex. The study team has been concerned with defining the nature and scope of programs for environmental education in primary and secondary schools, and the results of this part of their work have recently been presented in draft form in A Handbook for Analysts (140).

> Essentially the handbook consists of an analytical framework for the intrinsic evaluation of teaching and learning programmes; i.e. a set of questions and categories that enable a particular programme to be characterized in terms of its aims, intent, environmental orientation and pedagogy. It is hoped that a satisfactory analysis of a programme will enable analysts to pinpoint areas for development and improvement and iron out inconsistencies that normally exist between stated aims and strategies for their achievement. (140, p. 1)

At the present time there is little evidence of research in the field of environmental education in Britain. A literature search did not reveal any experimental studies, and only one large-scale survey was in evidence. This was conducted by Peter S. Berry in 1973 for the Conservation Society. The survey collected data from over 420 middle and secondary schools in the United Kingdom in an attempt to establish the current status of environmental education in the school curriculum. The final report, entitled National Survey into Environmental Education in Secondary Schools. Report and Recommendations (13), was based upon data provided by 356 state-controlled secondary schools in England and Wales, and excluded information gathered from independent, middle and Scottish schools.

The major findings of the survey are summarized in the following extract from the final report:

> 1. The majority of schools claim to be discussing aspects of the environmental crisis, but few have established definite syllabuses in Environmental Studies/ Science, and even fewer regard the work as examinable.
>
> 2. Work on environmental matters may involve a wide range of school departments, particularly with older pupils. Often, however, the work is restricted to those of average or below average ability.

3. Although work on population, resources, pollution, and certain ecological aspects is generally quite well established, there is considerable room for improving the extent to which schools consider the social, political and economic implications of, and particularly the individual's responsibility for, environmental problems. Population matters, especially, are often considered without the necessary follow-up work on sex education and family planning.

4. Most schools undertake some form of practical or field work with an environmental bias, although insufficient use seems to be made of the local environment.

5. The main problems encountered by schools in connection with Environmental Studies/Science are timetable difficulties, the lack of suitably qualified staff, the lack of suitable teaching aids, and the status of the subject in relation to more traditional disciplines, especially in connection with the demands of examinations and university entrance requirements. (13, p. 17-18)

The generally unsatisfactory status of environmental education revealed by this study led to the following recommendations for remedial action:

1. Teachers should study the relationships between man and his environment at their own level of enquiry and explore the contributions which their subjects can make in this field.

2. Schools should adopt one of three approaches

   a. Introduction of an additional subject to the school curriculum, possibly called 'Environmental Science'

   b. Integration of a group of existing subjects, with suitable syllabus modification, possibly called 'Environmental Studies'

   c. Modification of the syllabuses of existing subjects to include 'Environmental Elements' and coordination of these by adoption of the Conservation Grid.

3. Teacher education programmes should include a course on 'Environmental Studies' for all students, irrespective of their main specialization.

4. Local education authorities should appoint advisers in 'Environmental Studies' and should provide ample opportunities for teachers to attend special courses designed to encourage the development of environmental awareness.

5. Examination boards should consider their requirements to see what modifications are required to bring out the environmental implications of existing subjects, or what new subjects are needed.

6. The Department of Education and Science should encourage and support the above measures.

It is further recommended that the above suggestions be tackled with the urgency which the current march of environmental events demands. (13, p. 19-20)

Summary

An examination of the literature reflects the fact that enthusiasm for environmental education in England has outrun supportive research.

It should be a matter of concern to English educators that, while considerable effort has been made in the field of environmental curriculum development at the national, regional and local levels, there remains a dearth of survey and experimental research in this area. In particular, the absence of any baseline measures of the current environmental knowledge and attitudes of English students provides added justification for the present study.

CHAPTER III

DESIGN OF THE STUDY

Overview

The primary purposes of this study were to establish baseline data relating to the environmental knowledge and beliefs of 5th year secondary students in England and to examine relationships that might be of interest to teachers and curriculum developers in environmental education.

The instrument developed for the survey consisted of three questionnaires (Forms A, B and C) with each questionnaire containing a total of 45 cognitive and affective items. All items were thoroughly tested in a pilot study conducted in English secondary schools.

A stratified random sample of 500 secondary schools was selected, and within each participating school the questionnaires were administered to about 30 students in the 5th year. The answer sheets were machine scored, with student responses being automatically punched onto computer cards. Standard computer programs were then employed to assist in analyzing the data.

The design of the study is described in more detail in this chapter under the headings of: (1) Instrument Development; (2) The Population; (3) The Sample; (4) Administrative and Data Collecting Procedures; and (5) Analysis of Data.

Instrument Development

Initial Development

In devising an instrument to measure the environmental knowledge and beliefs of a group of students, it is necessary to define which aspects of the total human environment are to be included within the parameters of the study.

In the broadest sense, man's environment includes all the conditions and influences that affect his life and development and is determined by many complex interactions between the biophysical and socio-cultural components. It might therefore legitimately be argued that research relating to the human environment should include such factors as the influence of television on the development of children, the psychological impact of various colored walls in classrooms, or the sociological consequences of the common cold. However a multitude of environmental influences, such as those mentioned above, clearly cannot be examined within the scope of the present study. Rather the focus is upon those environmental factors that relate to the earth's life-supportive capacity and to the survival and well-being of man and his societies. Such factors are often referred to as "environmental concerns".

An examination of current environmental literature and consultation with persons involved in environmental education and research in England and the United States resulted in the identification of the following broad categories of environmental concern for inclusion in the study:

1. Pollution
2. Population
3. Natural Resources
4. Land Use
5. Energy
6. Environmental Health/Safety
7. Ecological Relationships
8. Social/Political/Economic Influences

Since an objective of this research was to measure environmental knowledge <u>and</u> attitudes, it was necessary to select or devise both cognitive and affective questions relating to each of the above "environmental concern" categories. To assist in this process a matrix was developed as shown in Figure 3.1. In selecting questions for the instrument care was taken to include items from every cell of the matrix.

An important early stage in developing the instrument was the creation of a pool of potentially useful items. Items were selected from a variety of inventories used in previous environmental studies. In particular, suitable questions from the American and Australian national surveys (104, 53) were added to the pool with the intent of providing the means for cross-country comparisons at a later time. Since this method did not adequately cover all of the cells in the matrix, a number of additional questions were written by the author to ensure that all categories were well represented. Almost 400 items in the resulting pool were pasted onto 5" x 8" cards and coded according to the type of question (factual, conceptual, or belief) and the environmental concern to which they most closely related. Questions were then edited, simplifying the wording to an appropriate reading level and modifying terms and expressions that might not be understood by English students (e.g. the term "billion" was changed to "thousand million").

FIGURE 3.1

MATRIX DEFINING ENVIRONMENTAL CONCERNS AND TYPE OF QUESTIONS INCLUDED IN THE INSTRUMENT

	COGNITIVE		AFFECTIVE
	Measure of Environmental Knowledge		Measure of Attitude toward the environment
Environmental Concerns	Factual Questions	Conceptual Questions	Belief Questions
Pollution			
Population			
Natural Resources			
Land Use			
Energy			
Env. Health/Safety			
Ecological Relationships			
Soc./Pol./Ec. Influences			
	17 Questions/Form Answer format: Multiple Choice	10 Questions/Form Answer format: True/False/Don't Know	15 Questions/Form Answer format: Agree/Disagree/No Opinion

As a means of eliciting a maximum amount of information, it was decided to develop three questionnaires each containing 45 items. While any one student was asked to respond to only one questionnaire, the random distribution of three different forms (containing some common items for purposes of comparison) made it possible to collect data from the sample on over one hundred items. In other words, this technique provided information on more than twice the number of items that could reasonably be presented on a single questionnaire for completion during one class period.

Items in the pool that were deemed to be most appropriate were assigned to the three questionnaires (Forms A, B, and C). They were distributed so that Form A dealt primarily with the environmental concerns of pollution and population, Form B with natural resources and land use, and Form C with energy and environmental health/safety. Questions dealing with ecological relationships and social/political/economic influences were distributed across the three forms. In addition, three perceptual questions relating to the student's source of environmental knowledge and to serious environmental problems were included as items common to all forms.

It was recognized that not all of these initially selected items would prove to be acceptable on the pilot study, and that it would be desirable to have field-tested items that could be used as suitable replacements. Form D, consisting of 45 "spare" questions, was therefore developed for field testing along with the other three forms.

Because of the large number of subjects involved in this national survey, it would have been extremely time-consuming and inefficient to attempt to hand-score the student responses. To avoid this an answer sheet suitable for optical scanning was designed and printed.

The Pilot Study

The pilot instrument (consisting of Forms A, B, C and D) was field-tested in nine schools in the counties of Lancashire, Norfolk and Wiltshire during October, 1975. They included comprehensive, secondary modern, direct grant/grammar, and independent schools, and were therefore representative of the major school types to be included in the study. The instrument was administered to a total of 386 students in the 5th year. Of these students, 158 answered the same questions several days later in a test/retest procedure, thus providing data to measure the stability of the items.

In addition to answering the questions, pupils were directed to underline any words or phrases that they could not understand, and to write comments next to items that presented difficulties. In two schools students were personally interviewed by the author after they had answered the questionnaires. From both the written and verbal responses, clear patterns emerged that identified the words that were too difficult for the majority and the items that were generally misunderstood. These problem areas were corrected by substituting simpler words, extensively rewriting the question, or by eliminating the item altogether.

It was evident from the pilot study that most students were able to complete the questionnaire within 30 minutes, and it therefore seemed reasonable to retain 45 items on each form of the final instrument.

The answer sheets completed during the field testing were returned to The Ohio State University where they were machine-scored, with the data being automatically punched onto computer cards. Computer analyses were then performed on the data. The program BMD 03D was used to determine correlations between the test and retest data (as a means of determining the reliability or coefficient of stability of items), and an item analysis was performed using the program STATPACK. This analysis provided the following measures on each item: percent correct, relative difficulty, phi coefficient, point biserial correlation coefficient, discrimination index, and efficiency. Only items that exhibited acceptable levels on these measures, and showed a test/retest correlation significant at the .05 level, were retained on the final instrument.

Copies of the pilot forms together with a set of instructions (see Appendix D) were sent to a total of 18 educators for critical examination. These critics included environmental and science educators working at the secondary and tertiary levels in England, Australia and the United States. Their written feedback was used to modify questions, and was valuable in deciding which items were inappropriate for inclusion in the survey. A smaller group of seven "experts", who were more intimately involved with the study, served as a panel (Appendix D) to decide the correct answers on the conceptual items and the "environmentally positive" response on the belief items. Complete agreement by the panel was necessary for a pilot question to be retained. Items deleted as a result of the computer analyses and critical feedback were replaced with suitable alternatives from Form D.

Final Instrument

The final forms of the instrument and answer sheet were thus the product of thorough field-testing and critical analyses by students and "experts". The reading level for the three questionnaires was determined to be at about the 9th grade level, using both the Fry Graph for Estimating Readability (61) and the Flesch Scale of Readability (59).

Of the 107 items used in the final product, 50 were developed by the author, 27 were selected from the inventories used in America (104) and Australia (53), while the remaining 30 items were drawn from a variety of sources such as Steiner (123), Roth (114), Cohen and Hollingsworth (31), Kleinke and Gardner (80), Bowman (20), and Tinsley (128). The questions selected from these previously-developed inventories were modified to make them appropriate for the English target population.

In constructing the factual knowledge questions presented in Part 1 of each form, care was taken to ensure that only one of the four alternative responses could reasonably be considered "correct". At least two authoritative sources were required to verify the correct response to each item, and these supportive references are listed in Appendix E. The acceptable answer to the conceptual questions in Part 2 of each form was determined by unanimous agreement of the panel. Although there are no "right" or "wrong" answers to the belief items (Part 3), the panel was asked to identify on each question the response reflecting "a viewpoint compatible with the maintenance of an environment that will promote the well-being and survival of Homo sapiens as a species, rather than one which is beneficial only to an individual or limited group of individuals". Using this criterion, the panel members were in complete agreement in selecting an "environmentally positive" response for each belief item used in the final inventory.

The distribution of questions (Figure 3.2) was similar to that on the pilot questionnaires. Items on Form A dealt primarily with the environmental concerns of pollution and population, those on Form B with natural resources, and land use, while the emphasis on Form C was on energy and environmental health/safety. The other environmental concerns were distributed across the three forms. A total of 14 common items provided the means for comparing response patterns on the different questionnaires. It should be noted that some questions could reasonably be assigned to more than one category of environmental concern e.g. C 6, C 9, and C 41 have been assigned to "environmental health/safety" although they might equally well have been placed under "pollution". Since these categories are not meant to be mutually exclusive, some questions are bound to cut across boundaries; however the assignment of

FIGURE 3.2

DISTRIBUTION OF ITEMS ACCORDING TO ENVIRONMENTAL CONCERN CATEGORIES

Form	Part	Pollution	Population	Natural Resources	Land Use	Energy	Env. H/S	Ec. Rel.	Soc/Pol/Ec
Form A	1	5,6,7,8,9 10,12,15 16	11,13,17					14	
	2	24,29	30					25,26 27,28	
	3	36,37,38 39,44	40,42,45					35	41,43
Form B	1		16	7,8,9,10 11,14,17	6,12,13 15			5	
	2			24,25,26 27,29,30	28				
	3			35,37,40 43,44,45	36,39 41,42				38
Form C	1	14,16				5,10 12	6,7,8 9,13	15	11,17
	2					26,28	24,25,29	30	27
	3	45				37,39 43,44	36,41		35,38,40 42
Forms A,B,C Common Items	1		1,2		3	4			
	2		22		21	23			
	3		31,33		34	32			

Common "perceptual" Items :

ABC18 Source of environmental knowledge
ABC19 Most serious local problem
ABC20 Most serious national problem

items, as shown in Figure 3.2, is useful in providing a framework for discussing the results in Chapter IV.

Instrument Validity and Reliability

That the instrument has content validity can be argued from the procedures used in its development. A clearly defined rationale (see Figure 3.1, page 48) was used to select questions from a large pool of about 400 items that had been designated as relevent to the study. The selection of the most appropriate items from the pool was done in consultation with the three Ohio State faculty members of the panel (Appendix D). The final instrument was critiqued by the panel and it was agreed that the nature of the specific items, and the proportion of items devoted to each area, were appropriate to the rationale and objectives of the study.

It was decided that the most suitable method for determining the reliability of the instrument would be the test/retest procedure. Arrangements were therefore made in seven representative schools to administer the instrument to the same students on two occasions, several days apart. A total of 164 students provided test/retest data on the three forms. The computer program BMD 03D was used to generate correlation coefficients between the two sets of data for both individual items and total scores. The results of this analysis and the reliability coefficients are presented in Chapter IV (page 90)

The Population

The population examined in this study was defined as all the 5th year students enrolled in the secondary schools of England.

The Choice of the 5th Year as the Target Population

The majority of students in the 5th year are 15 or 16 years old,[2] and this grade represents the last year of formal education for a considerable proportion of the population. The rapid attrition in school enrollment after attaining the school leaving age of 16 years is clearly illustrated by the figures in Table 3.1

TABLE 3.1

NUMBER OF STUDENTS IN ALL SCHOOLS BY AGE. (1974)

Age at beginning of Jan.	14	15	16	17	18
No. enrolled in school	731,323	721,219	354,036	140,388	44,553
Percent of age-group	99.8	99.2	49.8	20.3	6.6

Reference: Statistics of Education (44) pp. 12-13

2. The average of students involved in the survey was 15.4 years. However it should be noted that this average was computed from data in which students reported their ages in whole years only.

The choice of 15 year old pupils for the survey would have been disruptive to schools since students would have to be drawn from different classes for administration of the instrument. However, designating the 5th year as the target population enabled schools to use intact classes for testing with a minimum of inconvenience, and at the same time provided a group that was not yet biased by attrition toward the academically more competent. In addition, this level is comparable to the 10th year in American and Australian schools, making it possible to compare the results on some items with data collected in studies conducted in those countries.

Source of Population Data

At the time that this survey was being planned, the most recent published data relating to school enrollment were to be found in Statistics of Education. 1973 Schools, Vol. 1. However this information proved to be inadequate for the purposes of drawing the sample, since the counties and Local Education Authorities had been reorganized with new boundaries after those data had been compiled. Fortunately, the Director of Statistics of the Department of Education and Science (Mr. K.G. Forecast) made available the pre-publication proofs of Statistics of Education. 1974 Schools, Vol. 1 (44) and a computerized listing of all maintained secondary schools in England. These materials, together with the List of Independent Schools in England and

Wales Recognised as Efficient (45), provided the information necessary to draw a stratified, random sample from the population. The names and addresses of the headteachers of schools selected in the sample were elicited from the Education Committees Year Book. 1974-75 (132).

The Sample

Overview

The objective in drawing a sample was to select a smaller, manageable group of students that would be representative of the target population. The sample selection procedure was based upon the method used by Bohl (18) and Perkes (104) in the American environmental study.

Stage 1 in the sampling procedures involved the random selection of representative schools, while Stage 2 involved the further selection of students within those schools. It was decided that approximately 5[illegible] students from 500 schools, or almost 10% of all secondary schools in England, would more than adequately represent the target population.

The Stage 1 selection procedure, which will be described in detail in the next section, required knowledge of the distribution of students within the different types of school in each Local Education Authority (LEA) and region. For the purposes of this study, school types and regions were defined according to the following categories used by the Department of Education and Science (DES):

School Types	Comprehensive Secondary Modern Grammar Other (including technical)	Maintained by LEAs
	Direct Grant Independent	Non-maintained

Regions

1. North
2. Yorkshire and Humberside
3. North West
4. East Midlands
5. West Midlands
6. East Anglia
7. Greater London
8. Other South East
9. South West

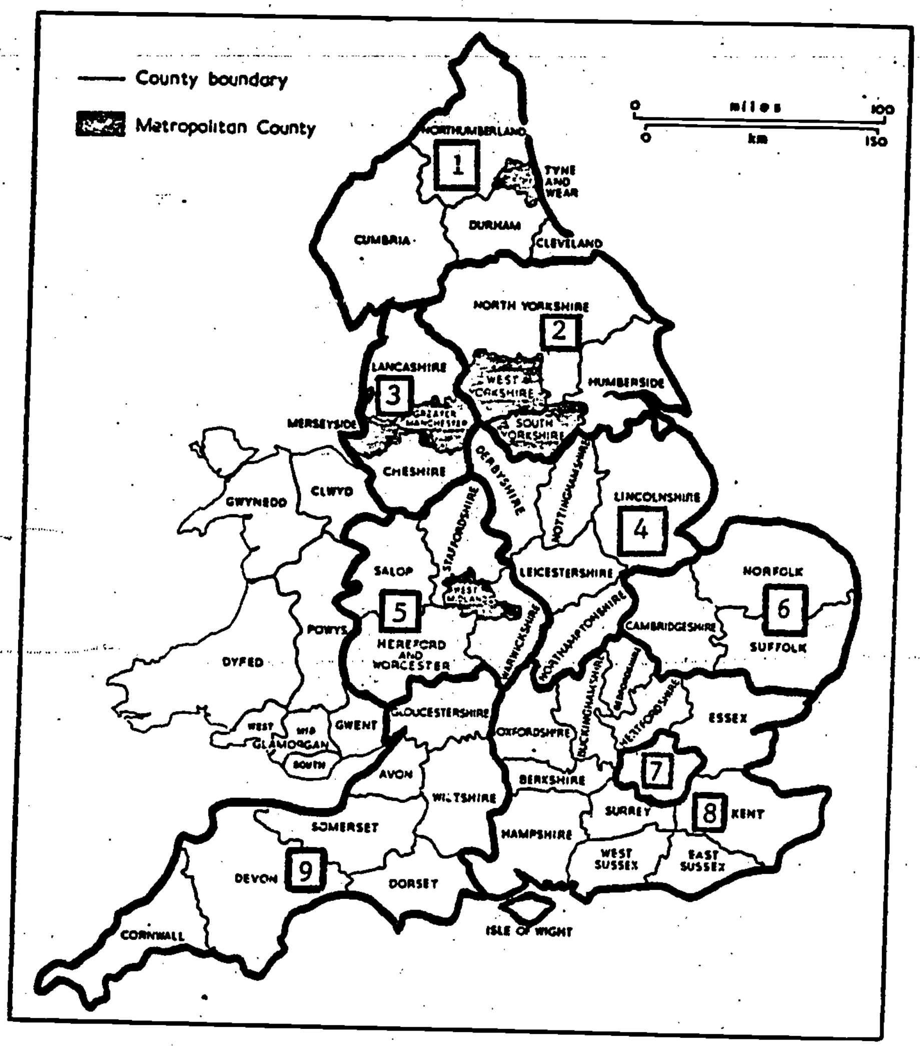
(See Figure 3.3 p. 61)

As a courtesy, letters were written to the Chief Education Officers[3] of all 97 LEAs in England asking their permission to approach the schools under their jurisdiction that were selected in the sample (Appendix B, p.223). As shown in Figure 3.4 (p. 62), 82 authorities

3. This title varies between LEAs. Other common titles for the chief officer are Director of Education and County Education Officer.

FIGURE 3.3

REGIONS OF ENGLAND



LEGEND

1. North
2. Yorkshire and Humberside
3. North West
4. East Midlands
5. West Midlands
6. East Anglia
7. Greater London
8. Other South East
9. South West

FIGURE 3.4

LOCAL EDUCATION AUTHORITIES COOPERATING IN SURVEY

Region	LEAs Cooperating	LEAs not Cooperating
1. North	Cleveland	
	Cumbria	
	Durham	
	Northumberland	
	Gateshead	
	Newcastle-upon-Tyne	
	North Tyneside	
	South Tyneside	
	Sunderland	
2. Yorkshire and Humberside	Humberside	Leeds
	North Yorkshire	Wakefield
	Barnsley	
	Doncaster	
	Rotherham	
	Sheffield	
	Bradford	
	Calderdale	
	Kirklees	
3. North West	Cheshire	Liverpool
	Lancashire	
	Knowsley	
	St. Helens	
	Sefton	
	Wirral	
	Bolton	
	Bury	
	Manchester	
	Oldham	
	Rochdale	
	Salford	
	Stockport	
	Tameside	
	Trafford	
	Wigan	
4. East Midlands	Derbyshire	
	Leicestershire	
	Lincolnshire	
	Northamptonshire	
	Nottinghamshire	

FIGURE 3.4 (CONT.)

Region	LEAs Cooperating	LEAs not Cooperating
5. West Midlands	Hereford and Worcester Salop Staffordshire Warwickshire Birmingham Coventry Dudley Solihull Wolverhampton	Sandwell Walsall
6. East Anglia	Cambridgeshire Suffolk	Norfolk
7. Greater London	Inner London Barnet Brent Bromley Haringey Havering Hillingdon Hounslow Kingston-upon-Thames Merton Newham Redbridge Richmond-upon-Thames Sutton Waltham Forest	Barking Bexley Croydon Ealing Enfield Harrow
8. Other South East	Bedfordshire Berkshire Buckinghamshire East Sussex Essex Hampshire Hertfordshire Isle of Wight Kent Oxfordshire Surrey	West Sussex

FIGURE 3.4 (CONT.)

Region	LEAs Cooperating	LEAs not Cooperating
9. South West	Avon Devon Gloucestershire Isles of Scilly Somerset Wiltshire	Cornwall Dorset

agreed to cooperate in the survey with only 15 dissenting. In cases where LEAs did not wish to take part in the survey, the schools initially assigned to them were reallocated to adjacent LEAs in the same region, thus causing minimal change in the representativeness of the sample.

Sample Selection

a. Sample selection of schools

Having decided upon a sample size of 500 secondary schools, it was necessary to determine the distribution of these schools in terms of school type and region (and LEAs within regions). The number of schools allocated to each region was calculated on the basis of the ratio of their secondary school enrollment to the total secondary enrollment of England. School enrollments, rather than the number of secondary schools in each region, were used in these calculations to avoid introducing a bias due to variations in the enrollment pattern. For example, a region having a large number of secondary schools with low enrollments would not be allocated schools at the expense of a region having few schools with large enrollments.

The data on student enrollments and school distributions that were used in the sampling calculations are shown in Tables 3.2 (p. 66) and 3.3 (p.67). The major steps used in these calculations were as

TABLE 3.2

SECONDARY PUPILS IN ENGLAND (1 APRIL 1974)

School type / Region	Maintained					Non-Maintained			Grand Total
	Modern	Grammar	Compre-hensive	Other	All maintained Schools	Direct Grant	Independent (efficient)	All non-maintained	
North	50,555	23,751	165,633	12,384	252,323	Distribution by region not appropriate			
Yorks. and Humb.	51,647	25,664	259,576	5,114	342,001				
North West	179,493	68,658	242,734	5,784	496,669				
East Midlands	78,305	35,657	163,388	6,185	283,535				
West Midlands	115,689	57,464	203,690	11,735	388,578				
East Anglia	49,215	14,547	43,722	2,397	109,881				
Greater London	73,524	61,574	326,355	28,907	490,360				
Other South East	160,807	78,107	380,235	58,146	677,295				
South West	77,733	34,584	160,130	13,624	286,071				
England	836,968	400,006	1,945,463	144,276	3,326,713	118,999	211,500	330,499	3,657,212

Adapted from Statistics of Education (44) pp. 6, 7

TABLE 3.3

SECONDARY SCHOOLS IN ENGLAND (1 APRIL 1974)

Region \ School type	Maintained					Non-Maintained			Grand Total
	Modern	Grammar	Compre-hensive	Other	All maintained Schools	Direct Grant	Independent (efficient)	All non-maintained	
North	119	36	180	26	361	Distribution by region not appropriate			
Yorks. and Humb.	84	42	281	7	414				
North West	292	99	257	10	658				
East Midlands	152	63	185	10	410				
West Midlands	206	104	208	16	534				
East Anglia	88	26	51	2	167				
Greater London	126	105	335	45	611				
Other South East	262	123	414	79	878				
South West	140	57	164	21	382				
England	1469	655	2075	216	4415	171	620	791	5206

Adapted from Statistics of Education (44) pp. 6, 7 follows:

(1) Determining the number of maintained versus non-maintained schools.

Of a total of 3,657,212 pupils in the secondary schools of England, a simple computation indicated that 91% were enrolled in maintained schools while 9% were to be found in non-maintained schools. Based upon these proportions, the distribution of the 500 sample schools was as follows:

Number of maintained schools (91%) = 4[illegible]

Number of non-maintained schools (9%) = 45

Of the 45 non-maintained schools, 16 (or 36%) were direct grant and 29 (or 64%) were independent.

(2) Determining the number of schools to be sampled in each region.

This calculation was based upon the formula:

$$N_{region} = \frac{X_{region}}{X_{total}} \times N$$

Where

N_{region} = number of maintained secondary schools to be sampled in a region

X_{region} = enrollment in maintained secondary schools of a region

X_{total} = total enrollment in maintained secondary schools in England

N = model sample size = 455

As an example, the computation to determine the number of schools assigned to the North West region was carried out as follows:

$$N_{region} = \frac{X_{region}}{X_{total}} \times 455$$

$$N_{North\ West} = \frac{496,669}{3,326,713} \times 455$$

$$= 67.93$$

i.e. the number of maintained secondary schools to be sampled in the North West was 68.

(3) Determining the number of each type of school to be sampled in each region.

Having assigned the number of schools to be sampled to each region, their distribution according to school types was calculated by the formula:

$$N_{\text{school type}} = \frac{Y_{\text{school type}}}{Y_{\text{total}}} \times N_{\text{region}}$$

Where

$N_{\text{school type}}$ = number of schools of each type to be sampled for a region

$Y_{\text{school type}}$ = number of schools of each type in a region

Y_{total} = total number of maintained secondary schools in a region

N_{region} = number of maintained secondary schools to be sampled in a region

Using the North West once again as an example, the number of secondary modern schools to be sampled in this region was computed as:

$$N_{\text{modern}} = \frac{Y_{\text{modern}}}{Y_{\text{total}}} \times N_{\text{region}}$$

$$= \frac{292}{658} \times 68$$

$$= 30.18$$

i.e. the number of secondary modern schools to be sampled in the North West was 30.

A summary of all computations to date, showing the distribution of sample schools by region and school type, is presented in Table 3.4 (p. 72)

(4) Determining the number of each type of school to be sampled in each LEA.

The first step in determining the assignment of schools to Local Education Authorities was to calculate a "unit population" for each school type in all regions. The unit population is the number of students represented by one sampled school of a given type in a given region.

These values were computed as follows:

$$\text{Unit Population} = \frac{Z_{\text{school type}}}{N_{\text{school type}}}$$

Where

$Z_{\text{school type}}$ = enrollment in a given school type for a given region

$N_{\text{school type}}$ = number of schools of a given school type to be sampled in a given region

Again, using the North West as an example, the unit population for secondary modern schools was calculated as shown:

TABLE 3.4

NUMBER OF SCHOOLS IN SAMPLE BY SCHOOL TYPE AND REGION

Region \ School type	Maintained Secondary					Non-maintained Secondary			Grand Total
	Modern	Grammar	Compre-hensive	Other	All maintained Schools	Direct Grant	Independent (efficient)	All Non-maintained	
North	11	3	17	3	34	Distribution by region not appropriate			
Yorks. & Humb.	10	5	31	1	47				
North West	30	10	27	1	68				
East Midlands	14	6	18	1	39				
West Midlands	20	10	21	2	53				
East Anglia	8	2	5	0	15				
Greater London	14	12	36	5	67				
Other South East	28	13	44	8	93				
South West	14	6	17	2	39				
England	149	67	216	23	455	16	29	45	500

TABLE 3.5

UNIT POPULATIONS FOR MAINTAINED SCHOOLS

	Modern	Grammar	Comprehensive	Other
North	4596	7917	9743	4128
Yorks. and Humb.	5165	5133	8373	5114
North West	5983	6866	8990	5784
East Midlands	5593	5943	9077	6185
West Midlands	5784	5746	9700	5868
East Anglia	6152	7274	8744	-
Greater London	5252	5131	9065	5781
Other South East	5743	6008	8642	7268
South West	5552	5764	9419	6812

$$\text{Unit Population} = \frac{Z_{\text{modern}}}{N_{\text{modern}}}$$

$$= \frac{179{,}493}{30}$$

$$= 5983$$

In the same way, the unit populations for all types of maintained secondary schools were computed. These values are presented in Table 3.5 (p. 73)

Using this information, the number of schools of each type to be sampled from an LEA was determined by dividing the total number enrolled in a given school type for the LEA by the unit population. Table 3.6 illustrates this procedure for the LEA of Lancashire in the North West region.

TABLE 3.6

DETERMINATION OF SCHOOLS TO BE SAMPLED IN LANCASHIRE

	No. of pupils enrolled	Unit Population	No. of schools to be sampled	Actual No. sampled
Modern	34,992	5983	5.85	6
Grammar	10,920	6866	1.59	2
Comprehensive	50,885	8990	5.66	6
Other	0	5784	0	0

The last two columns in Table 3.6 indicate that it was necessary to "round" fractions to the nearest whole number. When the value for a given school type was "rounded up", as far as possible the value for the same school type in an adjacent LEA was "rounded down". And as mentioned earlier, the schools assigned to LEAs that did not wish to participate were reallocated to adjacent LEAs in the same region. Thus every effort was made, within the restrictions imposed by practical considerations, to produce a sample of schools truly representative of the total school population.

Once the sampling calculations were completed the stage was set for randomly sampling schools from the total population. Computerized listings of all maintained secondary schools were arranged so that schools were ordered by size categories within their respective LEAs. The first school of a given type was identified by means of a random numbers table, and subsequent schools of the same type were selected at fixed intervals down the list. The intervals were determined for each school type within each LEA from the ratio of the number of schools to be sampled to the total number of schools of that type in the LEA.

In the case of direct grant and independent schools, the sample was drawn from listings contained in the Education Committees Yearbook, 1974-75 (132) by means of a random numbers table and calculated fixed intervals.

b. Selection of students within schools.

As indicated earlier, Stage 2 of the sampling procedures involved the selection of students within the sample schools. Cooperating teachers were given the choice of two methods for identifying a group of about 30 students within the 5th year. Method A required an intact heterogeneous class representative of the whole ability range of the 5th year, while Method B involved a random selection procedure from an alphabetical listing of all students at that level. A detailed description of this method is provided in Appendix C (p.233) under the heading of "Instruction for Cooperating Teachers".

Administrative and Data Collecting Procedures

Approach to the Schools

Since confidence in the results of the survey would be enhanced by a high response rate from sample schools, every effort was made to employ procedures and techniques that would encourage cooperation. Some of the factors that are believed to have contributed to the high level of cooperation may be considered under the following headings:

a. Timing.

The time at which schools were approached during the school year was important. It was not possible to administer the survey before the New Year because of the time required to develop and print the instrument and answer sheets after the pilot study results had been analyzed. By March, however, students in the 5th year throughout the country become preoccupied with preparation for the General Certificate of Education "O" level and Certificate of Secondary Education public examinations. Since the packages were mailed to schools on 15th January, the majority were able to administer the task before examination preparation became a priority.

b. Permission of Chief Education Officers.

As described earlier, the sample was only drawn from schools in the 82 LEAs in which the Chief Education Officers had indicated support of the survey. Requesting their permission to approach schools was not only a courtesy, but also provided greater incentive for headteachers to cooperate.

c. Letters to Headteachers.

It was recognized that a letter sent to headteachers requesting their participation in the survey would be very time consuming and would probably result in a large percentage of refusals. Instead it was decided to send the package of materials together with a carefully constructed letter of explanation.

Each letter was personally addressed to the headmaster or headmistress and was signed by the author and Richard F. Morgan, the English consultant. The letters briefly explained the importance of the survey, stressed that administration of the instrument was simple and [illegible] be completed within one class period, and indicated that part[illegible]ion would involve no expense to the school. A copy of the letter is provided in Appendix B (p.223).

g. Packages of Materials.

The 500 packages were put together and addressed at The Ohio State University, then air-freighted to England where they were mailed to headteachers of the selected schools by the English consultant. In addition to the personal letter described above, each package contained 30 instruments (10 of each form) with answer sheets enclosed inside, 30 sharpened pencils inscribed with the words ENVIRONMENTAL SURVEY (which the students were able to keep), a set of instructions for the cooperating teacher, a form requesting brief information about the school, and a stamped, addressed envelope for the return of the completed answer sheets. Examples of instruments and answer sheets are presented in Appendix A (p.195) while other printed materials in the package are shown in Appendix C (p. 233).

e. Follow-up Procedures.

Within one month of mailing out the packages, completed answer sheets had been returned by 64% of the sample while 6% responded that (for various reasons) they were unable to assist in the survey. Follow-up letters were posted on 16th February to headteachers of the remaining 30% of the schools that had not responded, providing additional information about the study and urging their cooperation. During the next two weeks replies were received from about one-half of these schools. On 27th February a second follow-up letter with a stamped, addressed card enclosed was sent to the remaining 15% of the sample that had not responded. The card made it possible for headteachers to indicate whether or not they intended to participate in the survey by simply checking a box on the card and dropping it in the mail. At the completion of the survey responses had been received from all but 16 schools or 3% of the total sample. Details of the response patterns are presented in the following chapter (p. 83) and copies of the letters sent to schools may be seen in Appendix B (p. 223).

Finally, a printed card was sent to the headteachers of all participating schools, thanking them for their cooperation and indicating that further information regarding the results of the study would be provided at a later date.

Data Collection and Preparation for Analysis

The completed answer sheets were returned in the mail to Preston Polytechnic School of Education, Chorley Campus, where they were sorted and allocated a school code number. Schools that did not provide all of the requested information were contacted by telephone for clarification. The answer sheets were then packed into boxes and returned to The Ohio State University in the company of the author.

Each sheet was examined to make sure that the response marks in pencil were satisfactory for machine scoring. In addition, they were coded with an identification number and with information relating to the type of school, school size, sex composition of the school, and sampling method used.

The answer sheets were then optically scanned and the data automatically punched onto computer cards. After checking for accuracy, the data were transferred from cards onto a computer tape for convenience.

Analysis of Data

The analysis of data was greatly facilitated by the use of standard computer programs available at The Ohio State University. The program STATPACK, developed by the Center for Measurement and Evaluation at The Ohio State University, was employed in the item analysis of the pilot data, and BMD 03D from Biomedical Computer Programs (48) provided test/retest correlations for identifying reliable items on the pilot instrument and the reliability of the final inventory.

The remaining analyses utilized various subprograms from the Statistical Package for the Social Sciences (SPSS) by Nie *et al.* (100). The subprogram FREQUENCIES presented the frequency of responses on each form, and the frequency of responses by each region, school type, school size, school sex, student sex, age category, and sampling method. CROSSTABS tabulated the number of responses (and percent response) on the alternatives to each item.

To determine if significant relationships existed between student responses and the independent variables of region, school type, school size, school sex, student sex, age and sampling method, a number of chi-square analyses were performed using the subprogram

CROSSTABS. Chi-square was also used to demonstrate the similarity of response patterns on common items on the three forms. Relationships between total scores on the three parts of each questionnaire (factual, conceptual, and belief) and the independent variables mentioned above were examined by analysis of variance, using the subprogram ONEWAY. Regression analyses, to investigate relationships between the independent demographic variables and criterion variables, were performed by means of subprogram REGRESSION.

Correlations between total scores on the factual, conceptual and belief sections of each form were established by means of the subprogram SCATTERGRAM, while the Pearson product-moment correlations between all items were provided by PEARSON CORR.

It should be noted that in all analyses involving "total belief scores", the score used was the number of responses in agreement with the panel. Since the panel used a criterion (previously described) to identify the "environmentally positive" response on each item, the composite belief score is seen as being indicative of the student's environmental attitude.

CHAPTER IV

RESULTS AND DISCUSSION

Overview

An analysis of the data obtained in the survey is presented in this chapter in both descriptive and tabular form. The results and discussion are organized under the following headings:

1. Response Rate and Distribution
2. Comparison of Sampling Techniques used in Schools
3. Comparison of Forms A, B and C
4. Reliability of the Instrument
5. Analysis of Student Responses
6. Relationships Between Variables

Response Rate and Distribution

Table 4.1 summarizes the pattern of returns received by the cut-off date of 15th May, 1976. A total of 383 schools, or 76.6% of the sample, returned packages of completed answer sheets. Of the remaining schools, 98 (19.6%) replied that they were not able to participate in the survey, three (0.6%) indicated that the materials

TABLE 4.1

SCHOOL RESPONSE RATES

		Number in Sample	Refusals	No Response	Materials Lost in Mail	Number of Returns	Returns as Percent of Sample
Maintained Schools by Region	North	34	8	1	-	25	73.5
	Yorks. and Humb.	47	7	-	1	39	83.0
	North West	68	9	3	-	56	82.4
	East Midlands	39	9	1	-	29	74.4
	West Midlands	53	7	1	-	45	84.9
	East Anglia	15	2	-	-	13	86.6
	Greater London	67	24	4	-	39	58.2
	Other South East	93	12	5	1	75	80.6
	South West	39	9	1	-	29	74.3
Non-Maintained	Independent	29	10	-	-	19	65.5
	Direct Grant	16	1	-	1	14	87.5
	Total	500	98	16	3	383	76.6

must have been lost in the mail, while 16 (3.2%) failed to respond in any way. Five of the 98 schools listed as "refusals" were in fact no longer in existence as a result of the recent reorganization of the school system.

The cooperating schools returned a total of 11,009 usable answer sheets. These were distributed as follows:

3740 (34.0%) were in response to Form A

3669 (33.3%) were in response to Form B

3600 (32.7%) were in response to Form C

Table 4.2 shows the number of student responses received from each region, and also illustrates that the regional distribution of respondents corresponds closely to the regional distribution of schools allocated in the sampling procedure. Similarly, the percentage of returns received from each school type closely approximates the distribution of school types selected in the sample (Table 4.3). Variations may have resulted from different response rates among school types, and from the changed status of some schools through reorganization.

Additional frequency counts indicated that 5,510 (50.0%) of the respondents were male and 5,446 (49.5%) were female. The remaining

TABLE 4.2

DISTRIBUTION OF STUDENT RESPONDENTS BY REGION

	Number of Answer Sheets Received from Student Respondents	Distribution of Student Respondents (percent)*	Distribution of Sample Schools (percent)*
North	731	6.6	6.8
Yorks. and Humb.	1,108	10.1	9.4
North West	1,606	14.6	13.6
East Midlands	827	7.5	7.8
West Midlands	1,350	12.3	10.6
East Anglia	370	3.4	3.0
Greater London	1,083	9.8	13.4
Other South East	2,117	19.2	18.6
South West	846	7.7	7.8
Ind. and Dir. Grant	971	8.8	9.0
Total	11,009	100.0	100.0

* Rounded to nearest tenth

TABLE 4.3

DISTRIBUTION OF STUDENT RESPONDENTS BY SCHOOL TYPE

	Number of Answer Sheets Received from Student Respondents	Distribution of Student Respondents (Percent)*	Distribution of Sample School (Percent)*
Comprehensive	4,710	42.8	43.2
Secondary Modern	3,650	33.2	29.8
Grammar	1,592	14.5	13.4
Ind. and Dir. Grant	971	8.8	9.0
Other	86	0.8	4.6
Total	11,009	100.0	100.0

*Rounded to nearest tenth

53 (0.5%) students did not state their sex. As expected, the majority (67.5%) attended coeducational or "mixed" schools, while 15.3% were from "all-boy" and 17.2% attended "all-girl" schools. The second stage sampling conducted by cooperating teachers resulted in a mean class size of 28.7 students.

Comparison of Sampling Techniques used in Schools

Of the two methods used for selecting students within the 5th year of the cooperating schools, 63.9% of the subjects were members of a "representative class" (Method A) while 36.1% were chosen by a random selection procedure from an alphabetical listing of the entire 5th year (Method B).

In order to ascertain whether the selection procedure influenced the pattern of responses, a chi-square analysis of sampling method versus student response was performed on all items (Appendix F, p.245). The results of this analysis clearly indicate that the method of selecting subjects within schools had no significant influence upon student responses.

Comparison of Forms A, B and C

Responses to the 14 common items were subjected to a chi-square analysis to determine if there were significant differences in responses to the same items on different forms. An examination of the response distributions and chi-square values indicated no significant differences between forms on the common items. As an example, the distribution of student responses to item ABC1 is shown below in Table 4.4:

TABLE 4.4

DISTRIBUTION OF STUDENT RESPONSES ON ITEM ABC1 BY FORMS

	Response Alternatives on Item 1			
	a	b	c	d
Form A	1747 46.7%	1115 29.8%	599 16.0%	278 7.4%
Form B	1661 45.5%	1087 29.7%	624 17.0%	290 7.9%
Form C	1642 45.7%	1094 30.4%	578 16.1%	279 7.8%
Total	5050 45.9%	3296 30.0%	1801 16.4%	847 7.7%

N = 10,994 $X^2 = 3.262$ 6 degrees of freedom Significance = 0.775

In this example, an examination of the row percentages shows a strikingly similar response pattern on the three forms, and the chi-square value indicates that any observed differences may be attributed to chance.

In the survey approximately one-third of the total sample responded to each of the three forms (A, B and C). The results of this comparative analysis of common items gives confidence in the assumption that the response pattern on every item would be essentially the same if they had been answered by all 11,009 subjects in the sample.

Reliability of the Instrument

As previously described on page 56, the reliability of the instrument was determined using the test/retest procedure in seven representative schools. Correlation coefficients between the test and retest data were computed for both individual items and total scores.

Of the 107 items in the instrument, 100 showed correlations beyond the 0.01 level of significance, and only one (B28) was not significant at the 0.05 level. This item, however, showed a significant correlation at the 0.02 level on the pilot study.

The test/retest reliability coefficients for the three forms were:

Form A = 0.84

Form B = 0.83

Form C = 0.89

Analysis of Student Responses

A statistical summary of the overall student performance, giving the mean score, standard deviation, and range of scores for each section of the three forms, is provided in Table 4.5. It should be noted that the scores reported on Belief Items (Part 3) in these tables, and throughout the following analyses, are based upon the number of responses "in agreement with the panel".

Responses to Factual Knowledge Items (Part 1)

Table 4.6 (p. 93) shows the frequency of responses to each alternative on the factual knowledge items, and gives the number of students attempting each item. To facilitate the examination of response patterns, the percent selecting each alternative will be listed against the questions, with the correct answer indicated by an asterisk (*). This will be followed by a brief discussion of pupil responses to factual items in each of the categories of "environmental concern".

ABC1. The present population of Britain is about

45.9	*a)	57 million
30.0	b)	67 million
16.4	c)	77 million
7.7	d)	87 million

TABLE 4.5

SUMMARY OF SCORE STATISTICS ON FORMS A, B, AND C

	Factual Items (Part 1)				Conceptual Items (Part 2)				Belief Items (Part 3)			
	Max. Score	Range	Mean	S. D.	Max. Score	Range	Mean	S. D.	Max. Score	Range	Mean	S. D.
Form A	17	16	7.54	2.66	10	10	6.46	2.15	15	15	9.04	2.66
Form B	17	16	7.81	2.49	10	10	5.99	2.16	15	15	9.39	2.75
Form C	17	15	8.12	2.85	10	10	5.88	1.93	15	15	8.45	2.91

TABLE 4.6

FREQUENCY OF RESPONSES (AS PERCENT) TO EACH ALTERNATIVE ON FACTUAL KNOWLEDGE ITEMS

Item	N	Alternative a	b	c	d
ABC1	10994	45.9*	30.0	16.4	7.7
ABC2	11000	21.7	42.1	34.2*	1.9
ABC3	10979	6.2	7.7	29.4	56.7*
ABC4	10972	69.6*	13.3	12.2	4.9
A5	3733	9.3	14.9	47.4*	28.4
A6	3726	15.5	24.9*	3.1	56.4
A7	3729	8.9	10.8	33.4	46.8*
A8	3721	25.8*	27.3	27.7	19.2
A9	3728	44.8	29.2	16.3*	9.8
A10	3722	32.3	7.6	15.3	44.8*
A11	3731	6.8	19.8	47.1*	26.3
A12	3691	16.7	41.8*	26.9	14.6
A13	3737	19.9	3.0	4.7	72.5*
A14	3719	19.0	20.9	41.9*	18.2
A15	3730	24.1	20.2*	8.5	47.2
A16	3726	74.5*	11.8	7.5	6.3
A17	3735	20.3	44.0*	26.6	9.1
B5	3626	44.7*	37.9	11.1	6.3
B6	3659	9.8	16.0	57.9*	16.2
B7	3661	14.8	11.7	38.6	34.9*
B8	3665	46.6	40.2*	10.5	2.7
B9	3666	9.2	10.7	4.6	75.5*
B10	3666	14.9	42.9*	31.8	10.5
B11	3666	48.5*	28.9	19.4	3.2
B12	3662	8.6	45.0*	40.4	6.0
B13	3638	15.6	10.8	21.7	51.9*
B14	3658	3.8	40.2	47.8*	8.2
B15	3662	16.8	46.0	30.3	6.8*
B16	3662	2.6	20.7*	42.0	34.7
B17	3663	19.1	10.9	60.3*	9.7

*Correct Response

TABLE 4.6 (CONT'D)

Item	N	Alternative			
		a	b	c	d
C5	3593	21.8	50.1*	14.7	13.4
C6	3581	65.3*	13.3	12.3	9.1
C7	3588	16.9	16.8	33.4	32.9*
C8	3584	12.1	46.1	17.6	24.2*
C9	3587	27.1	12.8	35.6*	24.4
C10	3591	9.5	42.8*	41.1	6.7
C11	3587	5.2	7.4	20.1	67.3*
C12	3592	6.7	45.1*	26.7	21.5
C13	3592	10.7*	38.6	17.0	33.8
C14	3573	8.5	16.1	7.6	67.8*
C15	3578	12.7	4.9	67.5*	14.9
C16	3587	22.4	54.9*	14.9	7.9
C17	3591	26.7	17.0	45.8*	10.5

*Correct Response

ABC2. The population of Britain is growing at a rate which is

21.7	a)	more than that of the world average
42.1	b)	about the same as the world average
34.2	*c)	less than that of the world average
1.9	d)	zero

ABC3. At the present time Britain

6.2	a)	produces more food than it uses, and exports the surplus
7.7	b)	produces just enough food to satisfy home needs
29.4	c)	must import about 5% of its food supply
56.7	*d)	must import about 50% of its food supply

ABC4. Which of the following is most likely to be an important world-wide source of energy for the future?

69.6	*a)	solar radiation
13.3	b)	tidal flow
12.2	c)	geothermal sources
4.9	d)	wind power

A5. On several recent occasions in various parts of the world, the sale of fish has been stopped because the fish have been found to contain high levels of

9.3	a)	thalidomide
14.9	b)	chlorine
47.4	*c)	mercury
28.4	d)	lead

A6. Since about 1950 birds of prey (such as the peregrine falcon, golden eagle and sparrow hawk) have seriously declined in numbers. Evidence suggests that this is because the pesticide DDT causes

15.5	a)	the birds to lose their ability to breed
24.9	*b)	the birds to have eggs with shells that are thin and easily break

3.1 c) baby birds to lose their appetite
56.4 d) immediate death to these birds if they eat food with DDT in it

A7. As a result of burning coal and oil the amount of carbon dioxide in the atmosphere is

8.9 a) decreasing, but will not affect the earth's environment
10.8 b) decreasing, with possible serious effects on the earth's environment
33.4 c) increasing, but will not affect the earth's environment
46.8 *d) increasing, with possible serious effects on the earth's environment

A8. Some people object to the use of detergents and soap powders that contain phosphates. The main reason for this is because phosphates

25.8 *a) cause the rapid growth of algae in lakes and rivers
27.3 b) are poisonous to bacteria that help to break down sewage
27.7 c) are harmful to the health of young children
19.2 d) cause birth defects in fish and other aquatic animals

A9. Once DDT has been spread to kill insects, it usually

44.8 a) remains toxic for a few weeks only
29.2 b) remains toxic for about one year
16.3 *c) remains toxic for many years
9.8 d) remains toxic forever

A10. <u>Torrey Canyon</u>

32.3 a) is the site of a large dam in the United States
7.6 b) is an area of scenic beauty in Wales

15.3	c)	is the site of recent discoveries of vast oil reserves
44.8	*d)	is the name of an oil-tanker that ran aground

A11. The population of the world increased from 2 thousand million in 1930 to about

6.8	a)	2.5 thousand million in 1975
19.8	b)	3.0 thousand million in 1975
47.1	*c)	4.0 thousand million in 1975
26.3	d)	5.0 thousand million in 1975

A12. A temperature inversion can be harmful because it

16.7	a)	puts more carbon dioxide into the air
41.8	*b)	keeps air pollutants near the ground
26.9	c)	prevents horizontal air flow
14.6	d)	produces pollutant particles

A13. The size of a population is affected by

19.9	a)	the birth rate
3.0	b)	the death rate
4.7	c)	the rate of immigration and emigration
72.5	*d)	all of the above

A14. Many organic wastes are broken down in water. In the process, what substance is taken out of the water?

19.0	a)	carbon dioxide
20.9	b)	hydrogen
41.9	*c)	oxygen
18.2	d)	sulphur

A15. Solid particles that contribute to air pollution (such as soot and dust) tend to

24.1	a)	increase the earth's temperature
20.2	*b)	decrease the earth's temperature

8.5	c)	keep the earth's temperature steady
47.2	d)	have no effect on the temperature

A16. The major air pollutant (measured by weight) discharged by motor vehicles is

74.5	*a)	carbon monoxide
11.8	b)	nitrogen dioxide
7.5	c)	sulphur dioxide
6.3	d)	particulate matter

A17. At its present rate of growth, the population of the world will double in about

20.3	a)	15 years
44.0	*b)	35 years
26.6	c)	60 years
9.1	d)	100 years

B5. Basic chemical materials would be locked up and would not be available for reuse by plants and animals if it were not for the activities of

44.7	*a)	decomposer organisms
37.9	b)	photosynthetic organisms
11.1	c)	herbivores
6.3	d)	carnivores

B6. During the next 25 years the amount of good quality agricultural land in Britain is expected to

9.8	a)	increase as a result of better planning
16.0	b)	increase as a result of reclaiming waste land
57.9	*c)	decrease as a result of urban and industrial expansion
16.2	d)	remain about the same

B7. The highest average annual rainfall in Britain is recorded in

14.8	a)	the south-west of England
11.7	b)	the Midlands
38.6	c)	the Lake District
34.9	*d)	the north-west of Scotland

B8. The average amount of water used per person per day in British homes is about

46.6	a)	4 gallons
40.2	*b)	40 gallons
10.5	c)	80 gallons
2.7	d)	160 gallons

B9. Several species of whale have become endangered because of

9.2	a)	pollution of the oceans by industrial wastes
10.7	b)	oil spills from tankers and off-shore drilling
4.6	c)	a reduction in the amount of food available to them
75.5	*d)	over-hunting by man

B10. It is estimated that at today's rate of use, known world reserves of resources such as zinc, lead, tin, oil and copper will be used up, or will be at a very low level in about

14.9	a)	10 years
42.9	*b)	40 years
31.8	c)	80 years
10.5	d)	180 years

B11. It is estimated that Britain will be self-sufficient in oil from the North Sea by (or soon after) the year

48.5	*a)	1980
28.9	b)	1990

19.4	c)	2000
3.2	d)	2010

B12. Approximately what percentage of the land surface in the United Kingdom is covered with forests and woods?

8.6	a)	0.5 percent
45.0	*b)	7.5 percent
40.4	c)	27.5 percent
6.0	d)	47.5 percent

B13. The number of hedgerows in Britain is

15.6	a)	increasing, resulting in an improvement to to the natural environment
10.8	b)	increasing, resulting in damage to the natural environment
21.7	c)	decreasing, resulting in an improvement to the natural environment
51.9	*d)	decreasing, resulting in damage to the natural environment

B14. Taking into account the increasing use of fossil fuels for energy, the known world supply of coal is estimated to be enough to last for

3.8	a)	about 5 years
40.2	b)	about 25 years
47.8	*c)	more than 100 years
8.2	d)	more than 1000 years

B15. Approximately what percentage of the land surface in the United Kingdom is used for agriculture (crops, pasture, and rough grazing)?

16.8	a)	20 percent
46.0	b)	40 percent
30.3	c)	60 percent
6.8	*d)	80 percent

B16. At the present time, the world population is growing at a rate of

2.6	a)	less than one percent each year
20.7	*b)	about two percent each year
42.0	c)	about five percent each year
34.7	d)	about ten percent each year

B17. Which country currently consumes the largest amount of oil and natural gas?

19.1	a)	USSR
10.9	b)	Japan
60.3	*c)	USA
9.7	d)	United Kingdom

C5. Most of the electrical energy used in Britain is produced by

21.8	a)	nuclear power plants
50.1	*b)	coal-burning power plants
14.7	c)	oil-burning power plants
13.4	d)	natural gas power plants

C6. Carbon monoxide is a serious air pollutant because it

65.3	*a)	is poisonous to humans
13.3	b)	causes atmospheric haze
12.3	c)	is harmful to vegetation
9.1	d)	is corrosive to metals

C7. Most of the radiation to which people in this country are exposed is due to

16.9	a)	the normal hazards of work
16.8	b)	TV sets and luminous watches
33.4	c)	medical sources (X-rays, etc.)
32.9	*d)	natural sources

C8. The largest single source of man-made radiation to which the British are exposed is due to

12.1	a)	the fallout from bomb tests
46.1	b)	nuclear power-plant radiation
17.6	c)	TV sets and luminous watches
24.2	*d)	medical sources (X-rays, etc.)

C9. Studies have shown that the pesticide DDT is present in the body tissues of people around the world. Most of this DDT in our bodies comes from

27.1	a)	the air we breathe
12.8	b)	the water we drink
35.6	*c)	the food we eat
24.4	d)	being directly exposed to aerosol sprays containing DDT

C10. About how much of the energy stored in coal is converted into electrical energy in modern power plants?

9.5	a)	10 - 20 percent
42.8	*b)	30 - 40 percent
41.1	c)	60 - 70 percent
6.7	d)	80 - 90 percent

C11. Since 1958 the smoke concentrations in central London have decreased by 80%, and sulphur dioxide in the air has decreased by 40%. This improvement in air quality is mainly the result of

5.2	a)	a decline in the population of central London
7.4	b)	the voluntary action of citizens to reduce air pollution
20.1	c)	the voluntary action of industry to reduce air pollution
67.3	*d)	legislative action taken by the government

C12. Nuclear power plants are built near bodies of water because the water is

6.7 a) an added safety factor in case of fire
45.1 *b) a coolant
26.7 c) an alternative power source
21.5 d) a disposal place for radioactive waste

C13. Bronchitis is a common respiratory disease. The death rate from bronchitis in Britain is

10.7 *a) about 4 times greater than the road accident death rate
38.6 b) about 4 times less than the road accident death rate
17.0 c) about the same as the road accident death rate
33.8 d) zero, since it is not a fatal disease

C14. Which of the following materials is <u>not</u> biodegradable?

8.5 a) leaves
16.1 b) bread
7.6 c) wood
67.8 *d glass

C15. Most of the oxygen found in the earth's atmosphere is the result of

12.7 a) the slow decomposition of silica (SiO_2) in the earth's crust
4.9 b) the action of volcanos
67.5 *c) the photosynthetic action of plants
14.9 d) the splitting of water molecules (H_2O) in the oceans

C16. Which of the following is <u>not</u> a potential problem with nuclear power plants?

22.4 a) thermal pollution
54.9 *b) smoke pollution

14.9	c)	waste disposal
7.9	d)	radiation pollution

C17. At present, the cheapest way to dispose of solid wastes collected from homes is by

26.7	a)	incineration
17.0	b)	recycling
45.8	*c)	dumping in pits and covering with soil
10.5	d)	composting

(1) Pollution (Items A5, A6, A7, A8, A9, A10, A12, A15, A16, C14, C16).

The level of factual knowledge relating to pollution appeared to be very variable. As many as three-quarters of the students correctly responded that carbon monoxide is the major air pollutant discharged by motor vehicles, and two-thirds understood the meaning of the term "biodegradable". The only other question correctly answered by a majority was C16, in which 54.9% indicated that smoke pollution is not a potential problem with nuclear power plants. Since the Torrey Canyon remains as one of the most serious examples of massive pollution in recent history, it is perhaps surprising that only 44.8% were able to recognize the name of this oil-tanker that ran aground off the southern coast of England. Of greater concern is the fact that only one-quarter of the respondents knew that phosphates contribute significantly to water pollution by increasing the growth rate of algae in lakes and rivers. The most poorly answered questions in this category related to the pesticide DDT. Fewer than one-quarter knew that DDT affects the proper development of eggs in birds of prey, while the vast majority underestimated the persistence of this chemical. Only 16.3% responded that DDT usually remains toxic for many years.

(2) Population (Items ABC1, ABC2, A11, A13, A17, B16). A clear majority of pupils (72.5%) were aware that the factors affecting the size of populations include the birth and death rates, and the rates of immigration and emigration. Less well known were some basic population statistics. The present world and British populations were correctly estimated by 47.1% and 45.9% of the students respectively, while 44.0% selected the most acceptable projection for the doubling time of the present world population. Knowledge relating to population growth rates appeared to be weak, with students tending to over-estimate the values. Only 20.7% knew that the

world growth rate is about 2% each year, and 34.2% correctly responded that the British population is growing at a rate which is less than the world average.

(3) Natural Resources (Items B7, B8, B9, B10, B11, B14, B17).

As might be expected, it was well known that whales have become endangered by over-hunting by man (74.5%) and that the United States is the world's largest consumer of oil and natural gas (60.3%). The remaining questions in this category were answered correctly by less than one-half of the pupils. Between 40 and 50 percent were correct in their responses to known world reserves of minerals and coal, and in estimating that Britain will be self-sufficient in oil by 1980. A large proportion of the sample (46.6%) thought that British homes use only four gallons of water per day, while 40.2% selected the correct answer of about 40 gallons.

(4) Land Use (Items ABC3, B6, B12, B13, B15).

With one exception, these questions were answered with relatively greater success. The vast majority recognized that Britain must import food, with 56.7% aware that about one-half of the food supply comes from overseas. It was also generally understood that good agricultural land is diminishing (57.9%) and that hedgerows are being removed with detrimental effects on the environment (51.9%). The response pattern on B15, however, indicated a serious misconception about the amount of land devoted to agriculture in the United Kingdom. A majority of respondents were of the opinion that 40% or less of the land is used for agriculture, while only 6.8% knew the correct answer of approximately 80%.

(5) Energy (Items ABC4, C5, C10, C12).

The present importance of coal-burning power plants in Britain (50.1%) and the future likely importance of solar radiation as a source of energy (69.6%) were quite well recognized. Students were less well informed regarding the efficiency of burning coal in modern power plants (42.8%) and the purpose of building nuclear plants near bodies of water (45.1%).

(6) Environmental Health/Safety (Items C6, C7, C8, C9, C13).

Questions relating to carbon monoxide and DDT were answered in a similar fashion to questions on the same topics in the pollution category. Over 65% knew that carbon monoxide is a pollution problem because it is poisonous to humans, while only 35.6% were aware that most of the DDT found in our body tissues is ingested in our food. Sources of radiation were not well known. Strangely enough, the most frequent response on item C7 incorrectly identified the source of radiation to which most people are exposed as "medical sources" (33.4%), whereas on item C8 students tended to avoid the correct answer of "medical sources" as the largest single man-made source of radiation affecting the public. On this question a misconception is very evident, with 46.1% selecting nuclear power plants compared to only 24.2% who correctly recognized that we are more frequently exposed to medical sources of radiation. The serious nature of bronchitis was greatly under-estimated. Although item C13 was a difficult question with only 10.7% making the correct selection, it should be of concern that one-third of the respondents did not know that bronchitis can be a fatal disease.

(7) Ecological Relationships (Items A14, B5, C15).

Two-thirds knew that most of the oxygen in the earth's atmosphere is the result of the photosynthetic action of plants. However, the two questions relating to function of decomposer organisms, and the removal of oxygen from water during the decomposition of organic materials were less well understood, with a little over 40% choosing the correct answers.

(8) Social/Political/Economic Influences (Items C11, C17).

The importance of legislative action in curbing pollution, as opposed to voluntary measures, was recognized by two-thirds of the respondents. Fewer showed knowledge of the economics of disposing of solid waste.

Responses to Conceptual Knowledge Items (Part 2)

Frequencies of responses to conceptual knowledge items are presented in Table 4.7 and against the alternatives to each question. This is followed by a discussion of response patterns under each category of "environmental concern".

ABC21. If sufficient water were available, virtually all of the land surface of the world could be economically used to produce food.

31.6 a) True

TABLE 4.7

FREQUENCY OF RESPONSES (AS PERCENT) TO EACH ALTERNATIVE ON CONCEPTUAL KNOWLEDGE ITEMS

Item	N	Alternative		
		a	b	c
ABC21	11005	31.6	60.2*	8.2
ABC22	10995	51.0*	20.6	28.4
ABC23	10998	22.6	72.0*	5.3
A24	3738	75.5*	11.1	13.4
A25	3736	77.4*	12.2	10.4
A26	3740	39.8	47.2*	12.9
A27	3736	69.3*	17.6	13.1
A28	3735	20.9	49.1*	30.0
A29	3735	75.3*	11.6	13.0
A30	3736	71.0*	16.8	12.2
B24	3666	18.3	59.0*	22.7
B25	3667	77.5*	6.4	16.1
B26	3665	74.4*	10.4	15.3
B27	3661	37.6	36.8*	25.6
B28	3665	77.5*	13.1	9.4
B29	3658	42.0*	39.1	18.9
B30	3667	39.9	45.5*	14.6
C24	3594	21.2	62.3*	16.5
C25	3594	89.7*	4.5	5.8
C26	3594	49.8*	36.8	13.4
C27	3589	30.6	25.6*	43.8
C28	3592	76.8*	12.6	10.6
C29	3591	52.9*	23.4	23.7
C30	3589	50.9*	23.7	25.4

* Correct response

60.2 *b) False
8.2 c) Don't Know

ABC22. The interaction of environmental, biological and social factors determines the size of human populations.

51.0 *a) True
20.6 b) False
28.4 c) Don't Know

ABC23. There is an unlimited supply of energy available to man from fossil fuels (such as coal and oil).

22.6 a) True
72.0 *b) False
5.3 c) Don't Know

A24. Pollution caused by man may give rise to irreversible changes in the environment.

75.5 *a) True
11.1 b) False
13.4 c) Don't Know

A25. In any environment, one component like water, air, or food may limit the type of life which can survive.

77.4 *a) True
12.2 b) False
10.4 c) Don't Know

A26. A natural body of water (such as a river or lake) will always have sufficient dissolved oxygen to support aquatic animal life.

39.8 a) True
47.2 *b) False
12.9 c) Don't Know

A27. Living things are interdependent with one another and with their environment.

69.3	*a)	True
17.6	b)	False
13.1	c)	Don't Know

A28. The rate of adaptation in organisms always keeps pace with the rate of change in the environment.

20.9	a)	True
49.1	*b)	False
30.0	c)	Don't Know

A29. Increasing human populations and demands for greater industrial and agricultural productivity have resulted in increasing levels of environmental pollution.

75.3	*a)	True
11.6	b)	False
13.0	c)	Don't Know

A30. The social behavior of humans can be affected by population density.

71.0	*a)	True
16.8	b)	False
12.2	c)	Don't Know

B24. Natural resources are equally distributed with respect to land areas and political boundaries.

18.3	a)	True
59.0	*b)	False
22.7	c)	Don't Know

B25. Wildlife refuges and undisturbed natural areas may be of value in protecting endangered species and perpetuating gene pools.

77.5	*a)	True
6.4	b)	False
16.1	c)	Don't Know

B26. The management of natural resources to meet the needs of successive generations demands long range planning.

74.4	*a)	True
10.4	b)	False
15.3	c)	Don't Know

B27. Throughout history, cultures with little technological development have used more natural resources than those with advanced levels of technological development.

37.6	a)	True
36.8	*b)	False
25.6	c)	Don't Know

B28. Maintaining, improving, and in some cases restoring soil productivity is important to the welfare of people.

77.5	*a)	True
13.1	b)	False
9.4	c)	Don't Know

B29. Minerals are non-renewable resources.

42.0	*a)	True
39.1	b)	False
18.9	c)	Don't Know

B30. The oceans represent a limitless source of food and resources for the future.

39.9	a)	True
45.5	*b)	False
14.6	c)	Don't Know

C24. There is no relationship between the incidence of bronchitis and the level of air pollution.

21.2	a)	True
62.3	*b)	False
16.5	c)	Don't Know

C25. Safe waste disposal is important if the well-being of man and the environment is to be preserved.

89.7	*a)	True
4.5	b)	False
5.8	c)	Don't Know

C26. The ultimate source of most of the energy that we use is the sun.

49.8	*a)	True
36.8	b)	False
13.4	c)	Don't Know

C27. There is a tendency for people to select long-term environmental benefits, often at the expense of short-term economic gains.

30.6	a)	True
25.6	*b)	False
43.8	c)	Don't Know

C28. Life as we know it is dependent upon the transformation of energy from one form into another.

76.8	*a)	True
12.6	b)	False
10.6	c)	Don't Know

C29. Chemical substances may be concentrated as they pass through food chains, and become a hazard to human health.

52.9	*a)	True
23.4	b)	False
23.7	c)	Don't Know

C30. An organism is a product of its heredity and environment.

50.9	*a)	True
23.7	b)	False
25.4	c)	Don't Know

(1) Pollution (Items A24, A29).

Three-quarters of the students responded correctly on these two questions, indicating a sound understanding of the role man plays in causing pollution and the irreversible environmental effects that may result.

(2) Population (Items ABC22, A30)

Pupils appeared to recognize that human social behavior can be affected by population density (71.0%), but were less aware of the factors determining the rise of human populations (51.0%).

(3) Natural Resources (Items B24, B25, B26, B27, B29, B30).

Concepts relating to the importance of wild-life refuges (77.5%), the need for long range planning in the management of natural resources (74.4%), and the unequal distribution of natural resources (59.0%), were generally well understood. Less well established were concepts concerning the non-renewable nature of minerals (42.0%) and the relationship between technological development and the consumption of natural resources (36.8%). Perhaps the most disturbing result to emerge from these questions was the fact that only 45.5% of the students refuted the notion that "the oceans represent a limitless source of food and resources for the future".

(4) Land Use (Items ABC21, B28).

A clear majority of students recognized that human welfare is dependent upon productive soil (77.5%), and that factors other than sufficient water are essential for food production (60.2%).

(5) Energy (Items ABC23, C26, C28).

The concepts that life is dependent upon the transformation of energy (76.8%) and that energy available from fossil fuels is finite (72.0%) were well established. However, less than one-half of the respondents knew that the ultimate source of most of our energy is the sun.

(6) Environmental Health/Safety (Items C24, C25, C29).

Although the importance of safe waste disposal was strongly endorsed (89.7%), almost one-half did not know that chemical substances can be concentrated in food chains and become hazardous to human health. Over 60% knew that a relationship exists between bronchitis and the level of air pollution.

(7) Ecological Relationships (Items A25, A26, A27, A28, C30).

The concepts of limiting factors (77.4%) and the interdependence of living things and their environment (69.3%) were well understood. At the other extreme, only 47.2% knew that dissolved oxygen is not always available in sufficient quantities to support aquatic life.

(8) Social/Political/Economic Influences (Item C27).

The concept expressed in this question was poorly understood. Only 25.6% correctly refuted the assertion that people tend to select long-term environmental benefits, often at the expense of short-term economic gains. The most frequent response was "Don't Know" (43.8%).

Responses to Belief Items (Part 3)

The response frequencies on the belief items are presented in Table 4.8 and next to the alternatives on each question. As before, this is followed by a discussion of response patterns under each "environmental concern" category.

ABC31. Planning which will limit the size of families is important if over-population is to be avoided.

80.0	*a)	Agree
15.2	b)	Disagree
4.7	c)	No Opinion

ABC32. The demand for energy is critical enough to justify relaxing some of the environmental restrictions which hinder energy production.

25.1	a)	Agree
45.5	*b)	Disagree
29.4	c)	No Opinion

TABLE 4.8

FREQUENCY OF RESPONSES (AS PERCENT) TO EACH ALTERNATIVE ON BELIEF ITEMS

Item	N	Alternative a	Alternative b	Alternative c
ABC31	10991	80.0*	15.2	4.7
ABC32	10967	25.1	45.5*	29.4
ABC33	10976	59.2*	27.0	13.8
ABC34	10973	27.6	58.0*	14.4
A35	3724	84.5*	7.5	8.0
A36	3729	76.4*	9.0	14.6
A37	3730	51.3*	34.3	14.4
A38	3731	23.6	69.2*	7.2
A39	3726	37.7	38.2*	24.1
A40	3724	44.9*	45.0	10.2
A41	3722	36.5	22.1*	41.4
A42	3724	11.6	77.8*	10.5
A43	3724	59.5*	22.9	17.6
A44	3724	9.5	83.9*	6.6
A45	3726	56.5*	24.9	18.6
B35	3663	38.5*	41.5	20.1
B36	3657	58.5*	28.5	13.0
B37	3661	9.2	84.6*	6.3
B38	3656	30.7	44.9*	24.4
B39	3657	75.8*	12.8	11.4
B40	3659	49.2*	38.8	12.0
B41	3660	72.0*	12.6	15.4
B42	3661	8.0	86.6*	5.5
B43	3661	60.4*	20.2	19.4
B44	3662	69.1*	24.5	6.3
B45	3661	26.8	58.2*	15.1
C35	3589	58.8	35.2*	6.0
C36	3589	67.2*	17.1	15.7
C37	3584	30.9	54.4*	14.7
C38	3589	64.2*	25.7	10.1
C39	3588	52.2*	19.0	28.8
C40	3583	41.9	39.4*	18.6

TABLE 4.8 (CONT'D)

Item	N	Alternative		
		a	b	c
C41	3586	69.0*	14.4	16.6
C42	3585	19.3	64.5*	16.2
C43	3584	55.6*	22.7	21.7
C44	3579	16.0	55.4*	28.7
C45	3586	49.3*	39.6	11.2

* Response in agreement with panel

ABC33. The tax system should be redesigned to encourage small families rather than large ones.

59.2	*a)	Agree
27.0	b)	Disagree
13.8	c)	No Opinion

ABC34. Large-scale famines are not likely to occur in the near future.

27.6	a)	Agree
58.0	*b)	Disagree
14.4	c)	No Opinion

A35. Man has a moral responsibility to protect the natural environment.

84.5	*a)	Agree
7.5	b)	Disagree
8.0	c)	No Opinion

A36. International agreements with legal and economic sanctions are necessary to prevent industries and oil-tankers from extensively polluting the oceans with their wastes.

76.4	*a)	Agree
9.0	b)	Disagree
14.6	c)	No Opinion

A37. People should only be allowed to burn smokeless fuels in their fireplaces at home.

51.3	*a)	Agree
34.3	b)	Disagree
14.4	c)	No Opinion

A38. Farmers should be allowed to use any pesticide that they wish in order to control the pests that eat their crops.

23.6	a)	Agree
69.2	*b)	Disagree
7.2	c)	No Opinion

A39. A community's standards for pollution should not be so strict that they discourage industrial growth and development.

37.7	a)	Agree
38.2	*b)	Disagree
24.1	c)	No Opinion

A40. Since population is a critical problem facing mankind, most couples should not produce more than two children.

44.9	*a)	Agree
45.0	b)	Disagree
10.2	c)	No Opinion

A41. Continuous growth of British industry and the Gross National Product (GNP) is highly desirable.

36.5	a)	Agree
22.1	*b)	Disagree
41.4	c)	No Opinion

A42. There is no need to worry about over-population because science and technology will solve the problem before it becomes too serious.

11.6	a)	Agree
77.8	*b)	Disagree
10.5	c)	No Opinion

A43. Controls should be placed on industry to protect the environment from pollution, even if it means that things will cost more.

59.5	*a)	Agree
22.9	b)	Disagree
17.6	c)	No Opinion

A44. The oceans represent an unused area where man should dispose of his wastes.

9.5	a)	Agree
83.9	*b)	Disagree
6.6	c)	No Opinion

A45. Adopting a child is a good policy for families who want more than two children.

56.5	*a)	Agree
24.9	b)	Disagree
18.6	c)	No Opinion

B35. Fossil fuels (coal, oil, natural gas) are too valuable a chemical resource to be used to such a great extent in electrical power generation.

38.5	*a)	Agree
41.5	b)	Disagree
20.1	c)	No Opinion

B36. Where scenic and recreation areas are being damaged by large numbers of visitors, there should be restrictions on the number of people who are allowed to visit at any one time.

58.5	*a)	Agree
28.5	b)	Disagree
13.0	c)	No Opinion

B37. People who can afford the high prices should be allowed to buy objects made from the skin or fur of endangered wild animals.

9.2	a)	Agree
84.6	*b)	Disagree
6.3	c)	No Opinion

B38. I would oppose laws that would restrict my standard of living, even though such laws might improve the standard of living for society as a whole.

30.7	a)	Agree
44.9	*b)	Disagree
24.4	c)	No Opinion

B39. The remaining forests in Britain should be conserved at all costs.

75.8	*a)	Agree
12.8	b)	Disagree
11.4	c)	No Opinion

B40. In order to reduce our use of oil, people should only be allowed to own cars that have a low petrol consumption.

49.2	*a)	Agree
38.8	b)	Disagree
12.0	c)	No Opinion

B41. A national land-use plan should be prepared and enforced to prevent housing and industry from using much of the best agricultural land in Britain.

72.0	*a)	Agree
12.6	b)	Disagree
15.4	c)	No Opinion

B42. When companies have finished surface-mining land that they own, they should be allowed to leave it in any condition they wish.

8.0	a)	Agree
86.6	*b)	Disagree
5.5	c)	No Opinion

B43. In order to keep raw materials from being used up too fast, an international authority should be established to ration them.

60.4	*a)	Agree
20.2	b)	Disagree
19.4	c)	No Opinion

B44. A person who buys a new leopard skin coat is just as responsible in bringing about the extinction of the leopard as the person who kills the animal.

69.1	*a)	Agree
24.5	b)	Disagree
6.3	c)	No Opinion

B45. Industry should not use recycled materials when it costs less to make the same product from new raw materials.

26.8	a)	Agree
58.2	*b)	Disagree
15.1	c)	No Opinion

C35. The most important thing to consider about bringing new industry into your area is the number of new jobs it will create.

58.8	a)	Agree
35.2	*b)	Disagree
6.0	c)	No Opinion

C36. We should question the construction of all nuclear power reactors because of the harmful by-products they produce.

67.2	*a)	Agree
17.1	b)	Disagree
15.7	c)	No Opinion

C37. Rather than rationing petroleum products, more oil should be imported from overseas to meet our growing energy needs.

30.9	a)	Agree
54.4	*b)	Disagree
14.7	c)	No Opinion

C38. Strong controls by Government are the most effective way to reduce pollution problems.

64.2	*a)	Agree
25.7	b)	Disagree
10.1	c)	No Opinion

C39. Priority should be given to developing alternatives to fossil and nuclear fuel as primary energy sources.

52.2	*a)	Agree
19.0	b)	Disagree
28.8	c)	No Opinion

C40. It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future.

41.9	a)	Agree
39.4	*b)	Disagree
18.6	c)	No Opinion

C41. Pesticides that remain toxic for a long period of time should be banned.

69.0	*a)	Agree
14.4	b)	Disagree
16.6	c)	No Opinion

C42. Most of the concern about environmental problems has been over-exaggerated.

19.3	a)	Agree
64.5	*b)	Disagree
16.2	c)	No Opinion

C43. The Government should give generous financial support to research related to the development of solar energy.

55.6	*a)	Agree
22.7	b)	Disagree
21.7	c)	No Opinion

C44. Government regulations for the approval of new nuclear power plants are too strict.

16.0	a)	Agree
55.4	*b)	Disagree
28.7	c)	No Opinion

C45. Considering the problems of pollution and crowding, we need to decrease the use of the car as a major means of transportation.

49.3	*a)	Agree
39.6	b)	Disagree
11.2	c)	No Opinion

(1) Pollution (Items A36, A37, A38, A39, A44, C45). There was very strong disagreement with the propositions that "The oceans represent an unused area where man should dispose of his wastes" (83.9%) and that "Farmers should be allowed to use any pesticide that they wish in order to control the pests that eat their crops" (69.2%). There was also a strong consensus that international agreements with legal and economic sanctions are necessary to prevent extensive pollution of the oceans (76.4%). On the other hand, a relatively small 51.3% believed that only smokeless fuels should be used in home fireplaces, 49.3% expressed the need to decrease the use of the car as a major means of transportation, and only 38.2% felt that community standards for pollution levels are more important than industrial growth and development. It is clear from the above responses that students' environmental attitudes are strongly positive when the object of concern does not impinge directly on their lives, but are relatively negative when some personal sacrifice may be required (such as using only smokeless fuels, reducing the use of cars, or decreasing local industrial growth).

(2) Population (Items ABC31, ABC33, A40, A42, A45).

Over three-quarters of the respondents expressed their belief that family planning is important in avoiding over-population, and that we should not rely upon science and technology to solve the over-population problem. Less enthusiasm was shown for redesigning the tax system to encourage small families (59.2%). The suggestion that "Most couples should not produce more than two children" resulted in an equal division of opinion, with 44.9% in agreement and 45.0% disagreeing. Once again, positive environmental attitudes were less evident when personal interests became threatened.

(3) Natural Resources (Items B35, B37, B40, B43, B44, B45).

Students appeared to be positive in their attitudes toward endangered animals, with 84.6% objecting to the sale of skins and furs of endangered wildlife, and 69.1% expressing the belief that a person who buys a new leopard skin coat shares in the responsibility for bringing about the extinction of this species. Beliefs relating to the importance of recycling materials (58.2%) and only allowing the use of cars that are efficient in their petrol consumption (49.2%) were less pronounced. The response pattern to item B35 should elicit some concern, in that a majority of students do not appear to be aware of the long-term value of fossil fuels as a chemical resource for mankind.

(4) Land Use (Items ABC34, B36, B39, B41, B42). Environmentally positive beliefs were expressed on all questions in this category. The importance of reclaiming surface-mined land (86.6%), conserving Britain's remaining forests (75.8%), and preventing the loss of good agricultural land to housing and industry (72.0%) were well recognized. Fewer students believed that large-scale famines are imminent (58.0%) or that visitors should be restricted in their access to scenic areas (58.5%).

(5) Energy (Items ABC32, C37, C39, C43, C44). On these questions approximately one-half of the responses were "in agreement with the panel". An unusually high selection of "No Opinion" on these items may reflect that student beliefs relating to energy are relatively poorly established.

(6) Environmental Health/Safety (Items C36, C41).

General concern for public health and safety was shown in the answers to these items. Sixty-nine percent agreed that pesticides that remain toxic for a long period of time should be banned, and 67.2% would question the construction of all nuclear power plants because of the hazard of radioactive by-products.

(7) Ecological Relationships (Item A35).

The only item in this category elicited a high level of agreement (84.5%) that "Man has a moral responsibility to protect the natural environment". However, it should be noted that many of the same students, in responding to other items on the inventory, chose responses that were not compatible with the protection of the natural environment.

(8) Social/Political/Economic Influences (Items A41, A43, B38, C35, C38, C40, C42).

A majority of students expressed their belief that most of the concern about environmental problems has not been over-exaggerated (64.5%), that strong government controls are the most effective way to reduce pollution (64.2%), and that industry should be subjected to such controls even if it means an increase in costs (59.5%). When asked if the continuous growth of British industry and the GNP is highly desirable, the largest group of respondents selected "No Opinion" (41.4%), perhaps reflecting the complex considerations involved in this topic. The effect of self-interest was once again evident in the responses to several statements in this category. Answers to items B38 and C40 indicate that fewer than one-half of the group would be supportive of laws restricting their standard of living in the interests of society as a whole, or protecting the future quality of life at the expense of their personal freedom of choice. And only 35.2% refuted the contention that new jobs are the most important consideration in bringing new industry into their community.

Responses to Perceptual Items (ABC18-20).

The frequency of responses to each alternative on the perceptual questions is shown in Table 4.9 and below.

TABLE 4.9

FREQUENCY OF RESPONSES (AS PERCENT) TO EACH ALTERNATIVE ON PERCEPTUAL ITEMS

Item	N	Alternative								
		a	b	c	d	e	f	g	h	i
ABC18	10980	31.5	6.9	48.1	13.5					
ABC19	10987	14.4	12.2	10.4	8.5	11.3	8.2	4.1	14.5	16.3
ABC20	10987	9.1	9.4	12.2	8.3	6.6	26.4	5.2	22.0	0.9

ABC18. Which <u>one</u> of the following best describes the way in which you have gained most of your knowledge about the environment?

31.5	a)	general education at school
6.9	b)	special environmental courses at school
48.1	c)	private reading, the radio, and TV
13.5	d)	talking with parents, friends and other people

It is interesting to note that less than 40% of the students believed that they gained most of their environmental knowledge from their formal schooling, while over 60% indicated that this knowledge had been gained from activities that might be described as "self-education". In the perception of these children, the media appears to have played the most important role while special environmental courses have made a relatively small impact.

ABC19. Which <u>one</u> of the following problems do you think is <u>the most serious</u> in the community where you live?

14.4	a)	Land use
12.2	b)	Traffic accidents
10.4	c)	Air pollution
3.5	d)	Water pollution
11.3	e)	Rubbish disposal
8.2	f)	Over-crowding
4.1	g)	Public health
14.5	h)	Crime
16.3	i)	None of the above are problems in our community

A somewhat surprising outcome on this question was the fact that the most frequently selected response was "None of the above are problems in our community". The next most popular choice was "Crime", indicating that this societal problem is of more pressing concern in the minds of many young people than the problems of their local physical environment.

ABC20. Which one of the following problems do you think is the most serious in Britain?

9.1	a)	Land use
9.4	b)	Traffic accidents
12.2	c)	Air pollution
8.3	d)	Water pollution
6.6	e)	Rubbish disposal
26.4	f)	Over-crowding
5.2	g)	Public health
22.0	h)	Crime
0.9	i)	None of the above are problems in Britain

Some interesting observations emerge in comparing the responses of items ABC19 and ABC20. Over-crowding which was of little concern in local communities, clearly emerges as the major concern for Britain as a whole. Although crime rated highly as a local problem, it was selected by a significantly higher proportion of students as being the major problem in Britain. And while 16.3% felt that none of the listed concerns were problems in their community, only 0.9% were prepared to state that they were not serious problems for the country as a whole. It would appear that a sizable number of students recognize that their country is afflicted with environmental problems, but they do not perceive that these problems are serious in their home communities.

Relationships Between Variables

This section is devoted to analyses of the relationships between variables, and provides the information necessary to answer the null hypotheses posited on pages 13 and 14.

The following statistical procedures were employed to determine whether significant relationships existed between both environmental knowledge and attitude and the independent variables of sex, type of school attended, sex composition of the school, school size and region of school attendance:

(a) SPSS subprogram CROSSTABS was used to conduct chi-square analyses between the response patterns on each item on the inventory and the independent variables listed above. When chi-square is performed with a large number of cases, very small differences show significance at the commonly-accepted 0.05 or 0.01 levels. Since the number of subjects responding to each item in this study was always in excess of 3,000, a 0.0001 level of significance was deemed appropriate for all chi-square analyses. The results of these analyses, giving the number of cases, chi-square value, degrees of freedom and level of significance, are presented in Appendix F (p. 245). In addition, the frequency of correct responses on each item by sex, school type, school sex, school size and region, together with chi-square values (marked with an asterisk to indicate significance at the 0.0001 level) are listed in Appendix G (p. 264).

(b) To determine whether significant relationships existed between total scores (on factual knowledge, conceptual knowledge and beliefs) and the independent demographic variables stated above, analysis of variance procedures (SPSS subprogram ANOVA) were utilized. Since the chance of committing a Type I error is increased by performing multiple analyses on the same data, a rigorous level of significance was chosen (0.001). In all cases involving the multiple comparison of means, the post hoc Scheffé test was used to indicate which differences between the means could be considered significant at the 0.01 level. To assist in the interpretation of data, mean scores on Forms A, B and C by sex, school type, school sex, school size and region are presented in Tables 4.10 through 4.14; and summaries of all ANOVA results are provided in Tables 4.15, 4.17 and 4.18.

(c) Regression analyses (SPSS subprogram REGRESSION) were used to ascertain the amount of variance that could be attributed to the independent variables of sex, school type, school sex and school size. Region was not included as a variable, since the data from non-maintained schools was excluded from the regional category and would therefore have been treated as "missing data" in all the regression analyses. Computer printouts of these analyses are presented in Appendix H (p.287), with Table 4.16 (p.147) providing a summary of the percent of variance attributable to each variable.

Chi-square was also used to examine the relationships between student perception of environmental problems, as expressed on items ABC19 and ABC20, and the independent demographic variables. And ANOVA was again employed to investigate relationships between student perception of "source of environmental knowledge" (Item 18) and level of environmental knowledge and attitude toward the environment.

Finally, as a means of revealing relationships that might exist between factual knowledge, conceptual knowledge and beliefs, correlation coefficients were computed between all items on each form and between total scores on each part of Forms A, B and C. SPSS subprogram PEARSON CORR was used to generate the correlations, and tabulated results are presented in Table 4.29 on page 172.

Relationships between Factual Knowledge and Selected Variables

An examination of the ANOVA results presented in Table 4.15 and the chi-square analyses on individual items (Appendices F and G) indicated significant differences in the response patterns on factual items with respect to sex, school type and school sex, and less pronounced differences with respect to school size and region.

Regression analyses, summarized in Appendix H and Table 4.16, made it clear that most of the observed variance could not be attributed to the demographic variables measured in this study, but was probably due to personal factors such as intelligence and home-background. Only the variables of "sex" and "secondary modern school" accounted for more than five percent of the variance and could therefore be considered meaningful predictors of factual environmental knowledge.

(a) Sex. Males scored significantly higher than females on factual knowledge items on all three forms (Table 4.10). Regression analyses (Table 4.16) showed that approximately five to ten percent of the variance may be attributed to sex differences. Thus, of the five independent variables under consideration, sex appears to be the strongest predictor of factual environmental knowledge.

(b) School Type. Mean scores in Table 4.11 showed considerable differences in the four school types, with non-maintained schools consistently producing the highest scores, followed by grammar, comprehensive and secondary modern schools in that order. Post

TABLE 4.10

MEAN SCORES ON FORMS A, B AND C BY SEX

	Factual Items (Part 1)			Conceptual Items (Part 2)			Belief Items (Part 3)		
	A	B	C	A	B	C	A	B	C
Male	8.25	8.33	8.97	6.58	6.22	5.96	9.14	9.42	8.63
Female	6.83	7.28	7.27	6.34	5.76	5.81	8.95	9.38	8.26

TABLE 4.11

MEAN SCORES ON FORMS A, B AND C BY SCHOOL TYPE

	Factual Items (Part 1)			Conceptual Items (Part 2)			Belief Items (Part 3)		
	A	B	C	A	B	C	A	B	C
Comprehensive	7.36	7.74	7.86	6.27	5.80	5.67	8.96	9.39	8.29
Sec. Modern	6.78	7.02	7.33	5.78	5.33	5.39	8.47	8.80	7.71
Grammar	8.78	8.91	9.60	7.75	7.21	6.93	10.05	10.25	9.86
Non-maintained	9.15	9.17	9.94	7.68	7.25	7.03	9.85	10.13	9.67

TABLE 4.12

MEAN SCORES ON FORMS A, B AND C BY SCHOOL SEX

	Factual Items (Part 1)			Conceptual Items (Part 2)			Belief Items (Part 3)		
	A	B	C	A	B	C	A	B	C
All Boy	9.20	9.06	10.14	7.33	6.97	6.79	9.64	9.71	9.41
All Girl	7.18	7.78	7.64	6.83	6.31	6.14	9.29	9.77	8.76
Mixed	7.25	7.53	7.79	6.16	5.68	5.62	8.84	9.22	8.15

TABLE 4.13

MEAN SCORES ON FORMS A, B AND C BY SCHOOL SIZE

	Factual Items (Part 1)			Conceptual Items (Part 2)			Belief Items (Part 3)		
	A	B	C	A	B	C	A	B	C
Under 400	7.18	7.07	7.57	6.16	5.59	5.53	8.67	9.07	8.01
400 - 799	7.62	7.92	8.25	6.59	6.09	5.97	9.02	9.33	8.48
800 - 1199	7.56	7.80	8.19	[illegible]	5.89	5.96	9.16	9.48	8.54
Over 1200	7.45	7.91	7.97	6.39	6.08	5.72	9.12	9.62	8.48

TABLE 4.14

MEAN SCORES ON FORMS A, B AND C BY REGION

	Factual Items (Part 1)			Conceptual Items (Part 2)			Belief Items (Part 3)		
	A	B	C	A	B	C	A	B	C
North	7.14	7.10	7.53	6.17	5.43	5.52	8.78	9.00	7.97
Yorks and Humb	7.18	7.59	7.74	6.00	5.83	5.76	8.69	9.34	7.96
North West	7.13	7.55	7.79	6.21	5.80	5.77	8.81	9.30	8.31
East Mid.	7.24	7.50	7.83	6.34	5.55	5.60	8.62	9.10	8.22
West Mid.	7.44	7.78	8.22	6.41	5.96	5.77	9.08	9.37	8.44
East Anglia	7.30	7.52	7.90	5.96	6.06	5.92	9.10	9.36	8.82
Greater London	7.41	7.77	8.14	6.58	5.92	6.12	9.06	9.36	8.53
Other S.E.	7.88	8.13	8.20	6.68	6.27	5.85	9.26	9.61	8.52
South West	7.18	7.33	7.69	6.09	5.45	5.50	9.01	8.97	8.16

TABLE 4.15

SUMMARY OF SIGNIFICANCE LEVELS FROM AN ANOVA OF TOTAL FACTUAL KNOWLEDGE SCORES BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX, (4) SCHOOL SIZE, AND (5) REGION

	Form	Degrees of Freedom	F Ratio	Level of Significance
Sex	A	1;3720	285.0	0.000*
	B	1;3644	168.5	0.000*
	C	1;3585	348.8	0.000*
School Type	A	3;3707	126.8	0.000*
	B	3;3636	118.0	0.000*
	C	3;3567	138.8	0.000*
School Sex	A	2;3737	140.9	0.000*
	B	2;3666	90.9	0.000*
	C	2;3596	177.6	0.000*
School Size	A	3;3736	3.0	0.029
	B	3;3665	12.2	0.000*
	C	3;3595	6.2	0.001*
Region	A	8;3407	4.7	0.000*
	B	8;3333	6.0	0.000*
	C	8;3271	2.8	0.004*

* $P \leq 0.001$

TABLE 4.16

SUMMARY OF REGRESSION ANALYSES* SHOWING PERCENT OF VARIANCE ATTRIBUTABLE TO SELECTED VARIABLES

	FACTUAL KNOWLEDGE			CONCEPTUAL KNOWLEDGE			BELIEFS		
	Form A	Form B	Form C	Form A	Form B	Form C	Form A	Form B	Form C
Sex	7.4	4.7	9.3	0.4	1.3	0.2	0.2	0.0	0.5
Comprehensive	0.0	0.0	0.1	0.0	0.2	0.3	0.0	0.0	0.1
Sec. Modern	5.6	5.2	6.5	7.7	6.5	5.9	2.9	2.5	4.6
Grammar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-maintained	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Boy	0.2	0.0	0.3	0.0	0.0	0.1	0.0	0.1	0.0
All Girl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mixed	2.3	2.6	2.7	3.6	4.0	3.9	1.2	0.8	2.1
School Size	0.2	1.0	0.4	0.3	0.7	0.4	0.6	0.7	0.6

*Data extracted from computer printouts in Appendix H hoc Scheffé tests on the three forms indicated that the differences between non-maintained and grammar scores were not significant at the 0.01 level, however these two school types did perform significantly better than comprehensive schools which in turn produced significantly higher scores than secondary modern schools. With the variance attributed to sex removed, a little over five percent of the variance is accounted for by secondary modern schools, while the other school types make virtually no contribution (Table 4.16).

(c) School Sex. Post hoc Scheffé tests demonstrated that "all boy" schools produced significantly higher scores on factual knowledge, while no significant differences were detected between the "all girl" and "mixed" schools. Since school sex accounted for very little of the variance (the variables "all boy" and "all girl" did not enter the prediction table with any appreciable amount of variance), it would appear that the "all boy" superiority was primarily a function of sex and school type i.e. "all boy" schools reflected the higher achievement of males over females, and generally were not penalized by the lower performance of secondary modern schools.

(d) School Size. Significant differences were detected on Forms B and C, and the *post hoc* analyses indicated that the smaller schools of under 400 students did not perform as well as the three larger school categories. Since school size was found to account for less than one percent of the variance (Table 4.16) the significantly poorer performance of the smaller schools can be attributed to other factors such as sex and school type.

(e) Region. Significant regional differences were detected on Forms A and B at the 0.001 level, with Form C barely falling short of significance at this level. Based on pooled data from the three forms, the highest mean score on factual items was achieved by the South East (8.07) followed by West Midlands (7.81), Greater London (7.76), East Anglia (7.57) East Midlands (7.52), Yorkshire and Humberside (7.50), North West (7.49), South West (7.39), and the North (7.25).

While the _post hoc_ analyses differed on each form, the overall pattern indicated that the South East region performed significantly better than the North. However, it should be noted that a frequency count of the distribution of sexes by region revealed some departure from the expected ratio of 49% males to 51% females. Since males have been shown to score significantly higher than females, a preponderance of males would tend to inflate the regional mean. Thus the North, with 47.4% males in its sample, was slightly penalized while the South East, with 51.8% males, gained a slight advantage. The most pronounced deviations in the proportion of males to females were in the West Midlands (57.0% males) and Greater London (38.6% males).

In a similar way, a frequency count of school types by region revealed departures from the expected ratio of 47% comprehensive, 37% secondary modern and 16% grammar (non-maintained schools being excluded from regional distributions). Since it has already been shown that "secondary modern" produced significantly lower scores than the other school types, regions with a high proportion of secondary modern schools would be penalized compared to regions with a lower proportion. Thus the North West, with 47.5% secondary modern schools was at a disadvantage when compared to Yorkshire and Humberside with 17.3% secondary modern.

After correcting for the effect of unequal sex and school type distributions in each region, a general pattern of achievement emerges. It appears that the highest levels of factual environmental knowledge are centered in the South East and Greater London regions, with decreasing knowledge levels as one proceeds toward the more distant regions of the North and South West.

Relationships between Conceptual Knowledge and Selected Variables

As in the previous section ANOVA (Table 4.17) and chi-square analyses (Appendices F and G) were used to determine significant relationships between variables. It was found that response patterns on conceptual items differed significantly with respect to school type and school sex, with less pronounced significant differences

TABLE 4.17

SUMMARY OF SIGNIFICANCE LEVELS FROM AN ANOVA OF TOTAL CONCEPTUAL KNOWLEDGE SCORES BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX, (4) SCHOOL SIZE, AND (5) REGION

	Form	Degrees of Freedom	F Ratio	Level of Significance
	A	1;3720	12.1	0.001*
Sex	B	1;3644	40.1	0.000*
	C	1;3585	5.6	0.017
	A	3;3707	165.8	0.000*
School Type	B	3;3636	151.7	0.000*
	C	3;3567	134.3	0.000*
	A	2;3737	83.7	0.000*
School Sex	B	2;3666	93.9	0.000*
	C	2;3596	92.5	0.000*
	A	3;3736	5.2	0.002
School Size	B	3;3665	6.5	0.000*
	C	3;3595	7.0	0.000*
	A	8;3407	5.5	0.000*
Region	B	8;3333	6.9	0.000*
	C	8;3271	3.1	0.002

* $p \leq 0.001$

associated with sex, school size and region. Regression analyses (Appendix H and Table 4.16) again indicated that most of the variance probably resulted from factors not measured in this study. The only variables appreciably contributing to the variance were "secondary modern school" with about six percent, and "mixed school" with approximately four percent.

(a) Sex. Males scored significantly higher than females on conceptual knowledge on Forms A and B, and marginally higher on Form C. However, since this variable accounted for less than one percent of the variance (Table 4.16) it cannot be considered a reliable predictor of conceptual environmental knowledge.

(b) School Type. The highest conceptual-scores were consistently achieved by non-maintained and grammar schools, while mean scores of the secondary modern schools were always lowest. *Post hoc* tests on the three forms demonstrated that non-maintained and grammar schools performed significantly better than comprehensive schools, and comprehensive schools in turn produced significantly higher scores than secondary modern schools. Regression analyses

(Table 4.16) showed that the variable "secondary modern school" accounted for about six percent of the variance and is therefore predictive of lower achievement on conceptual environmental knowledge.

(c) School Sex. Scheffé tests performed on all forms verified that the "all boy" schools scored significantly higher than "all girl" schools, which in turn achieved significantly better than "mixed" schools. Since "mixed" schools accounted for about four percent of the variance, this variable appears to be a modest predictor of lower scores on conceptual items.

(d) School Size. Although the *post hoc* analyses varied somewhat on the three forms, it was clear that schools of between 400 and 799 students performed significantly better than the smaller schools with enrollments below 400. Since the regression analyses showed that school size accounted for less than one percent of the variance, it would appear that the poorer performance of the smaller schools was to a large extent a function of other variables such as school type and school sex.

(e) Region. Significant regional differences were evident on Forms A and B, with Form C not quite achieving significance at the 0.001 level. Based upon pooled data from the three forms, the South East produced the highest mean scores on conceptual items with 6.27, followed by Greater London (6.22), West Midlands (6.05), East Anglia (5.98), North West (5.93), Yorkshire and Humberside (5.87), East Midlands (5.83), North (5.70), and South West (5.68). An examination of the *post hoc* analyses showed that students in the South East possessed significantly more conceptual environmental knowledge than students in the South West and North.

A regional pattern of achievement on conceptual items appeared to be similar to the pattern noted for factual knowledge. The highest conceptual knowledge scores were found in the South East and Greater London regions, while the more remote North and South West produced the lowest scores.

Relationships between Beliefs and Selected Variables

Once again ANOVA (Table 4.18) and chi-square analyses (Appendices F and G) were used to examine the relationships between variables. Significant differences in the response patterns on belief items were found with respect to school type and school sex, however no differences were detected at the 0.001 level with respect to sex (on Forms A and B), school size and region. The variables under consideration in this study were found to contribute little to the total variance on belief scores (Table 4.16), with "secondary modern school" accounting for less than five percent and "mixed school" accounting for about one percent.

(a) Sex. Although males scored slightly higher than females on environmental beliefs, only the means on Form C were deemed to be significantly different. Since the differences on two of the three forms did not exceed the accepted level of significance, the stated hypothesis that "there are no significant relationships between expressed attitudes toward the environment and sex" was retained. Regression analyses indicated that sex did not contribute appreciably to the variance on belief scores (Table 4.16).

TABLE 4.18

SUMMARY OF SIGNIFICANCE LEVELS FROM AN ANOVA OF TOTAL BELIEF SCORES BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX, (4) SCHOOL SIZE, AND (5) REGION

	Form	Degrees of Freedom	F Ratio	Level of Significance
Sex	A	1;3720	4.8	0.026
	B	1;3644	0.2	0.620
	C	1;3585	14.8	0.000*
School Type	A	3;3707	58.1	0.000*
	B	3;3636	44.9	0.000*
	C	3;3567	92.0	0.000*
School Sex	A	2;3737	24.9	0.000*
	B	2;3666	14.6	0.000*
	C	2;3596	46.8	0.000*
School Size	A	3;3736	3.1	0.024
	B	3;3665	3.5	0.014
	C	3;3595	3.0	0.026
Region	A	8;3407	2.7	0.006
	B	8;3333	2.2	0.023
	C	8;3271	2.4	0.013

* $p \leq 0.001$

(b) School Type. As in the case of factual and conceptual knowledge, *post hoc* Scheffé tests demonstrated that grammar and non-maintained schools produced significantly higher belief scores than comprehensive schools, which in turn achieved significantly better than secondary modern schools. Of all the variables, "secondary modern" accounted for most of the variance on beliefs. However, since this was only about three percent of the variance, it cannot be considered a very effective predictor of lower belief scores.

(c) School Sex. Significant differences were shown on all forms, with the "all boy" and "all girl" schools producing significantly higher belief scores than the "mixed" schools. Only about one percent of the variance was contributed by "mixed schools" (Table 4.16) making this variable a poor predictor of environmental beliefs.

(d) School Size. No significant differences in beliefs were detected with respect to school size.

(e) Region. No significant regional differences were found in environmental belief scores.

Relationships between Student Perception of Problems and Selected Variables

Item ABC19 asked students to identify from a list of common environmental problems the one that they thought to be most serious in their home community. Similarly, item ABC20 asked students to indicate the problem that they perceived to be most serious in Britain. In order to determine whether significant relationships existed between student perception of environmental problems and the independent variables of sex, school type, school sex, school size and region, chi-square analyses were performed on the data pooled from the three forms. The results of these analyses (and the percent response on each alternative) are provided in Tables 4.19 through 4.26. It should be noted that data from a very large number of subjects (in excess of 10,000) were used in these analyses, with the result that rather small variations in the response pattern (which may have no practical implications) are reported as being significant at the 0.0001 level.

(a) Sex. Tables 4.19 and 4.20 indicate significant differences in the response of males and females to these perceptual questions. Males appeared to be more concerned than females about land use and water pollution, while females expressed greater concern

TABLE 4.19

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC19 BY SEX

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
Male	15.5	9.5	10.6	9.4	10.9	8.3	4.3	13.9	17.6
Female	13.4	14.8	10.1	7.7	11.8	8.1	4.0	15.2	15.0

N = 10,934 $X^2 = 99.6$ 8 degrees of freedom Significance = 0.0000

TABLE 4.20

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC20 BY SEX

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
Male	10.4	8.8	12.6	10.4	7.4	26.0	5.5	17.9	1.1
Female	7.8	10.1	11.6	6.2	5.8	26.9	4.9	26.1	0.7

N = 10,934 $X^2 = 185.3$ 8 degrees of freedom Significance = 0.0000

about traffic accidents and crime (especially for the nation).

(b) School Type. Significant differences in response patterns by school type were detected (Tables 4.21 and 4.22). Students in non-maintained and grammar schools expressed greater concern over land use and water pollution than their peers in comprehensive and secondary modern schools. Non-maintained students were also more concerned about local over-crowding but less worried about crime as a national problem. Comprehensive students emphasized local crime, while those in secondary modern schools were more concerned about traffic accidents than their peers in other schools. The most frequently selected response of secondary modern pupils to item ABC19 was "none of the above are problems in our community".

(c) School Sex. Tables 4.23 and 4.24 exhibit significant differences in response patterns by school sex. "All boy" schools emphasized the problems of land use and water pollution to a greater extent than the other schools, while "all girl" schools showed greater

TABLE 4.21

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC19 BY SCHOOL TYPE

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
Comprehensive	14.3	12.6	11.0	7.6	10.9	8.6	4.1	16.1	14.9
Sec. Modern	13.7	12.9	9.3	8.0	11.7	7.7	4.5	13.9	18.4
Grammar	16.7	11.5	10.6	10.8	11.5	6.9	3.5	12.8	15.7
Non-maintained	14.4	9.0	10.1	11.4	11.7	10.1	3.8	12.5	17.0

N = 10,902 $X^2 = 93.3$ 24 degrees of freedom Significance = 0.0000

TABLE 4.22

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC20 BY SCHOOL TYPE

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
Comprehensive	9.3	9.1	11.8	8.0	6.6	25.8	5.8	22.6	1.0
Sec. Modern	7.2	11.8	11.8	6.3	6.8	27.4	5.1	22.5	1.2
Grammar	10.4	7.2	13.7	11.0	5.2	26.4	4.0	22.0	0.2
Non-maintained	12.5	5.7	12.8	12.7	8.1	25.5	4.3	17.5	0.9

N = 10,901 $X^2 = 174.7$ 24 degrees of freedom Significance = 0.0000

TABLE 4.23

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC19 BY SCHOOL SEX

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
All Boy	15.9	9.1	11.9	10.2	10.5	8.9	4.1	12.5	16.9
All Girl	12.4	15.1	10.2	9.0	10.4	8.5	4.1	15.9	14.5
Mixed	14.6	12.1	10.1	8.1	11.7	8.0	4.2	14.6	16.7

N = 10,987 $X^2 = 64.3$ 16 degrees of freedom Significance = 0.0000

TABLE 4.24

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC20 BY SCHOOL SEX

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
All Boy	13.3	6.5	11.2	11.9	7.3	27.1	5.1	16.4	1.1
All Girl	8.5	8.3	11.7	7.0	5.3	29.3	4.4	24.9	0.6
Mixed	8.2	10.4	12.5	7.8	6.8	25.5	5.4	22.5	0.9

N = 10,987 $X^2 = 151.7$ 16 degrees of freedom Significance = 0.0000

concern for crime and local traffic accidents. Students in "mixed" schools chose traffic accidents as a national problem more frequently than their peers in schools segregated by sex. These differences noted for "school sex" appear to be largely due to the variable "sex".

(d) School Size. Significant differences in student perceptions were not detected with respect to school size. Tables giving response patterns are therefore not presented for this variable.

(e) Region. Significant regional differences were evident in responses to items ABC19 and ABC20 (Tables 4.25 and 4.26). With respect to local problems, the most striking result was the popularity of the response that "none of the above are problems in our community". In fact this was the most frequently selected alternative in East Anglia (23.0%), the South West (21.1%), the East Midlands (19.6%) and the West Midlands (16.7%). Land use problems were emphasized by the South East, East Anglia and the South West; traffic accidents by Greater London; air pollution by

TABLE 4.25

DISTRIBUTION OF RESPONSES (AS PRECENT) ON ITEM ABC19 BY REGION

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
North	12.9	11.0	14.2	8.6	10.7	4.4	5.1	18.9	14.2
Yorks & Humb.	10.3	13.4	11.4	12.8	10.1	6.2	3.9	16.1	15.8
North West	13.5	11.2	10.2	10.6	12.5	6.3	5.4	15.2	15.1
East Mid.	11.4	10.0	10.2	8.7	13.3	9.3	3.8	13.7	19.6
West Mid.	15.2	11.7	14.4	5.9	12.9	8.5	5.0	9.8	16.7
East Anglia	17.3	7.9	7.0	12.2	12.2	8.9	3.3	8.1	23.0
Greater London	11.9	17.3	11.4	5.1	7.8	11.4	3.3	19.5	12.2
Other S.E.	18.2	13.0	7.7	6.0	11.0	9.0	3.6	16.0	15.5
South West	16.9	13.1	6.7	9.2	11.1	7.8	3.3	10.7	21.1

N = 10,018 $\quad X^2 = 431.1 \quad$ 64 degrees of freedom $\quad$ Significance = 0.0000

TABLE 4.26

DISTRIBUTION OF RESPONSES (AS PERCENT) ON ITEM ABC20 BY REGION

	Response Alternatives								
	a	b	c	d	e	f	g	h	i
North	7.7	11.5	14.4	8.5	5.9	23.5	4.7	23.4	0.5
Yorks & Humb.	6.4	10.4	13.7	8.2	5.9	22.2	4.3	27.3	1.5
North West	7.2	11.4	12.0	7.9	4.7	23.8	5.7	26.6	0.7
East Mid.	5.5	10.3	9.7	8.4	8.6	29.8	4.7	22.3	0.7
West Mid.	8.7	9.7	11.4	7.8	8.0	27.0	5.8	20.9	0.8
East Anglia	8.7	12.3	15.5	7.1	4.6	29.4	5.2	16.6	0.5
Greater London	9.5	7.4	11.6	5.6	5.4	31.6	4.7	22.7	1.4
Other S.E.	12.5	7.5	11.2	8.0	6.5	28.6	5.4	19.4	1.0
South West	8.5	12.1	12.9	9.4	8.4	22.6	6.3	19.3	0.5

N = 10,017 $X^2 = 244.1$ 64 degrees of freedom Significance = 0.0000

the West Midlands and North; water pollution by Yorkshire and Humberside and East Anglia; over-crowding by Greater London; and crime by Greater London, the North, Yorkshire and Humberside, the South East and North West.

In the case of item ABC20, students in every region identified the two most serious problems in Britain as "over-crowding" and "crime".

Relationships between "Source of Knowledge" and Student Environmental Knowledge and Attitude

Item ABC18 asked students to identify whether they gained most of their knowledge about the environment from general education at school ("regular courses"), special environmental courses at school ("special courses"), private reading, the radio and TV ("reading-media"), or talking with parents, friends and other people ("discussion"). Analysis of variance procedures were used to determine whether significant relationships existed between students' perception of their "source of environmental knowledge" and their level of environmental knowledge or attitude toward the environment. Mean factual, conceptual and beliefs scores of students responding to the four alternatives on this item are given in Table 4.27, and an ANOVA summary (from the three forms) is presented in

Table 4.28.

Post hoc Scheffé tests showed that on factual items the "reading-media" group scored significantly higher than the "regular courses" and "discussion" groups, while the "reading-media" and "regular courses" groups performed significantly better than the "special courses" group. On both the conceptual knowledge and belief sections the "reading-media" group scored significantly higher than both the "discussion" and "regular courses" groups, and they in turn produced significantly higher means than the "special courses" group.

The significantly higher levels of environmental knowledge and more positive attitudes of students who identified their major source of environmental knowledge as "reading, the radio and TV", and the significantly poorer knowledge and attitudes of students who identified their major source as "special environmental courses at school" raises some interesting questions. Perhaps no clear conclusions can be drawn from the responses to this question without knowing more about the educational experiences and personal qualities of the respondents; and certainly no causal relationship should be inferred. However the results on item ABC18 (including the frequency of responses cited earlier in Table 4.9) tend to

TABLE 4.27

MEAN FACTUAL, CONCEPTUAL AND BELIEF SCORES ON ITEM ABC18
(USING DATA POOLED FROM FORMS A, B AND C)

	Factual Items (Part 1)	Conceptual Items (Part 2)	Belief Items (Part 3)
Regular Courses	7.48	5.80	8.62
Special Courses	7.06	5.44	8.18
Reading-Media	8.29	6.49	9.40
Discussion	7.33	5.85	8.62

TABLE 4.28

SUMMARY OF SIGNIFICANCE LEVELS FROM AN ANALYSIS OF VARIANCE OF RESPONSE PATTERNS ON ITEM ABC18

	Form	Degrees of Freedom	F Ratio	Level of Significance
Factual	A	3;3729	53.8	0.000*
	B	3;3653	37.8	0.000*
	C	3;3586	32.2	0.000*
Conceptual	A	3;3729	58.0	0.000*
	B	3;3653	38.3	0.000*
	C	3;3586	27.2	0.000*
Belief	A	3;3729	34.4	0.000*
	B	3;3653	19.9	0.000*
	C	3;3586	35.5	0.000*

* $P \leq 0.001$

reaffirm the importance of the media as an educational tool. In addition to improving the quality and quantity of special environmental courses, it would seem wise to intensify environmental education efforts in those areas that the majority of students already perceive to be the prime source of their knowledge.

Relationships between Environmental Knowledge and Attitude

In order to reveal relationships that might exist between factual knowledge, conceptual knowledge and attitudes, correlation coefficients were computed between the total scores on the factual, conceptual and belief sections of each form using SPSS subprogram SCATTERGRAM. In addition, SPSS subprogram PEARSON CORR was used to compute the PEARSON product-moment correlation coefficients between all items on Forms A, B and C.

With the number of cases being in excess of 3500, a correlation coefficient of 0.05 is found to be statistically significant at the 0.001 level. Since this correlation coefficient accounts for an extremely small amount of the variance (0.25 percent) it was decided to select a correlation value that represented at least one percent of the variance. Thus, in examining relationships between individual items only correlation coefficients exceeding 0.10 ($r > 0.10$) were accepted. The probability of falsely claiming a significant correlation between items was therefore considerably less than one in a thousand.

The correlation coefficients (significant at the 0.00001 level) between total scores on the factual, conceptual and belief sections of each form are presented below in Table 4.29.

TABLE 4.29

CORRELATIONS BETWEEN TOTAL FACTUAL, CONCEPTUAL AND BELIEF SCORES ON EACH FORM

	Corr. Coefficient Between Factual & Conceptual Scores	Corr. Coefficient Between Conceptual and Belief Scores	Corr. Coefficient Between Factual and Belief Scores
Form A	0.446	0.466	0.359
Form B	0.455	0.482	0.349
Form C	0.433	0.494	0.451

Fisher z transformations were used to calculate average correlations across the three forms and to show that the differences between these average correlations were significant. The results indicated that the strongest relationship exists between conceptual knowledge and attitude (composite belief score), with a slightly weaker relationship between factual and conceptual knowledge. The lowest correlation was found to be between factual knowledge and attitude.

Figures 4.1, 4.2 and 4.3 provide a visual impression of the items that correlate positively with each other ($r > 0.10$) on the three forms. It is immediately apparent that the relationships between individual items support the results described above, in which total scores were correlated. When the results shown in Figures 4.1, 4.2 and 4.3 were pooled, significant correlations were found to exist between 36.9% of the conceptual and belief items, 23.3% of the factual and conceptual items, and 15.0% of the factual and belief items. This reinforces the earlier finding that the strongest relationship exists between conceptual knowledge and attitude while the weakest relationship is between factual knowledge and attitude.

FIGURE 4.1 CORRELATIONS BETW... FORM A

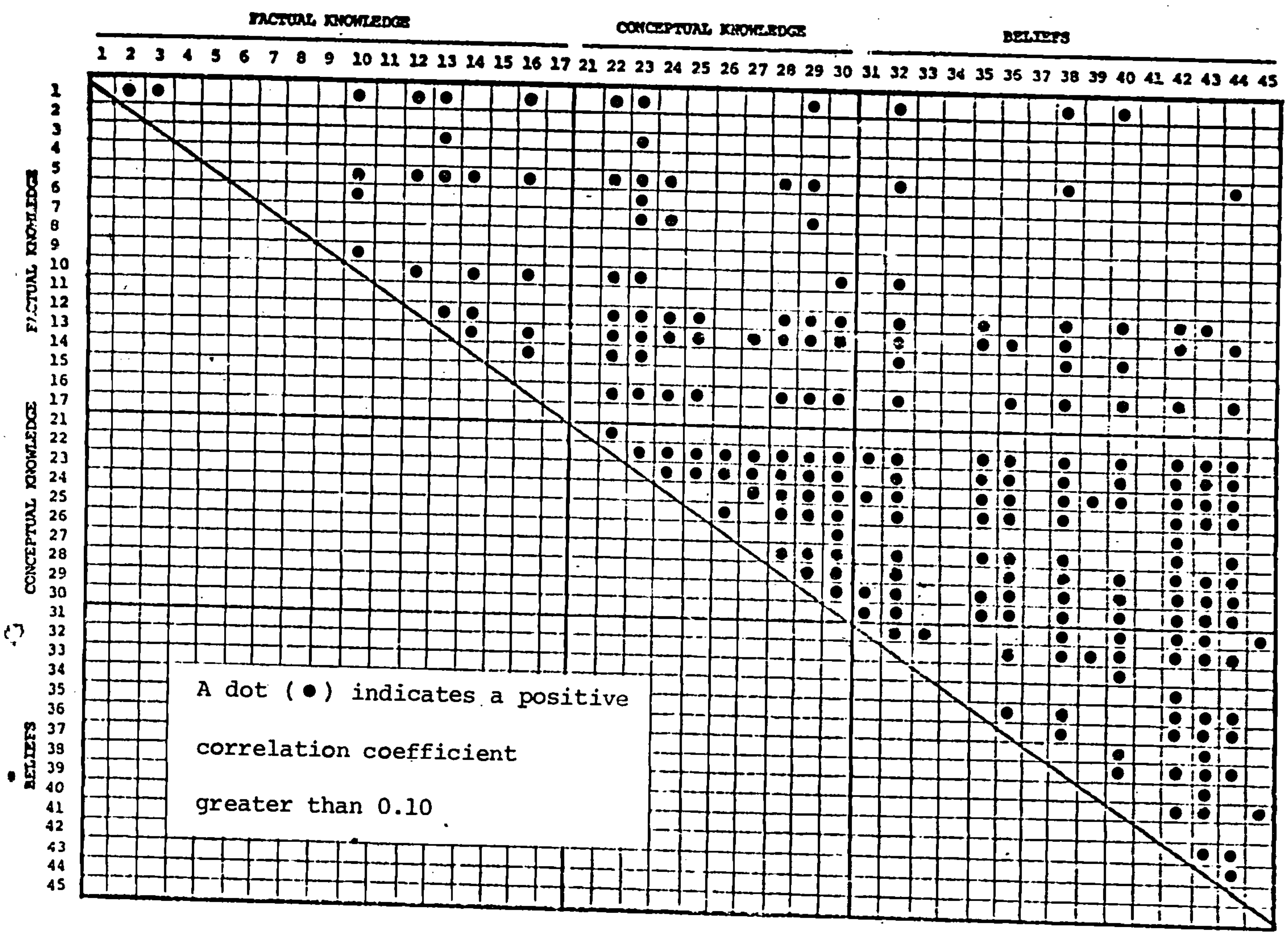


FIGURE 4.2 CORRELATIONS BETWEEN ITEMS FORM B

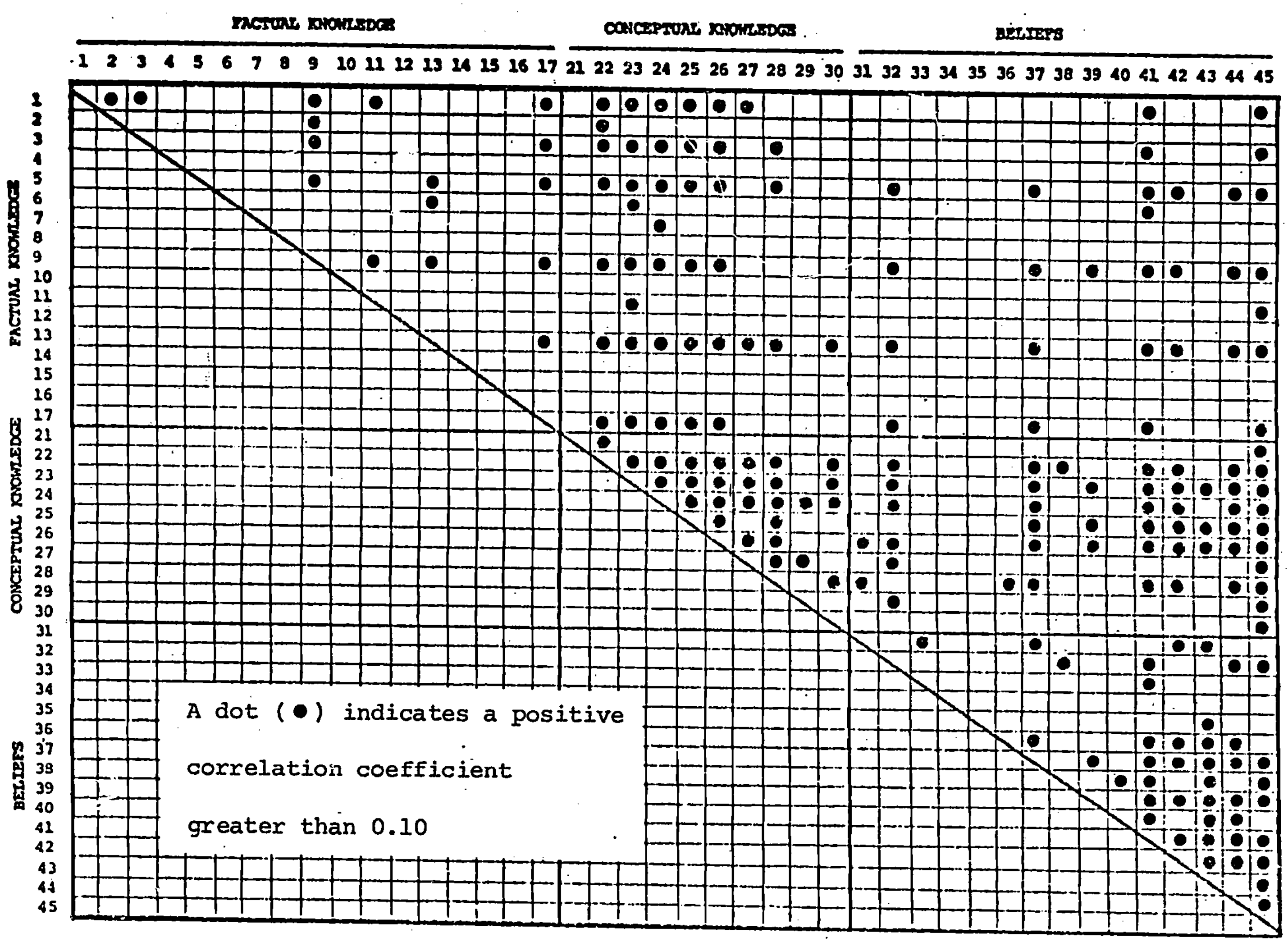
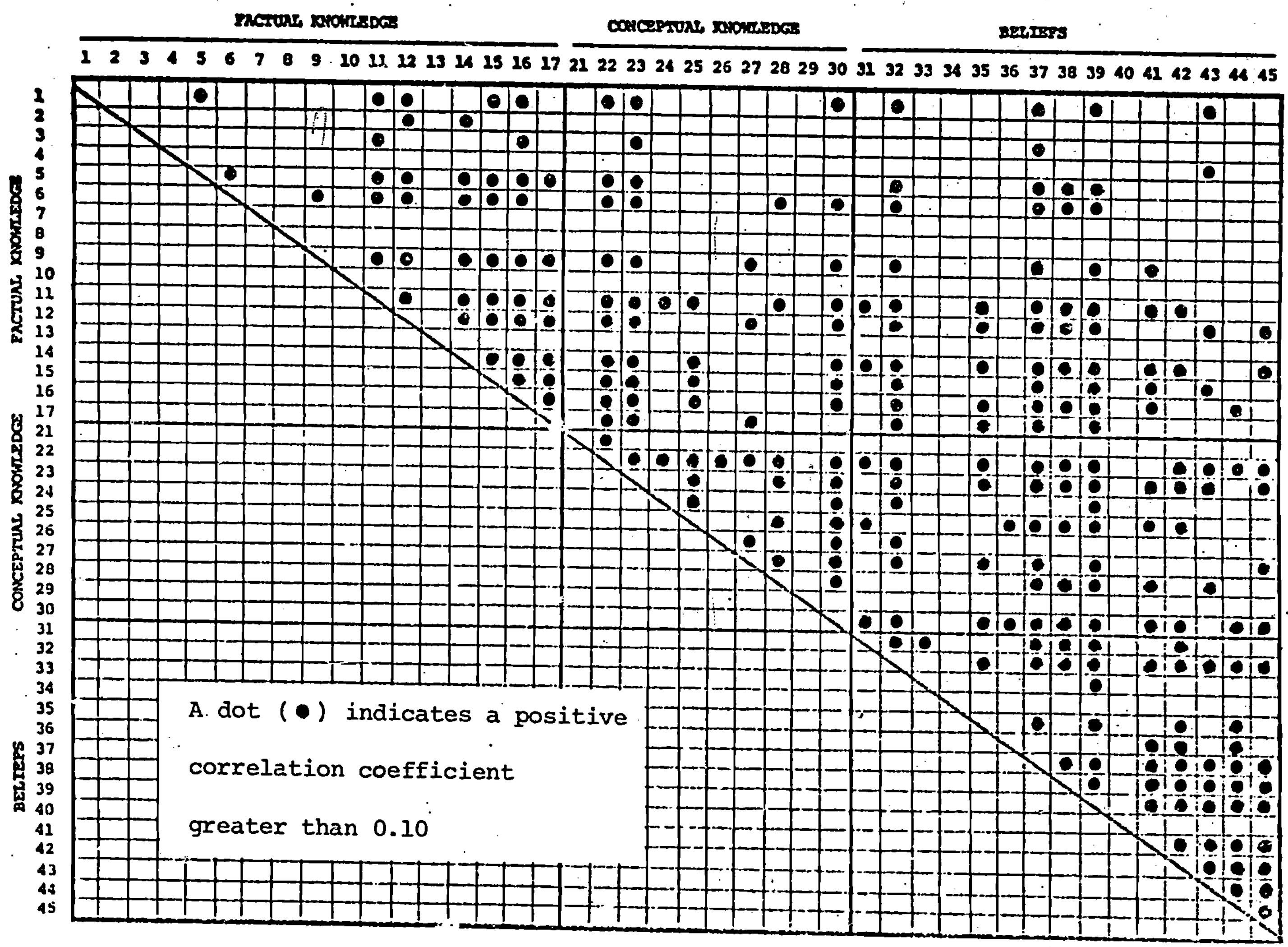


FIGURE 4.3 CORRELATIONS BETWEEN ITEMS FORM C



Results of Testing the Null Hypotheses

Based upon the preceding examination of relationships between variables, the following decisions were made to retain or reject each of the null hypotheses stated on pages 13 and 14:

	Hypothesis		Decision
1.	There are no significant relationships between the level of environmental knowledge and		
	a)	sex;	Rejected
	b)	type of school attended;	Rejected
	c)	sex composition of the school;	Rejected
	d)	school size; and	Rejected
	e)	region of school attendance	Rejected
2.	There are no significant relationships between expressed attitudes toward the environment and		
	a)	sex;	Not rejected
	b)	type of school attended;	Rejected
	c)	sex composition of the school;	Rejected
	d)	school size; and	Not rejected
	e)	region of school attendance	Not rejected
3.	There are no significant relationships between student perception of environmental problems (both local and national) and		
	a)	sex;	Rejected
	b)	type of school attended;	Rejected
	c)	sex composition of the school;	Rejected
	d)	school size; and	Not rejected
	e)	region of school attendance	Rejected

	Hypothesis	Decision
4.	There are no significant relationships between student perception of "source of environmental knowledge" and level of environmental knowledge or attitude toward the environment.	Rejected
5.	There is no significant relationship between the level of factual environmental knowledge and expressed attitude toward the environment.	Rejected
6.	There is no significant relationship between the level of conceptual environmental knowledge and expressed attitude toward the environment.	Rejected

Although many of the null hypotheses were rejected, it should be re-emphasized that the variables of sex and school type ("secondary modern") accounted for most of the variance. Thus for practical purposes it should be remembered that differences noted in school sex, school size and region were to a large extent a function of the variables sex and school type.

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS, AND RECOMMENDATIONS

Summary

In response to the recent upsurge of interest in environmental matters, there has been a flurry of activity in England to develop environmental education programs and introduce them into the school curriculum. Must of this curriculum development has been somewhat subjective and intuitive and has taken place without the benefit of having objective measures of the students' current environmental knowledge and attitudes. Thus the major purpose of this study was to establish baseline data relating to the environmental knowledge and beliefs of English teenagers in the final year before the majority leave school. An additional objective was to examine the relationships between variables that might be of interest to curriculum developers and educational decision-makers.

The instrument developed for the survey consisted of three questionnaires (Forms A, B and C) with each questionnaire containing a total of 45 factual knowledge, conceptual knowledge, belief and perceptual items. All items used in the instrument were thoroughly tested in a pilot study conducted in representative English secondary schools.

A sample of 500 secondary schools was randomly selected to proportionately represent the major types of school in every region of the country. Packaged materials were mailed to the selected schools with instructions to administer the instrument to 30 students in the 5th year. A total of 383 schools (76.6% of the sample) returned completed answer sheets, providing information from over 11,000 students. The answer sheets were machine scored, with student responses being automatically punched onto computer cards. The data were then transferred to magnetic tape and analyzed by standard computer programs.

Conclusions and Implications

In this section the major conclusions derived from the analyses of data will be summarized. In addition, the findings will be related to past research, and implications which can be drawn from this study will be discussed.

Measures of Environmental Knowledge and Attitudes

(1) In general, students responded poorly to factual knowledge items. Only 14 of the 43 factual knowledge items were correctly answered by more than 50% of the students, and the overall correct response rate was approximately 46%.

(2) Students demonstrated a greater understanding of environmental concepts, with an overall correct response rate of a little over 60%. Seventeen of the 24 conceptual knowledge items were correctly answered by more than 50% of the respondents.

(3) Response patterns on the belief items indicated that students have a moderately positive attitude toward the environment. About 60% of all responses on this section were "in agreement with the panel"; and on 27 of the 37 items more than 50% of the students selected the environmentally positive alternative.

The results described above are strikingly similar to the response patterns observed by Bohl (18) and Perkes (104) in the United States and by Eyers (53) in Australia. In these studies, students at the equivalent grade level were reported to have a generally poor grasp of factual environmental knowledge (with higher levels of conceptual knowledge evident in the United States), and yet they tended to express positive environmental attitudes on the affective questions. This led Bohl to conclude that secondary school student environmental attitudes could be considered "learned responses", and since they lacked "a strong base of cognitive information, these attitude responses on the part of the student should not be considered firm beliefs." (18, p. 166)

The rather low level of environmental knowledge revealed in this survey should be a matter of some concern to the educational community. Although it might be argued that many of the factual questions were difficult, they never-the-less relate to issues of great consequence to the health and well-being of the English people. Since responsible decision-making is dependent upon a firm foundation of factual information, it is of importance to tomorrow's society that today's youth be provided with a sound basis of environmental knowledge. This study has revealed a number of misconceptions about aspects of the environment; and it is these areas of general misunderstanding that should receive the close scrutiny of those involved in developing environmental education programs.

Although it has been reported that students generally appeared to have positive attitudes toward the environment, this should be no cause for complacency. It was also noted in Chapter IV that students' environmental attitudes tend to be strongly positive when the object of concern does not impinge directly on their lives, but are relatively negative when some personal sacrifice may be required. For example, a large majority agreed that "Man has a moral responsibility to protect the natural environment" (84.5%), while fewer than one-half believed that we need to decrease the use of the car as a major means of transportation, that community standards for pollution are more important than industrial growth and development, and that most couples should not produce more than two children. Perkes recognized a similar pattern of responses to affective items and concluded that

> ... environmental attitudes which tend to be broad in nature and possess little personal commitment are viewed favorably. However, when these attitudes become more specific and an obvious change in personal actions logically follows, individuals tend to remove the dissonance by not making the transfer from general to specific or by changing personal attitudes to correspond with their present actions. (104, p. 138-139)

If a primary educational goal is to be the development of positive environmental attitudes (especially with respect to issues and situations that involve some personal commitment and sacrifice), then much effort and research must be directed toward establishing effective means for achieving this end. If student attitudes are to be translated into responsible social behavior, it would appear that these attitudes should be deeply rooted and based upon knowledge, experience and conviction, rather than superficially "learned" or instilled by indoctrination.

Relationships between Environmental Knowledge and Attitude and Selected Variables

(1) On factual knowledge scores, significant differences were found with respect to sex, school type, school sex, school size and region. However regression analyses indicated that the differences observed on school sex and school size could to a large extent be attributed to the high performance of males over females and the poorer achievement of students in secondary modern schools.

(2) The response patterns on conceptual knowledge items differed significantly with respect to school type and school sex, with less pronounced significant differences associated with sex, school size and region. Of the variables under consideration, most of the variance could be

attributed to "secondary modern" and "mixed" schools, with both categories performing relatively poorly.

(3) On total belief scores, significant differences were found with respect to school type and school sex; however differences in sex, school size and regional scores did not appear to be significant. Some variance could again be attributed to the variables "secondary modern" and "mixed", with students in these schools expressing significantly poorer environmental attitudes than their peers in other schools.

Regression analyses indicated that most of the observed variance could not be attributed to the demographic variables measured in this study, but was probably due to personal factors such as intelligence and home-background. Of the variables under consideration, only "sex" and "secondary modern" (and to a lesser extent "mixed") accounted for an appreciable amount of the variance.

It is not surprising that students in secondary modern schools did not perform as well as their peers in other school types, since children of lower ability are channeled into the "modern" schools. Perhaps of greater interest is the fact that males performed significantly better than females on factual environmental knowledge, although differences in environmental attitude did not appear to be dependent upon sex. This result supports the findings of other research discussed in Chapter II. Perkes suggested that such findings "might be explained in terms of differences in scientific background of males and females" (104, p.139), since many topics involving facts about the environment are studied in science courses, and science subjects are elected by males more frequently than females. Eyers, on the other hand, favored the suggestion that the "generally poorer performance of females at the secondary level might be due to a decline in motivation brought about by their view of the role of females in society" (53, p. 118). Both of these explanations have merit, and perhaps with a shift in enrollment patterns in science to include more females, and with a continuing change in the self-image that women have of their role in society, the present discrepancy between the sexes on environmental knowledge will be eliminated. In the meantime, the significant sex differences should be taken into account in the planning of environmental education programs.

Relationship between Environmental Knowledge and Attitude

In examining the relationships between the responses on the factual knowledge, conceptual knowledge and belief sections of the instrument, it was found that

(1) the strongest relationship exists between conceptual knowledge and attitude ($r = 0.48$ on total scores);

(2) a slightly weaker relationship exists between factual and conceptual knowledge ($r = 0.44$ on total scores); and

(3) the weakest relationship is between factual knowledge and attitude ($r = 0.38$ on total scores).

These results support the findings of other research described in Chapter II, and provide a more precise measure of the strengths of these relationships than any of the previous studies concerning environmental knowledge and attitudes. Without diminishing the value of factual environmental knowledge (which was mentioned earlier as a prerequisite for responsible decision-making), these results appear to underline the importance of conceptual knowledge in the development of positive environmental attitudes. Although no causative relationship has been demonstrated, the relatively strong correlation between the conceptual and belief sections suggests that the development of sound concepts might be a productive means of leading to the establishment of positive attitudes. The importance of conceptual development has been stressed by many educators, and these findings not only support their position but are a reminder that conceptual understanding should be a prime objective of environmental education programs.

Student Perceptions of Environmental Problems

(1) With respect to local environmental problems, the most frequently selected response (16.3%) was "None of the above are problems in our community". Thus a sizable number of students did not perceive these common problems to be of concern in their immediate surroundings.

(2) On the national scene, all but a few students (0.9%) were prepared to identify an environmental problem. Overcrowding, which was of little concern in local communities, emerged as the major concern for Britain as a whole, closely followed by crime.

(3) Significant differences in student perceptions of both local and national environmental problems were found with respect to sex, school type, school sex, and region. Significant differences in student perceptions were not

detected with respect to school size.

The results of these analyses give some idea of the environmental problems that loom largest in the minds of young people. For the country as a whole, societal problems such as over-crowding and crime were considered more serious than problems relating to the physical environment (such as water and air pollution). The fact that an appreciable number of students believed that none of the listed environmental problems were serious in their home communities (but were problems for the nation), may indicate the need for an increased emphasis on local studies.

Student Perceptions of "Source of Environmental Knowledge"

(1) Fewer than 40% of the respondents believed that they had gained most of their environmental knowledge from their formal schooling, while over 60% indicated that this knowledge has been gained outside of the classroom in "self-educational" activities. In the perception of these students the media appears to have been the most important source of their knowledge (48.1%) while special education courses have made a relatively small impact (6.9%).

(2) Students who identified their major source of environmental knowledge as "reading, the radio, and TV" scored

significantly higher than the other groups on factual knowledge, conceptual knowledge and beliefs. Those who indicated that their major source of knowledge was "special environmental courses at school" produced significantly lower factual, conceptual and belief scores than the other groups.

Since this item was designed to elicit the students' perceptions of where they have gained most of their environmental knowledge, and does not necessarily indicate the true source, some caution should be observed in interpreting the response pattern. For example, the fact that fewer than one-half of the students believe that they have gained most of their knowledge in the classroom does not necessarily imply that schools are not doing an adequate job in environmental education; however it does tend to raise that suspicion. Perhaps the most important outcome from this question is the importance attributed to the media as a source of environmental knowledge. In addition to improving the quality and quantity of environmental education in the school curriculum, it would appear to be a fruitful strategy to intensify the coverage of environmental matters in newspapers and on the radio and television.

The question on the "source of environmental knowledge" was first used by Eyers in the Australian study, and it is interesting to note the similarity of response patterns in the two countries. Australian and English students responded to each alternative within a few percentage points of each other, perhaps reflecting the similarities of the two societies and the current state of development of their environmental education programs.

Recommendations

(1) The findings presented in this study should be taken into account in the future development of environmental education programs in England. Curriculum developers should particularly bear in mind the following:

(i) The baseline data collected in this survey pinpoints areas of inadequate information and negative attitudes that may require additional emphasis in the curriculum.

(ii) Without neglecting factual information, particular emphasis should be placed on promoting conceptual understanding.

(iii) Differences relating to sex and school type should be recognized, especially in local curriculum development.

(iv) It would appear from the analysis of student perceptions that there is a need to identify and study local problems to a greater extent.

(v) Educators should capitalize on the mass media (especially television) as a means of promoting sound knowledge and positive environmental attitudes.

(2) The instrument used in this study (or a modified version) might well be used by individual schools or LEAs to establish their local cognitive and affective baselines prior to developing environmental courses.

(3) Using data collected in the survey, it would be possible to isolate schools with students having high levels of environmental knowledge and/or positive attitudes. By examining these schools it might be possible to identify programs, teaching practices or other factors that have contributed to these desired outcomes.

(4) Additional research on a number of topics peripheral to this study is needed. For example, we need to know more about the relationships between knowledge and attitudes,

and perhaps even more importantly, the relationships between attitudes and behavior. Further research might explore why students who perceive that most of their environmental knowledge comes from media sources have higher levels of information and more positive attitudes; while another study might examine why males possess more factual information than females without having more positive attitudes.

(5) Now that similar studies have been conducted in the United States, Australia and England, comparisons should be made between the environmental knowledge levels and attitudes of these students. Such information would provide some insight into the "exportability" of existing (and possibly future) environmental education curricula.

(6) It is hoped that this study might be useful as a model for similar environmental surveys in other countries. The data generated by surveys in a number of diverse cultures could provide the basis for developing models for an international environmental education curriculum, as recommended by the United Nations Conference on the Human Environment.

(7) The instrument used in this study should be readministered to 5th year students in England at an appropriate time in the future, perhaps several years from now. In this way changes in the environmental knowledge and attitudes of secondary students could be measured, and trends that have curriculum implications might be identified.

APPENDIX A

1. The Instrument* : Forms A, B and C

2. Answer Sheets** : Forms A, B and C

Answers coded on Part 1 are supported by references shown in Appendix E Answers coded on Parts 2 and 3 were selected by the panel using criteria presented in Appendix D

* Photo-reduced by 15% from the original
** Photo-reduced by 23% from the original

FORM A

Part 1

Directions : Read all items carefully. For items 1 - 20, select the one response which you believe provides the best answer. Mark your choice in the appropriate box on the Answer Sheet provided.

1. The present population of Britain is about

   a) 57 million
   b) 67 million
   c) 77 million
   d) 87 million

2. The population of Britain is growing at a rate which is

   a) more than that of the world average
   b) about the same as the world average
   c) less than that of the world average
   d) zero

3. At the present time Britain

   a) produces more food than it uses, and exports the surplus
   b) produces just enough food to satisfy home needs
   c) must import about 5% of its food supply
   d) must import about 50% of its food supply

4. Which of the following is most likely to be an important world-wide source of energy for the future?

   a) solar radiation
   b) tidal flow
   c) geothermal sources
   d) wind power

5. On several recent occasions in various parts of the world, the sale of fish has been stopped because the fish have been found to contain high levels of

   a) thalidomide
   b) chlorine
   c) mercury
   d) lead

A 2

6. Since about 1950 birds of prey (such as the peregrine falcon, golden eagle and sparrow hawk) have seriously declined in numbers. Evidence suggests that this is because the pesticide DDT causes

a) the birds to lose their ability to breed
b) the birds to have eggs with shells that are thin and easily break
c) baby birds to lose their appetite
d) immediate death to these birds if they eat food with DDT in it

7. As a result of burning coal and oil the amount of carbon dioxide in the atmosphere is

a) decreasing, but will not affect the earth's environment
b) decreasing, with possible serious effects on the earth's environment
c) increasing, but will not affect the earth's environment
d) increasing, with possible serious effects on the earth's environment

8. Some people object to the use of detergents and soap powders that contain phosphates. The main reason for this is because phosphates

a) cause the rapid growth of algae in lakes and rivers
b) are poisonous to bacteria that help to break down sewage
c) are harmful to the health of young children
d) cause birth defects in fish and other aquatic animals

9. Once DDT has been spread to kill insect pests, it usually

a) remains toxic for a few weeks only
b) remains toxic for about one year
c) remains toxic for many years
d) remains toxic forever

10. Torrey Canyon

a) is the site of a large dam in the United States
b) is an area of scenic beauty in Wales
c) is the site of recent discoveries of vast oil reserves
d) is the name of an oil-tanker that ran aground

A 3

11. The population of the world increased from 2 thousand million in 1930 to about

a) 2.5 thousand million in 1975
b) 3.0 thousand million in 1975
c) 4.0 thousand million in 1975
d) 5.0 thousand million in 1975

12. A temperature inversion can be harmful because it

a) puts more carbon dioxide into the air
b) keeps air pollutants near the ground
c) prevents horizontal air flow
d) produces pollutant particles

13. The size of a population is affected by

a) the birth rate
b) the death rate
c) the rate of immigration and emigration
d) all of the above

14. Many organic wastes are broken down in water. In the process, what substance is taken out of the water?

a) carbon dioxide
b) hydrogen
c) oxygen
d) sulphur

15. Solid particles that contribute to air pollution (such as soot and dust) tend to

a) increase the earth's temperature
b) decrease the earth's temperature
c) keep the earth's temperature steady
d) have no effect on the temperature

16. The major air pollutant (measured by weight) discharged by motor vehicles is

a) carbon monoxide
b) nitrogen dioxide
c) sulphur dioxide
d) particulate matter

A 4

17. At its present rate of growth, the population of the world will double in about

a) 15 years
b) 35 years
c) 60 years
d) 100 years

18. Which one of the following best describes the way in which you have gained most of your knowledge about the environment?

a) general education at school
b) special environmental courses at school
c) private reading, the radio, and TV
d) talking with parents, friends and other people

19. Which one of the following problems do you think is the most serious in the community where you live?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in our community

20. Which one of the following problems do you think is the most serious in Britain?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in Britain

A 5

Part 2

Directions : Carefully read items 21 - 30, and in each case decide whether the statement is true or false. If you cannot decide, you should respond "Don't Know". Mark the answer of your choice on the Answer Sheet.

21. If sufficient water were available, virtually all of the land surface of the world could be economically used to produce food.

a) True b) False c) Don't Know

22. The interaction of environmental, biological and social factors determines the size of human populations.

a) True b) False c) Don't Know

23. There is an unlimited supply of energy available to man from fossil fuels (such as coal and oil).

a) True b) False c) Don't Know

24. Pollution caused by man may give rise to irreversible changes in the environment.

a) True b) False c) Don't Know

25. In any environment, one component like water, air, or food may limit the type of life which can survive.

a) True b) False c) Don't Know

26. A natural body of water (such as a river or lake) will always have sufficient dissolved oxygen to support aquatic animal life.

a) True b) False c) Don't Know

A 6

27. Living things are interdependent with one another and with their environment.

a) True b) False c) Don't Know

28. The rate of adaptation in organisms always keeps pace with the rate of change in the environment.

a) True b) False c) Don't Know

29. Increasing human populations and demands for greater industrial and agricultural productivity have resulted in increasing levels of environmental pollution.

a) True b) False c) Don't Know

30. The social behavior of humans can be affected by population density.

a) True b) False c) Don't Know

A 7

Part 3

Directions : For items 31 - 45 there are no "right" or "wrong" answers. Simply select the response which best expresses your belief about each statement, and mark it on the Answer Sheet.

31. Planning which will limit the size of families is important if over-population is to be avoided.

a) Agree b) Disagree c) No Opinion

32. The demand for energy is critical enough to justify relaxing some of the environmental restrictions which hinder energy production.

a) Agree b) Disagree c) No Opinion

33. The tax system should be redesigned to encourage small families rather than large ones.

a) Agree b) Disagree c) No Opinion

34. Large-scale famines are not likely to occur in the near future.

a) Agree b) Disagree c) No Opinion

35. Man has a moral responsibility to protect the natural environment.

a) Agree b) Disagree c) No Opinion

36. International agreements with legal and economic sanctions are necessary to prevent industries and oil-tankers from extensively polluting the oceans with their wastes.

a) Agree b) Disagree c) No Opinion

37. People should only be allowed to burn smokeless fuels in their fireplaces at home.

a) Agree b) Disagree c) No Opinion

A 8

38. Farmers should be allowed to use any pesticide that they wish in order to control the pests that eat their crops.

a) Agree b) Disagree c) No Opinion

39. A community's standards for pollution levels should not be so strict that they discourage industrial growth and development.

a) Agree b) Disagree c) No Opinion

40. Since population is a critical problem facing mankind, most couples should not produce more than two children.

a) Agree b) Disagree c) No Opinion

41. Continuous growth of British industry and the Gross National Product (GNP) is highly desirable.

a) Agree b) Disagree c) No Opinion

42. There is no need to worry about over-population because science and technology will solve the problem before it becomes too serious.

a) Agree b) Disagree c) No Opinion

43. Controls should be placed on industry to protect the environment from pollution, even if it means that things will cost more.

a) Agree b) Disagree c) No Opinion

44. The oceans represent an unused area where man should dispose of his wastes.

a) Agree b) Disagree c) No Opinion

45. Adopting a child is a good policy for families who want more than two children.

a) Agree b) Disagree c) No Opinion

FORM B

Part 1

Directions : Read all items carefully. For items 1 - 20, select the one response which you believe provides the best answer. Mark your choice in the appropriate box on the Answer Sheet provided.

1. The present population of Britain is about

   a) 57 million
   b) 67 million
   c) 77 million
   d) 87 million

2. The population of Britain is growing at a rate which is

   a) more than that of the world average
   b) about the same as the world average
   c) less than that of the world average
   d) zero

3. At the present time Britain

   a) produces more food than it uses, and exports the surplus
   b) produces just enough food to satisfy home needs
   c) must import about 5% of its food supply
   d) must import about 50% of its food supply

4. Which of the following is most likely to be an important world-wide source of energy for the future?

   a) solar radiation
   b) tidal flow
   c) geothermal sources
   d) wind power

5. Basic chemical materials would be locked up and would not be available for reuse by plants and animals if it were not for the activities of

   a) decomposer organisms
   b) photosynthetic organisms
   c) herbivores
   d) carnivores

B 2

6. During the next 25 years the amount of good quality agricultural land in Britain is expected to

a) increase as a result of better planning
b) increase as a result of reclaiming waste land
c) decrease as a result of urban and industrial expansion
d) remain about the same

7. The highest average annual rainfall in Britain is recorded in

a) the south-west of England
b) the Midlands
c) the Lake District
d) the north-west of Scotland

8. The average amount of water used per person per day in British homes is about

a) 4 gallons
b) 40 gallons
c) 80 gallons
d) 160 gallons

9. Several species of whale have become endangered because of

a) pollution of the oceans by industrial wastes
b) oil spills from tankers and off-shore drilling
c) a reduction in the amount of food available to them
d) over-hunting by man

10. It is estimated that at today's rate of use, known world reserves of resources such as zinc, lead, tin, oil and copper will be used up, or will be at a very low level in about

a) 10 years
b) 40 years
c) 80 years
d) 180 years

B 3

11. It is estimated that Britain will be self-sufficient in oil from the North Sea by (or soon after) the year

a) 1980
b) 1990
c) 2000
d) 2010

12. Approximately what percentage of the land surface in the United Kingdom is covered with forests and woods?

a) 0.5 percent
b) 7.5 percent
c) 27.5 percent
d) 47.5 percent

13. The number of hedgerows in Britain is

a) increasing, resulting in an improvement to the natural environment
b) increasing, resulting in damage to the natural environment
c) decreasing, resulting in an improvement to the natural environment
d) decreasing, resulting in damage to the natural environment

14. Taking into account the increasing use of fossil fuels for energy, the known world supply of coal is estimated to be enough to last for

a) about 5 years
b) about 25 years
c) more than 100 years
d) more than 1000 years

15. Approximately what percentage of the land surface in the United Kingdom is used for agriculture (crops, pasture, and rough grazing)?

a) 20 percent
b) 40 percent
c) 60 percent
d) 80 percent

16. At the present time, the world population is growing at a rate of

a) less than one percent each year
b) about two percent each year
c) about five percent each year
d) about ten percent each year

B 4

17. Which country currently consumes the largest amount of oil and natural gas?

a) USSR
b) Japan
c) USA
d) United Kingdom

18. Which one of the following best describes the way in which you have gained most of your knowledge about the environment?

a) general education at school
b) special environmental courses at school
c) private reading, the radio, and TV
d) talking with parents, friends and other people

19. Which one of the following problems do you think is the most serious in the community where you live?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in our community

20. Which one of the following problems do you think is the most serious in Britain?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in Britain

B 5

Part 2

Directions : Carefully read items 21 - 30, and in each case decide whether the statement is true or false. If you cannot decide, you should respond "Don't Know". Mark the answer of your choice on the Answer Sheet.

21. If sufficient water were available, virtually all of the land surface of the world could be economically used to produce food.

a) True b) False c) Don't Know

22. The interaction of environmental, biological and social factors determines the size of human populations.

a) True b) False c) Don't Know

23. There is an unlimited supply of energy available to man from fossil fuels (such as coal and oil).

a) True b) False c) Don't Know

24. Natural resources are equally distributed with respect to land areas and political boundaries.

a) True b) False c) Don't Know

25. Wildlife refuges and undisturbed natural areas may be of value in protecting endangered species and perpetuating gene pools.

a) True b) False c) Don't Know

26. The management of natural resources to meet the needs of successive generations demands long range planning.

a) True b) False c) Don't Know

B 6

27. Throughout history, cultures with little technological development have used more natural resources than those with advanced levels of technological development.

a) True b) False c) Don't Know

28. Maintaining, improving, and in some cases restoring soil productivity is important to the welfare of people.

a) True b) False c) Don't Know

29. Minerals are non-renewable resources.

a) True b) False c) Don't Know

30. The oceans represent a limitless source of food and resources for the future.

a) True b) False c) Don't Know

B 7

Part 3

Directions : For items 31 - 45 there are no "right" or "wrong" answers. Simply select the response which best expresses your belief about each statement, and mark it on the Answer Sheet.

31. Planning which will limit the size of families is important if over-population is to be avoided.

a) Agree b) Disagree c) No Opinion

32. The demand for energy is critical enough to justify relaxing some of the environmental restrictions which hinder energy production.

a) Agree b) Disagree c) No Opinion

33. The tax system should be redesigned to encourage small families rather than large ones.

a) Agree b) Disagree c) No Opinion

34. Large-scale famines are not likely to occur in the near future.

a) Agree b) Disagree c) No Opinion

35. Fossil fuels (coal, oil, natural gas) are too valuable a chemical resource to be used to such a great extent in electrical power generation.

a) Agree b) Disagree c) No Opinion

36. Where scenic and recreation areas are being damaged by large numbers of visitors, there should be restrictions on the number of people who are allowed to visit at any one time.

a) Agree b) Disagree c) No Opinion

37. People who can afford the high prices should be allowed to buy objects made from the skin or fur of endangered wild animals.

a) Agree b) Disagree c) No Opinion

B 8

38. I would oppose laws that would restrict my standard of living, even though such laws might improve the standard of living for society as a whole.

a) Agree b) Disagree c) No Opinion

39. The remaining forests in Britain should be conserved at all costs.

a) Agree b) Disagree c) No Opinion

40. In order to reduce our use of oil, people should only be allowed to own cars that have a low petrol consumption.

a) Agree b) Disagree c) No Opinion

41. A national land-use plan should be prepared and enforced to prevent housing and industry from using much of the best agricultural land in Britain.

a) Agree b) Disagree c) No Opinion

42. When companies have finished surface-mining land that they own, they should be allowed to leave it in any condition they wish.

a) Agree b) Disagree c) No Opinion

43. In order to keep raw materials from being used up too fast, an international authority should be established to ration them.

a) Agree b) Disagree c) No Opinion

44. A person who buys a new leopard skin coat is just as responsible in bringing about the extinction of the leopard as the person who kills the animal.

a) Agree b) Disagree c) No Opinion

45. Industry should not use recycled materials when it costs less to make the same product from new raw materials.

a) Agree b) Disagree c) No Opinion

FORM C

Part 1

Directions : Read all items carefully. For items 1 - 20, select the one response which you believe provides the best answer. Mark your choice in the appropriate box on the Answer Sheet provided.

1. The present population of Britain is about

   a) 57 million
   b) 67 million
   c) 77 million
   d) 87 million

2. The population of Britain is growing at a rate which is

   a) more than that of the world average
   b) about the same as the world average
   c) less than that of the world average
   d) zero

3. At the present time Britain

   a) produces more food than it uses, and exports the surplus
   b) produces just enough food to satisfy home needs
   c) must import about 5% of its food supply
   d) must import about 50% of its food supply

4. Which of the following is most likely to be an important world-wide source of energy for the future?

   a) solar radiation
   b) tidal flow
   c) geothermal sources
   d) wind power

5. Most of the electrical energy used in Britain is produced by

   a) nuclear power plants
   b) coal-burning power plants
   c) oil-burning power plants
   d) natural gas power plants

C 2

6. Carbon monoxide is a serious air pollutant because it

a) is poisonous to humans
b) causes atmospheric haze
c) is harmful to vegetation
d) is corrosive to metals

7. Most of the radiation to which people in this country are exposed is due to

a) the normal hazards of work
b) TV sets and luminous watches
c) medical sources (X-rays, etc.)
d) natural sources

8. The largest single source of man-made radiation to which the British are exposed is due to

a) the fallout from bomb tests
b) nuclear power-plant radiation
c) TV sets and luminous watches
d) medical sources (X-rays, etc.)

9. Studies have shown that the pesticide DDT is present in the body tissues of people around the world. Most of this DDT in our bodies comes from

a) the air we breathe
b) the water we drink
c) the food we eat
d) being directly exposed to aerosol sprays containing DDT

10. About how much of the energy stored in coal is converted into electrical energy in modern power plants?

a) 10 - 20 percent
b) 30 - 40 percent
c) 60 - 70 percent
d) 80 - 90 percent

C 3

11. Since 1958 the smoke concentrations in central London have decreased by 80%, and sulphur dioxide in the air has decreased by 40%. This improvement in air quality is mainly the result of

a) a decline in the population of central London
b) the voluntary action of citizens to reduce air pollution
c) the voluntary action of industry to reduce air pollution
d) legislative action taken by the government

12. Nuclear power plants are built near bodies of water because the water is

a) an added safety factor in case of fire
b) a coolant
c) an alternative power source
d) a disposal place for radioactive waste

13. Bronchitis is a common respiratory disease. The death rate from bronchitis in Britain is

a) about 4 times greater than the road accident death rate
b) about 4 times less than the road accident death rate
c) about the same as the road accident death rate
d) zero, since it is not a fatal disease

14. Which of the following materials is <u>not</u> biodegradable?

a) leaves
b) bread
c) wood
d) glass

15. Most of the oxygen found in the earth's atmosphere is the result of

a) the slow decomposition of silica (SiO_2) in the earth's crust
b) the action of volcanos
c) the photosynthetic action of plants
d) the splitting of water molecules (H_2O) in the oceans

16. Which of the following is <u>not</u> a potential problem with nuclear power plants?

a) thermal pollution
b) smoke pollution
c) waste disposal
d) radiation pollution

C 4

17. At present, the cheapest way to dispose of solid wastes collected from homes is by

a) incineration
b) recycling
c) dumping in pits and covering with soil
d) composting

18. Which one of the following best describes the way in which you have gained most of your knowledge about the environment?

a) general education at school
b) special environmental courses at school
c) private reading, the radio, and TV
d) talking with parents, friends and other people

19. Which one of the following problems do you think is the most serious in the community where you live?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in our community

20. Which one of the following problems do you think is the most serious in Britain?

a) Land use
b) Traffic accidents
c) Air pollution
d) Water pollution
e) Rubbish disposal
f) Over-crowding
g) Public health
h) Crime
i) None of the above are problems in Britain

C 5

Part 2

Directions : Carefully read items 21 - 30, and in each case decide whether the statement is true or false. If you cannot decide, you should respond "Don't Know". Mark the answer of your choice on the Answer Sheet.

21. If sufficient water were available, virtually all of the land surface of the world could be economically used to produce food.

a) True b) False c) Don't Know

22. The interaction of environmental, biological and social factors determines the size of human populations.

a) True b) False c) Don't Know

23. There is an unlimited supply of energy available to man from fossil fuels (such as coal and oil).

a) True b) False c) Don't Know

24. There is no relationship between the incidence of bronchitis and the level of air pollution.

a) True b) False c) Don't Know

25. Safe waste disposal is important if the well-being of man and the environment is to be preserved.

a) True b) False c) Don't Know

26. The ultimate source of most of the energy that we use is the sun.

a) True b) False c) Don't Know

C 6

27. There is a tendency for people to select long-term environmental benefits, often at the expense of short-term economic gains.

a) True b) False c) Don't Know

28. Life as we know it is dependent upon the transformation of energy from one form into another.

a) True b) False c) Don't Know

29. Chemical substances may be concentrated as they pass through food chains, and become a hazard to human health.

a) True b) False c) Don't Know

30. An organism is a product of its heredity and environment.

a) True b) False c) Don't Know

C 7

Part 3

Directions : For items 31 - 45 there are no "right" or "wrong" answers. Simply select the response which best expresses your belief about each statement, and mark it on the Answer Sheet.

31. Planning which will limit the size of families is important if over-population is to be avoided.

a) Agree b) Disagree c) No Opinion

32. The demand for energy is critical enough to justify relaxing some of the environmental restrictions which hinder energy production.

a) Agree b) Disagree c) No Opinion

33. The tax system should be redesigned to encourage small families rather than large ones.

a) Agree b) Disagree c) No Opinion

34. Large-scale famines are not likely to occur in the near future.

a) Agree b) Disagree c) No Opinion

35. The most important thing to consider about bringing new industry into your area is the number of new jobs it will create.

a) Agree b) Disagree c) No Opinion

36. We should question the construction of all nuclear power reactors because of the harmful by-products they produce.

a) Agree b) Disagree c) No Opinion

37. Rather than rationing petroleum products, more oil should be imported from overseas to meet our growing energy needs.

a) Agree b) Disagree c) No Opinion

C 8

38. Strong controls by Government are the most effective way to reduce pollution problems.

a) Agree b) Disagree c) No Opinion

39. Priority should be given to developing alternatives to fossil and nuclear fuel as primary energy sources.

a) Agree b) Disagree c) No Opinion

40. It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future.

a) Agree b) Disagree c) No Opinion

41. Pesticides that remain toxic for a long period of time should be banned.

a) Agree b) Disagree c) No Opinion

42. Most of the concern about environmental problems has been over-exaggerated.

a) Agree b) Disagree c) No Opinion

43. The Government should give generous financial support to research related to the development of solar energy.

a) Agree b) Disagree c) No Opinion

44. Government regulations for the approval of new nuclear power plants are too strict.

a) Agree b) Disagree c) No Opinion

45. Considering the problems of pollution and crowding, we need to decrease the use of the car as a major means of transportation.

a) Agree b) Disagree c) No Opinion

STUDENT ANSWER SHEET

FORM **A**

DO NOT MARK IN THIS BOX

	A	B	C
FORM			

A

B

C 1 2 3 4 5 6 7 8 9

D 1 2 3 4 5 6 7 8 9

E 1 2 3 4 5 6 7 8 9

F

DIRECTIONS

PLEASE USE PENCIL.
Mark the answer of your choice in the appropriate box below. Be sure that each mark is black and completely fills the box. Erase completely any answer that you wish to change.

Example: If the answer of your choice is C, fill in the box as follows: a b c d

Please provide the following information about yourself:

1. Are you male or female? MALE FEMALE
2. What is your age? 12 13 14 15 16 17 18

PART 1

1	a	b	c	d				
2	a	b	c	d				
3	a	b	c	d				
4	a	b	c	d				
5	a	b	c	d				
6	a	b	c	d				
7	a	b	c	d				
8	a	b	c	d				
9	a	b	c	d				
10	a	b	c	d				
11	a	b	c	d				
12	a	b	c	d				
13	a	b	c	d				
14	a	b	c	d				
15	a	b	c	d				
16	a	b	c	d				
17	a	b	c	d				
18	a	b	c	d				
19	a	b	c	d	e	f	g	h	i
20	a	b	c	d	e	f	g	h	i

PART 2

	TRUE	FALSE	DON'T KNOW
21	a	b	c
22	a	b	c
23	a	b	c
24	a	b	c
25	a	b	c
26	a	b	c
27	a	b	c
28	a	b	c
29	a	b	c
30	a	b	c

PART 3

	AGREE	DISAGREE	NO OPINION
31	a	b	c
32	a	b	c
33	a	b	c
34	a	b	c
35	a	b	c
36	a	b	c
37	a	b	c
38	a	b	c
39	a	b	c
40	a	b	c
41	a	b	c
42	a	b	c
43	a	b	c
44	a	b	c
45	a	b	c

STUDENT ANSWER SHEET FORM **B**

DO NOT MARK IN THIS BOX

FORM A B C

A

B

C 1 2 3 4 5 6 7 8 9

D 1 2 3 4 5 6 7 8 9

E 1 2 3 4 5 6 7 8 9

F 1 2 3 4 5 6 7 8 9

DIRECTIONS

PLEASE USE PENCIL.

Mark the answer of your choice in the appropriate box below.
Be sure that each mark is black and completely fills the box.
Erase completely any answer that you wish to change.

Example: If the answer of your choice is C, fill in the box as follows: a b c d

Please provide the following information about yourself:

1. Are you male or female? MALE FEMALE
2. What is your age? 12 13 14 15 16 17 18

PART 1

	a	b	c	d	e	f	g	h	i
1	a	b	c	d					
2	a	b	c	d					
3	a	b	c	d					
4	a	b	c	d					
5	a	b	c	d					
6	a	b	c	d					
7	a	b	c	d					
8	a	b	c	d					
9	a	b	c	d					
10	a	b	c	d					
11	a	b	c	d					
12	a	b	c	d					
13	a	b	c	d					
14	a	b	c	d					
15	a	b	c	d					
16	a	b	c	d					
17	a	b	c	d					
18	a	b	c	d					
19	a	b	c	d	e	f	g	h	i
20	a	b	c	d	e	f	g	h	i

PART 2

	TRUE	FALSE	DON'T KNOW
21	a	b	c
22	a	b	c
23	a	b	c
24	a	b	c
25	a	b	c
26	a	b	c
27	a	b	c
28	a	b	c
29	a	b	c
30	a	b	c

PART 3

	AGREE	DISAGREE	NO OPINION
31	a	b	c
32	a	b	c
33	a	b	c
34	a	b	c
35	a	b	c
36	a	b	c
37	a	b	c
38	a	b	c
39	a	b	c
40	a	b	c
41	a	b	c
42	a	b	c
43	a	b	c
44	a	b	c
45	a	b	c

STUDENT ANSWER SHEET FORM C

DO NOT MARK IN THIS BOX

FORM A B C

A

B

1 2 3 4 5 6 7 8 9

C

1 2 3 4 5 6 7 8 9

D

1 2 3 4 5 6 7 8 9

E

1 2 3 4 5 6 7 8 9

F

DIRECTIONS

PLEASE USE PENCIL.
Mark the answer of your choice in the appropriate box below. Be sure that each mark is black and completely fills the box. Erase completely any answer that you wish to change.

Example: If the answer of your choice is C, fill in the box as follows: a b c d

Please provide the following information about yourself:

1. Are you male or female?------------ MALE FEMALE
2. What is your age?------------------- 12 13 14 15 16 17 18

PART 1

	a	b	c	d	e	f	g	h	i
1	a	b	c	d					
2	a	b	c	d					
3	a	b	c	d					
4	a	b	c	d					
5	a	b	c	d					
6	a	b	c	d					
7	a	b	c	d					
8	a	b	c	d					
9	a	b	c	d					
10	a	b	c	d					
11	a	b	c	d					
12	a	b	c	d					
13	a	b	c	d					
14	a	b	c	d					
15	a	b	c	d					
16	a	b	c	d					
17	a	b	c	d					
18	a	b	c	d					
19	a	b	c	d	e	f	g	h	i
20	a	b	c	d	e	f	g	h	i

PART 2

	TRUE	FALSE	DON'T KNOW
21	a	b	c
22	a	b	c
23	a	b	c
24	a	b	c
25	a	b	c
26	a	b	c
27	a	b	c
28	a	b	c
29	a	b	c
30	a	b	c

PART 3

	AGREE	DISAGREE	NO OPINION
31	a	b	c
32	a	b	c
33	a	b	c
34	a	b	c
35	a	b	c
36	a	b	c
37	a	b	c
38	a	b	c
39	a	b	c
40	a	b	c
41	a	b	c
42	a	b	c
43	a	b	c
44	a	b	c
45	a	b	c

APPENDIX B

1. Letter to Chief Education Officers*
2. Initial Letter to Headteachers*
3. First Follow-up Letter to Headteachers*
4. Second Follow-up Letter to Headteachers*
5. Postcard Sent with Second Follow-up Letter
6. Card Thanking Cooperating Schools

* Photo-reduced by 15% from the original

Preston Polytechnic Director H. D. LAW, B.A., Ph.D., F.R.I.C.
Corporation Street, Preston PR1 2TQ 0772-51831

SCHOOL OF EDUCATION
Dean of School: A. B. Butterworth, MEd, Acad.DipEd. CertEd, NFF, ADB

CHORLEY CAMPUS, Union Street, Chorley, PR7 1ED 02572-5811

November 14, 1975

Concern for man's relationship with his environment and the need for education in this field has grown in recent years. This development was documented in the School's Council "Project Environment" Report No. 2 and in the Project's recent publications. Many additional efforts are currently being made to develop syllabuses and curricular materials in England. The recent "A" level syllabuses in Environmental Science and Environmental Studies of boards such as the Joint Matriculation Board and the Associated Examining Board are examples of this. The United Nations Conference on the Human Environment acted on this same concern when it recommended the establishment of an international environmental education programme.

Before developing programmes in the future (whether for local, national or international use) it is highly desirable to have a measure of the existing environmental knowledge and attitudes of pupils in the target population. With this in mind, nation-wide surveys have already been conducted in Australia and the United States. A similar survey is planned for England in January 1976.

A randomly selected sample of about ten percent of the secondary schools within each local education authority will be drawn from statistical information that has been provided by the Director of Statistics of the Department of Education and Science. The survey will involve presenting the questionnaire to about 30 children in the fifth year of each school selected in the sample.

Our experience in a recently completed pilot study showed that presenting the questionnaire is not an onerous task for the staff of the cooperating schools. It is simple to administer and should only take about 30 minutes to complete. Participation will not involve any expense for either the local education authority or the individual schools.

Clearly, if the survey is to present a true national picture, a high response rate from the sample schools in all the local education authorities is necessary. May we therefore please have your permission to seek the cooperation of those schools under your authority which will be selected in the random sample?

It would greatly help if you would reply to our request at an early date. A stamped addressed envelope is enclosed. If you have any queries please contact R. F. Morgan at the above Chorley Campus address.

Yours sincerely,

R. F. Morgan
Senior Lecturer,
Applied Curriculum Studies Division.
Formerly Deputy Director,
School's Council Project Environment.

James M. Richmond
University Fellow,
The Ohio State University.

RFM/JMR/lrw

Enclosure

Preston Polytechnic Director H. D. LAW, B.A., Ph.D., F.R.I.C.
Corporation Street, Preston PR1 2TQ 0772-51831

SCHOOL OF EDUCATION
Dean of School: A. B. Butterworth, MEd, Acad.DipEd. CertEd, NFF, ADB

CHORLEY CAMPUS, Union Street, Chorley, PR7 1ED 02572-5811

Date 5th January, 1976 Our reference RFM/JMR/gr Your reference

Concern for man's relationship with his environment and the need for education in this field has grown in recent years. As you will know, many efforts have been made in England to develop syllabuses and teaching resources. The recent "A" level syllabuses in Environmental Science and Environmental Studies of boards such as the Joint Matriculation Board and the Associated Examining Board are examples of this. The United Nations Conference on the Human Environment acted on this same concern when it recommended the establishment of an international environmental education programme.

Before developing syllabuses in the future (whether for local, national, or international use) it is highly desirable to have a measure of the existing environmental knowledge and attitudes of the pupils. With this in mind, nation-wide surveys have already been conducted in Australia and the United States. A similar survey is now being conducted in England. The results of this will be invaluable in developing courses of environmental work for our schools.

The Chief Education Officer for your LEA has given us permission to ask for your cooperation in this survey. Your participation will involve presenting a questionnaire to about 30 pupils in the 5th year. The task is not complicated as the enclosed instructions show. Our experience with the pilot study showed that the whole operation takes only 30-40 minutes to complete. No expense will be incurred by your school. All materials (including pencils which the students may keep) are enclosed, and a stamped addressed envelope is provided for returning the answer sheets.

We should add that your school has been selected by means of a random sample of about 10 percent of all secondary schools in England. The decision as to whether or not your school participates in this research is, of course, left to your discretion. However, you will appreciate that we are totally dependent upon a positive response from selected schools for success with the survey.

We greatly appreciate your cooperation in this project.

Yours sincerely,

R.F. Morgan
Senior Lecturer,
Applied Curriculum Studies Division.
Formerly Deputy Director,
School's Council Project Environment.

James M. Richmond
University Fellow,
The Ohio State University.

P.S. Since computer time has been booked for analyzing the data, it would be helpful if you would return the answer sheets to us before 13 February, 1976.

Enclosure

Preston Polytechnic Director H. D. LAW, B.A., Ph.D., F.R.I.C.
Corporation Street, Preston PR1 2TQ 0772-51831

SCHOOL OF EDUCATION
Dean of School: A. B. Butterworth, MEd, Acad.DipEd. CertEd, NFF, ADB

CHORLEY CAMPUS, Union Street, Chorley, PR7 1ED 02572-5811

Date 16th February 1976 Our reference Your reference

Dear

In mid-January I posted a package to you containing 30 questionnaires relating to environmental matters. Enclosed was a request that the questionnaires be completed by pupils in your fifth year and that the answer sheets be returned to me by 13th February. Since I have not received them I am writing to enquire whether the package arrived and, if so, whether you have had an opportunity to return the pupil responses.

It may be that you have been unable so far to fit the task into your programme; I fully appreciate the pressures upon schools (having taught in secondary schools for 20 years before coming into teacher training). However it will not be too late if we can have your contribution by the end of this month. Although we have computer time booked, we can begin using this for the returns that have already come in.

You may be interested to know a little more about my involvement with this survey. I work closely with schools and with working parties of teachers for much of my time in the task of developing curriculum materials in environmental education for children. In all this work, national, regional and local, we lack some firm baselines from which to begin and a great deal of time is often spent in finding suitable starting points. There is little evidence of the exact state of secondary school pupils' knowledge about environmental matters or of their attitudes to the problems which face us. I became involved with this survey because I believe it will provide some of this information and will be most useful as guidance for anyone (project team, working party or individual teacher) devising courses with an environmental element, whether based upon one subject or on interdisciplinary grounds.

In accordance with the recommendations made by the United Nations Conference on the Human Environment, surveys have already been successfully completed in Australia and the United States with a high degree of cooperation by their schools. The present study in England is a continuation of this effort. The department of Science and Mathematics Education at the Ohio State University initiated the survey and asked me to be the English consultant and coordinator. I accepted because my wide contact with environmental education activities in this country indicates that we urgently need the information which this research will provide. The survey is being funded entirely from American resources and the final report will be published and made available in England. Thus the project offers an excellent opportunity to gather some valuable information for future curriculum development at no financial cost to ourselves. It may be considered that this is too good an opportunity to miss in the present difficult financial times.

Some people have raised questions about the vocabulary and the level of the questions asked in the questionnaires. I should point out that all of the items have been thoroughly tested and analysed in a pilot study involving almost 400 pupils from nine representative English schools. Only questions that provided meaningful information to the researchers were retained. As you will appreciate, this is not a test of individual children's knowledge. The survey must show the extent of knowledge of the very bright as well as the less able and for this reason must extend even the most knowledgeable. Obviously, if it were designed to enable everyone to answer all or most of the questions it would tell us little. Perhaps the most important thing is to reassure the children of lower ability that this is not a test of them as individuals but that it is a piece of 'customer research' to find out how fifteen-year-olds in general think about the environment.

I hope that this information may be of interest to you and that in the light of this additional knowledge you will now wish to participate, if you have not already done so. As we said in our original letter, your school is one of 500 selected in a random sample from schools throughout England and we are dependent upon your response for the success of the survey and for making the considerable expenditure of effort and money worthwhile.

Yours sincerely,

....
R. F. Morgan

Senior Lecturer
Applied Curriculum Studies Division

Preston Polytechnic Director H. D. LAW, B.A., Ph.D., F.R.I.C.
Corporation Street, Preston PR1 2TQ 0772-51831

SCHOOL OF EDUCATION
Dean of School: A. B. Butterworth, MEd, Acad.DipEd. CertEd, NFF, ADB

CHORLEY CAMPUS, Union Street, Chorley, PR7 1ED 02572-5811

Date 27 February '76 Our reference RFM/DB Your reference

Dear

About six weeks ago I posted a package to you containing 30 questionnaires as part of a national survey of the environmental knowledge and attitudes of 5th year pupils. This was followed by a letter on 13 February providing additional information about the survey. Since I have not received the completed student answer sheets from your school I am concerned that the materials may have gone astray in transit.

If, on the other hand, you have not had an opportunity to administer the survey or are prevented from participating, it would be helpful if you could let us know. I am therefore enclosing a card (with stamp and return address) which will provide the information that we need. I would be grateful if you would take a moment to fill in the card and drop it in the post at your earliest convenience.

Thank you for your co-operation.

Yours sincerely,

P.S. It should be stressed that it is not too late to have a group of your pupils answer the questionnaire if this has not been done already.

POSTCARD SENT WITH SECOND FOLLOW-UP/LETTER

Please tick the appropriate box below:

☐ The completed answer sheets have already been posted to you.

☐ The completed answer sheets will be posted to you on ________.
(date)

☐ We have not received your package of questionnaires, but we will be prepared to cooperate in this survey.

☐ Sorry, we are not able to cooperate in the survey.

Comments: ____

____

Name: ____
(position)

Address: ____

____

CARD THANKING COOPERATING SCHOOLS

National Survey of Environmental Knowledge and Attitudes of 5th Year Pupils

We wish to thank the Headteacher and cooperating members of Staff and pupils for so kindly assisting in this survey. The excellent response by schools throughout the country is greatly appreciated.

Since many participating schools have expressed an interest in the results of the survey, we will send further information when the analysis of results has been completed.

James M. Richmond,
The Ohio State University.

Richard F. Morgan,
Preston Polytechnic
School of Education.
Chorley. PR7 1ED

APPENDIX C

1. Instructions for Cooperating Teachers*
2. School Information Sheet*

* Photo-reduced by 23% from the original

National Survey of the Environmental Knowledge and Attitudes of 5th Year Pupils

Instructions for Cooperating Teacher

The Questionnaires

There are 3 questionnaires, identified as Form A, Form B, and Form C. Each form is different, although they contain some common items. Each pupil will answer only one form. The instructions for answering the questions are clearly stated on each form and on the answer sheets.

Choosing the Pupils

It is important that the questionnaires are answered by about 30 pupils who represent the complete 5th year ability range. This may be achieved by following either of the following methods :

Method A

If your school already has a form in the 5th year which includes the whole ability range, use this group.

Method B

If your forms are grouped by ability, select a mixed sample by the following random procedure :

1. Take an alphabetical list of the whole 5th year and number it in order (say 1 to 169).
2. Divide the total number by 30 to the nearest whole number (e.g. 169 $\div$ 30 = 6)
3. Select any number between 1 and 9 (say 3). The pupil that has this number will be the first to be selected.
4. Add the "interval number" that you obtained in Step 2 to this first selected number, and continue this successively until the list is used up (e.g. 3, 9, 15, ...165).
5. If you have less than 30 pupils at the end, continue counting by going back to the beginning of the list (e.g. in our example the last pupil was number 165, giving a total of 28 selected pupils; so we count from 165 to 169 and return to the beginning of the list. The 29th pupil will be number 2, and the 30th will be number 8).

OVER

Completing the Questionnaires

1. Each student should fill in only one form, either A, or B, or C. Hand out the forms in order (A, B, C, A, B, C ... etc.) according to the alphabetical listing of names in your selected group.

2. Please ask pupils to check that the letter on their questionnaire (A, B, or C) corresponds with the letter on their answer sheet.

3. There is no time limit. Pupils should be allowed sufficient time to complete the form.

4. Pupils should use the pencils provided for answering the questions. This is essential for machine-scoring the answers. Please stress that the pencil marks on the answer sheet should be firm and black and should completely fill the narrow boxes. Pupils may keep the pencils after completing the task.

5. In analyzing the data we require some basic information (which will be held in confidence) about the schools participating in the survey. Would you therefore please fill in the enclosed form and return it with the answer sheets in the stamped addressed envelope provided.

6. You are welcome to keep the questionnaires if you feel they might be useful as resource materials.

National Survey of the Environmental Knowledge and Attitudes of 5th Year Pupils

To the Cooperating Teacher :

Please fill in this form and return it with the student answer sheets.

A. Name and address of school ....
....
....
....

B. Which of the following best describes your school? (Tick one box)

[1] Comprehensive

[2] Secondary Modern

[3] Grammar

[4] Direct Grant

[5] Independent

[6] Other (name) ....

C. How many pupils are enrolled at your school? ....

D. How many pupils are there in the 5th year? ....

OVER

E. Which of the following applies to your school? (Tick one box)

[1] All boys

[2] All girls

[3] Mixed

F. Which method did you use in choosing pupils to answer the questionnaires? (Tick one box)

[1] Method A

[2] Method B

APPENDIX D

1. Instructions to Critics of the Instrument*
2. Panel Members

* Photo-reduced by 15% from the original

Forms A, B, C, and D represent the initial attempt to construct an instrument for measuring the environmental knowledge and beliefs of 10th grade students in England. The items contained in these forms will be tested in a pilot study before putting together the final instrument.

In addition, a number of people who have expertise in Environmental Studies are being asked to respond to the items.

Instructions for responding to items:

Part I   Factual Items

These items are factual in nature and the correct answer can be verified from published data and the writings of recognized authorities.

If you know the answer to an item, circle the letter (a,b,c,d) preceding the statement of your choice. If you cannot confidently identify the correct response, place a question-mark (?) next to the item.

Part 2   Conceptual Items

These items represent "big ideas" involving relationships between facts and generalizations.

Carefully consider each statement, and respond by circling the letter of your choice.

Part 3   Belief Items

The answer that you give to these belief statements need not necessarily represent your own personal viewpoint. The response should reflect a viewpoint compatible with the maintenance of an environment that will promote the well-being and survival of *Homo sapiens* as a species, rather than one which is beneficial only to an individual or limited group of individuals.

For example, for economic reasons you may not agree with the statement that "The tax system should be redesigned to encourage small families rather than large ones." However, from the point-of-view of maintaining an environment that will promote the well-being and survival of *Homo sapiens* as a species (by discouraging over-population), the more appropriate response would be "agree".

In addition, please feel free to write comments about the items (such as "inappropriate", "ambiguous", etc.) in the margin. Suggested improvements in the wording of items will be appreciated, however remember that words and sentences should be kept as simple as possible to suit the 10th grade reading level.

Panel Members

Dr. Robert W. Howe	Chairman, Science and Mathematics Education. The Ohio State University Director, ERIC Science, Mathematics and Environmental Education Information Analysis Center.
Dr. Robert E. Roth	Chairman, Division of Environmental Education. School of Natural Resources The Ohio State University
Dr. Robert L. Steiner	Assoc. Professor, Science Education The Ohio State University
Dr. W.B. Bohl	Director, International Field Studies Columbus, Ohio
Dr. A. Cordell Perkes	Asst. Professor, Science Education George Mason University, Virginia
D.W. McGregor	Head of Applied Curriculum Studies Division. Preston Polytechnic School of Education, Chorley Campus
Richard F. Morgan	Senior Lecturer, Applied Curriculum Studies Division. Preston Polytechnic School of Education, Chorley Campus Formerly Deputy Director, Schools Council "Project Environment".

APPENDIX E

Supportive References for Answers to Factual Knowledge Items (Part 1)

SUPPORTIVE REFERENCES FOR ANSWERS TO FACTUAL KNOWLEDGE ITEMS

Item Number	Bibliographic Reference	Author	Page Number
ABC1	135	United Nations	116
	4	Allen, Robert	33
ABC2	135	United Nations	63, 116
	142	World Population Data Sheet	-
ABC3	4	Allen, Robert	39
	50	Edwards and Wibberley	44
ABC4	54	Fagan, John J.	134
	67	Hammond, Allen L. et al	61-66, 147-151
A5	42	Curry-Lindahl, Kai	31
	121	Southwick, Charles H.	12
A6	119	Shea, Kevin P.	164
	108	Radcliffe, D.A.	208-210
A7	9	Aynsley, Eric	345-347
	1	Albone, Eric S.	148
A8	37	Commoner, Barry	348
	28	Chanlett, Emil T.	125
A9	143	Wurster, Charles F.	557
	137	Wallis, H.F.	91
A10	16	Blumer, Max	296
	137	Wallis, H.F.	81
A11	39	Cook, Robert C.	-
	7	Arvill, Robert	206
A12	51	Ehrlich and Ehrlich	124
	54	Fagan, John J.	42
A13	51	Ehrlich and Ehrlich	7
	14	Biological Sciences Curriculum Study	679
A14	139	Weale, Michael	16
	91	McNaughton and Wolf	406-407
A15	19	Bourne, Arthur G.	263
	141	WEA Background Notes	12
A16	1	Albone, Eric S.	154
	40	Council on Environmental Quality	266

Item Number	Bibliographic Reference	Author	Page Number
A17	92	Meadows, Donella H. et al	30-34
	51	Ehrlich and Ehrlich	8
B5	121	Southwick, Charles H.	120-121
	81	Kormondy, Edward J.	3-4
B6	50	Edwards and Wibberley	88
	7	Arvill, Robert	63-64
B7	7	Arvill, Robert	130
	101	O'Dell and Walton	37
B8	7	Arvill, Robert	115
	137	Wallis, H.F.	120
B9	92	Meadows, Donella H. et al	151-153
	73	Idyll, Clarence P.	36-45
B10	92	Meadows, Donella H. et al	56-60
	139	Weale, Michael	37
B11	46	Department of Energy	1, 15
	25	Central Office of Information	1
B12	50	Edwards and Wibberley	85
	7	Arvill, Robert	42,54
B13	64	Goldsmith, Edward	74-76
	3	Allaby, Michael	146-147
B14	92	Meadows, Donella H. et al	56
	72	Hubbert, M. King	205
B15	50	Edwards and Wibberley	85
	7	Arvill, Robert	42-43
B16	135	United Nations	63
	39	Cook, Robert C.	-
B17	75	International Petroleum Encyclopedia	13
	92	Meadows, Donella H. et al	58-59
C5	25	Central Office of Information	24
	98	National Coal Board	1
C6	54	Fagan, John J.	18-19
	28	Chanlett, Emil T.	200-204
C7	107	Pochin, E. Eric	280
	40	Council on Environmental Quality	190-191

Item Number	Bibliographic Reference	Author	Page Number
C8	107	Pochin, E. Eric	280
	40	Council on Environmental Quality	190-191
C9	92	Meadows, Donella H. et al	82-85
	97	National Academy of Sciences	29
C10	25	Central Office of Information	25-26
	125	Summers, Claude M.	95-106
C11	7	Arvill, Robert	105, 108-109
	6	Arthur, Don R.	125
C12	5	American Nuclear Society	16-19
	136	United States Atomic Energy Commission	3-4
C13	7	Arvill, Robert	107
		Data provided in personal communication with the Office of Population Censuses and Surveys, London	
C14	70	Holliman, Jonathan	15
	51	Ehrlich and Ehrlich	129
C15	121	Southwick, Charles H.	274
	14	Biological Sciences Curriculum Study	190
C16	5	American Nuclear Society	10-26
	103	Pennsylvania Department of Education	49-53
C17	137	Wallis, H.F.	60
	21	Brooks, Peter F.	67

APPENDIX F

Chi Square Analyses on All Items
on Forms A, B and C by

(a) Sex

(b) School Type

(c) School Sex

(d) School Size

(e) Region

(f) Sampling Method

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3721	227.5	3	0.0000*
2	3719	62.3	3	0.0000*
3	3713	41.6	3	0.0000*
4	3708	32.1	3	0.0000*
5	3715	17.4	3	0.0006
6	3708	32.6	3	0.0000*
7	3711	46.3	3	0.0000*
8	3703	6.8	3	0.0771
9	3710	16.9	3	0.0007
10	3705	305.6	3	0.0000*
11	3713	3.8	3	0.2811
12	3673	40.9	3	0.0000*
13	3719	6.0	3	0.1116
14	3701	25.7	3	0.0000*
15	3712	73.2	3	0.0000*
16	3708	126.9	3	0.0000*
17	3717	0.4	3	0.9264
18	3716	30.3	3	0.0000*
19	3718	48.8	8	0.0000*
20	3712	61.7	8	0.0000*
21	3721	3.7	2	0.1520
22	3719	8.2	2	0.0165
23	3720	70.6	2	0.0000*
24	3720	6.6	2	0.0366
25	3718	1.0	2	0.5777
26	3722	4.5	2	0.1009
27	3718	43.7	2	0.0000*
28	3717	17.0	2	0.0002
29	3717	9.9	2	0.0068
30	3718	14.1	2	0.0008
31	3714	3.9	2	0.1386
32	3706	97.9	2	0.0000*
33	3709	23.6	2	0.0000*
34	3709	0.2	2	0.8667
35	3706	4.8	2	0.0887
36	3711	17.8	2	0.0001*
37	3712	10.4	2	0.0055
38	3713	13.0	2	0.0014
39	3708	4.5	2	0.1048
40	3706	51.0	2	0.0000*
41	3704	93.7	2	0.0000*
42	3706	2.7	2	0.2586
43	3706	10.2	2	0.0059
44	3706	0.0	2	0.9691
45	3708	51.5	2	0.0000*

*$p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3640	210.1	3	0.0000*
2	3643	84.4	3	0.0000*
3	3639	40.8	3	0.0000*
4	3635	38.2	3	0.0000*
5	3603	6.3	3	0.0945
6	3636	14.2	3	0.0026
7	3638	22.1	3	0.0001*
8	3642	10.7	3	0.0130
9	3643	181.5	3	0.0000*
10	3643	16.9	3	0.0007
11	3643	160.4	3	0.0000*
12	3639	81.2	3	0.0000*
13	3615	6.7	3	0.0788
14	3635	16.9	3	0.0007
15	3639	11.4	3	0.0094
16	3639	25.9	3	0.0000*
17	3640	55.4	3	0.0000*
18	3634	8.7	3	0.0331
19	3637	50.1	8	0.0000*
20	3642	62.9	8	0.0000*
21	3645	2.2	2	0.3302
22	3642	31.3	2	0.0000*
23	3641	65.0	2	0.0000*
24	3643	28.3	2	0.0000*
25	3644	0.3	2	0.8520
26	3642	16.3	2	0.0003
27	3638	76.4	2	0.0000*
28	3642	1.9	2	0.3840
29	3636	14.0	2	0.0009
30	3644	10.0	2	0.0064
31	3644	14.5	2	0.0007
32	3637	49.1	2	0.0000*
33	3638	38.7	2	0.0000*
34	3639	3.1	2	0.2050
35	3640	41.2	2	0.0000*
36	3634	10.8	2	0.0045
37	3638	4.6	2	0.0998
38	3633	55.3	2	0.0000*
39	3634	1.2	2	0.5379
40	3636	11.1	2	0.0038
41	3637	2.0	2	0.3540
42	3638	9.2	2	0.0096
43	3638	19.5	2	0.0001*
44	3639	4.0	2	0.1301
45	3638	34.8	2	0.0000*

*p $\leq$ 0.0001

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3581	214.3	3	0.0000*
2	3585	60.7	3	0.0000*
3	3575	29.5	3	0.0000*
4	3576	45.7	3	0.0000*
5	3581	224.8	3	0.0000*
6	3569	45.0	3	0.0000*
7	3576	64.5	3	0.0000*
8	3572	41.5	3	0.0000*
9	3575	33.0	3	0.0000*
10	3579	42.0	3	0.0000*
11	3575	16.2	3	0.0010
12	3580	213.4	3	0.0000*
13	3580	13.5	3	0.0035
14	3561	24.6	3	0.0000*
15	3566	56.1	3	0.0000*
16	3575	101.6	3	0.0000*
17	3579	73.7	3	0.0000*
18	3578	26.8	3	0.0000*
19	3579	22.2	8	0.0044
20	3580	72.8	8	0.0000*
21	3586	1.0	2	0.5922
22	3581	4.0	2	0.1293
23	3584	36.7	2	0.0000*
24	3582	30.0	2	0.0000*
25	3582	10.2	2	0.0059
26	3582	8.3	2	0.0157
27	3577	32.2	2	0.0000*
28	3580	9.2	2	0.0099
29	3579	1.2	2	0.5373
30	3577	4.2	2	0.1172
31	3580	8.7	2	0.0127
32	3571	39.4	2	0.0000*
33	3576	18.5	2	0.0001*
34	3572	2.9	2	0.2307
35	3577	15.0	2	0.0005
36	3577	123.6	2	0.0000*
37	3573	44.2	2	0.0000*
38	3577	29.1	2	0.0000*
39	3576	95.5	2	0.0000*
40	3571	30.8	2	0.0000*
41	3574	3.5	2	0.1654
42	3573	16.3	2	0.0003
43	3572	74.3	2	0.0000*
44	3567	47.3	2	0.0000*
45	3574	6.4	2	0.0402

*$p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3710	80.4	9	0.0000*
2	3708	83.7	9	0.0000*
3	3703	92.0	9	0.0000*
4	3697	41.0	9	0.0000*
5	3704	168.9	9	0.0000*
6	3698	75.6	9	0.0000*
7	3700	65.9	9	0.0000*
8	3692	64.6	9	0.0000*
9	3699	68.2	9	0.0000*
10	3693	131.1	9	0.0000*
11	3702	11.2	9	0.2602
12	3662	199.0	9	0.0000*
13	3708	132.7	9	0.0000*
14	3690	153.9	9	0.0000*
15	3701	78.7	9	0.0000*
16	3697	105.1	9	0.0000*
17	3706	27.8	9	0.0010
18	3704	143.4	9	0.0000*
19	3708	45.9	24	0.0045
20	3701	84.9	24	0.0000*
21	3710	41.2	6	9.0000*
22	3708	285.0	6	0.0000*
23	3709	195.7	6	0.0000*
24	3709	85.8	6	0.0000*
25	3707	62.1	6	0.0000*
26	3711	36.2	6	0.0000*
27	3707	116.3	6	0.0000*
28	3706	111.2	6	0.0000*
29	3706	109.2	6	0.0000*
30	3707	76.8	6	0.0000*
31	3703	20.3	6	0.0024
32	3695	158.7	6	0.0000*
33	3698	13.4	6	0.0360
34	3698	29.9	6	0.0000*
35	3695	36.2	6	0.0000*
36	3700	57.6	6	0.0000*
37	3701	23.0	6	0.0008
38	3702	139.3	6	0.0000*
39	3697	44.4	6	0.0000*
40	3695	31.3	6	0.0000*
41	3693	89.4	6	0.0000*
42	3695	88.3	6	0.0000*
43	3695	50.7	6	0.0000*
44	3695	73.6	6	0.0000*
45	3697	5.7	6	0.4542

* $p \leq 0.0001$

SCHOOL TYPE FORM B

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3633	100.6	9	0.0000*
2	3637	132.3	9	0.0000*
3	3632	115.0	9	0.0000*
4	3629	22.7	9	0.0067
5	3597	220.0	9	0.0000*
6	3630	84.3	9	0.0000*
7	3632	99.5	9	0.0000*
8	3636	32.4	9	0002
9	3637	77.4	9	0.0000*
10	3637	14.2	9	0.1131
11	3637	38.1	9	0.0000*
12	3633	86.4	9	0.0000*
13	3609	136.4	9	0.0000*
14	3629	11.8	9	0.2239
15	3633	22.0	9	0.0088
16	3633	15.9	9	0.0677
17	3634	108.4	9	0.0000*
18	3628	76.2	9	0.0000*
19	3631	69.6	24	0.0000*
20	3636	75.4	24	0.0000*
21	3639	40.1	6	0.0000*
22	3636	249.9	6	0.0000*
23	3635	167.6	6	0.0000*
24	3637	231.0	6	0.0000*
25	3638	92.6	6	0.0000*
26	3636	86.9	6	0.0000*
27	3632	61.4	6	0.0000*
28	3636	80.4	6	0.0000*
29	3629	31.0	6	0.0000*
30	3638	45.9	6	0.0000*
31	3638	8.7	6	0.1858
32	3631	112.5	6	0.0000*
33	3632	4.6	6	0.5908
34	3633	27.0	6	0.0001*
35	3634	11.1	6	0.0852
36	3628	23.8	6	0.0006
37	3632	44.1	6	0.0000*
38	3627	23.9	6	0.0005
39	3628	7.5	6	0.2691
40	3630	11.3	6	0.0780
41	3631	133.9	6	0.0000*
42	3632	78.0	6	0.0000*
43	3632	1.5	6	0.9581
44	3633	27.0	6	0.0001*
45	3632	185.1	6	0.0000*

*$p \leq 0.0001$

SCHOOL TYPE FORM C

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3565	95.3	9	0.0000*
2	3569	121.2	9	0.0000*
3	3559	85.4	9	0.0000*
4	3560	33.6	9	0.0001*
5	3565	68.4	9	0.0000*
6	3553	149.9	9	0.0000*
7	3560	18.3	9	0.0314
8	3556	41.4	9	0.0000*
9	3559	84.7	9	0.0000*
10	3563	37.9	9	0.0000*
11	3559	132.9	9	0.0000*
12	3564	147.3	9	0.0000*
13	3565	25.5	9	0.0024
14	3545	105.5	9	0.0000*
15	3550	71.2	9	0.0000*
16	3559	143.7	9	0.0000*
17	3563	61.2	9	0.0000*
18	3562	80.9	9	0.0000*
19	3563	49.2	24	0.0018
20	3564	69.1	24	0.0000*
21	3570	57.8	6	0.0000*
22	3565	243.1	6	0.0000*
23	3568	204.2	6	0.0000*
24	3566	37.7	6	0.0000*
25	3566	56.2	6	0.0000*
26	3566	34.1	6	0.0000*
27	3561	75.0	6	0.0000*
28	3564	56.1	6	0.0000*
29	3563	15.4	6	0.0167
30	3561	206.4	6	0.0000*
31	3564	34.6	6	0.0000*
32	3555	176.1	6	0.0000*
33	3560	17.9	6	0.0065
34	3556	26.8	6	0.0002
35	3561	122.6	6	0.0000*
36	3561	26.8	6	0.0002
37	3556	158.8	6	0.0000*
38	3561	53.8	6	0.0000*
39	3560	80.8	6	0.0000*
40	3555	9.6	6	0.1401
41	3558	48.5	6	0.0000*
42	3558	34.8	6	0.0000*
43	3556	16.2	6	0.0126
44	3551	41.6	6	0.0000*
45	3558	48.7	6	0.0000*

*$p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3739	157.6	6	0.0000*
2	3737	66.7	6	0.0000*
3	3731	50.3	6	0.0000*
4	3726	30.3	6	0.0000*
5	3733	75.5	6	0.0000*
6	3726	42.7	6	0.0000*
7	3729	52.9	6	0.0000*
8	3721	33.7	6	0.0000*
9	3728	66.3	6	0.0000*
10	3722	198.5	6	0.0000*
11	3731	8.0	6	0.2343
12	3691	70.5	6	0.0000*
13	3737	30.0	6	0.0000*
14	3719	52.4	6	0.0000*
15	3730	44.3	6	0.0000*
16	3726	56.4	6	0.0000*
17	3735	9.2	6	0.1589
18	3733	42.2	6	0.0000*
19	3736	40.0	16	0.0008
20	3730	54.8	16	0.0000*
21	3739	8.2	4	0.0829
22	3737	126.6	4	0.0000*
23	3738	91.6	4	0.0000*
24	3738	25.1	4	0.0000*
25	3736	35.6	4	0.0000*
26	3740	29.7	4	0.0000*
27	3736	40.4	4	0.0000*
28	3735	46.2	4	0.0000*
29	3735	41.2	4	0.0000*
30	3736	26.6	4	0.0000*
31	3732	7.0	4	0.1312
32	3724	72.5	4	0.0000*
33	3727	24.5	4	0.0001*
34	3727	6.2	4	0.1825
35	3724	8.2	4	0.0832
36	3729	31.4	4	0.0000*
37	3730	10.4	4	0.0329
38	3731	37.3	4	0.0000*
39	3726	16.4	4	0.0025
40	3724	49.5	4	0.0000*
41	3722	71.3	4	0.0000*
42	3724	27.3	4	0.0000*
43	3724	20.8	4	0.0003
44	3724	28.3	4	0.0000*
45	3726	15.2	4	0.0042

$^*p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3662	147.4	6	0.0000*
2	3666	143.0	6	0.0000*
3	3661	46.3	6	0.0000*
4	3658	33.2	6	0.0000*
5	3626	58.1	6	0.0000*
6	3659	61.8	6	0.0000*
7	3661	32.2	6	0.0000*
8	3665	10.7	6	0.0965
9	3666	79.3	6	0.0000*
10	3666	12.6	6	0.0486
11	3666	51.3	6	0.0000*
12	3662	68.6	6	0.0000*
13	3638	43.2	6	0.0000*
14	3658	3.5	6	0.7351
15	3662	8.3	6	0.2134
16	3662	19.8	6	0.0029
17	3663	47.2	6	0.0000*
18	3657	29.1	6	0.0001*
19	3660	37.9	16	0.0016
20	3665	58.2	16	0.0000*
21	3668	34.6	4	0.0000*
22	3665	106.8	4	0.0000*
23	3664	70.1	4	0.0000*
24	3666	92.1	4	0.0000*
25	3667	33.9	4	0.0000*
26	3665	44.5	4	0.0000*
27	3661	43.2	4	0.0000*
28	3665	29.3	4	0.0000*
29	3658	10.8	4	0.0281
30	3667	20.4	4	0.0004
31	3667	4.2	4	0.3736
32	3660	47.3	4	0.0000*
33	3661	36.3	4	0.0000*
34	3662	12.5	4	0.0137
35	3663	5.2	4	0.2643
36	3657	5.0	4	0.2870
37	3661	9.0	4	0.0597
38	3656	38.5	4	0.0000*
39	3657	2.9	4	0.5618
40	3659	13.6	4	0.0086
41	3660	31.4	4	0.0000*
42	3661	22.7	4	0.0001*
43	3661	10.3	4	0.0354
44	3662	6.7	4	0.1478
45	3661	58.9	4	0.0000*

*$p \leq 0.0001$

SCHOOL SEX FORM C

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3593	158.1	6	0.0000*
2	3597	97.1	6	0.0000*
3	3587	42.2	6	0.0000*
4	3588	20.2	6	0.0025
5	3593	135.2	6	0.0000*
6	3581	103.6	6	0.0000*
7	3588	27.2	6	0.0001*
8	3584	53.4	6	0.0000*
9	3587	68.6	6	0.0000*
10	3591	64.4	6	0.0000*
11	3587	70.4	6	0.0000*
12	3592	194.1	6	0.0000*
13	3592	6.7	6	0.3426
14	3573	47.8	6	0.0000*
15	3578	67.1	6	0.0000*
16	3587	82.3	6	0.0000*
17	3591	47.4	6	0.0000*
18	3590	38.6	6	0.0000*
19	3591	29.7	16	0.0195
20	3592	60.8	16	0.0000*
21	3598	21.2	4	0.0003
22	3593	150.4	4	0.0000*
23	3596	86.9	4	0.0000*
24	3594	35.1	4	0.0000*
25	3594	35.8	4	0.0000*
26	3594	16.5	4	0.0023
27	3589	52.1	4	0.0000*
28	3592	20.2	4	0.0005
29	3591	1.6	4	0.8079
30	3589	81.7	4	0.0000*
31	3592	12.1	4	0.0165
32	3583	73.2	4	0.0000*
33	3588	20.0	4	0.0005
34	3584	9.6	4	0.0475
35	3589	76.9	4	0.0000*
36	3589	65.5	4	0.0000*
37	3584	75.2	4	0.0000*
38	3589	17.9	4	0.0013
39	3588	73.3	4	0.0000*
40	3583	24.9	4	0.0001*
41	3586	10.0	4	0.0399
42	3585	17.8	4	0.0013
43	3584	37.7	4	0.0000*
44	3579	24.2	4	0.0001*
45	3586	28.3	4	0.0000*

*$p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3739	24.2	9	0.0039
2	3737	24.4	9	0.0036
3	3731	5.7	9	0.7648
4	3726	8.3	9	0.5025
5	3733	23.2	9	0.0056
6	3726	44.5	9	0.0000*
7	3729	11.6	9	0.2353
8	3721	12.1	9	0.2047
9	3728	16.4	9	0.0582
10	3722	8.5	9	0.4779
11	3731	6.1	9	0.7273
12	3691	22.4	9	0.0076
13	3737	6.7	9	0.6669
14	3719	9.2	9	0.4167
15	3730	7.9	9	0.5344
16	3726	12.1	9	0.2035
17	3735	18.4	9	0.0305
18	3733	24.1	9	0.0041
19	3736	34.2	24	0.0810
20	3730	21.2	24	0.6226
21	3739	10.0	6	0.1219
22	3737	26.5	6	0.0002
23	3738	6.9	6	0.3221
24	3738	6.1	6	0.4112
25	3736	2.1	6	0.9068
26	3740	1.6	6	0.9490
27	3736	11.7	6	0.0668
28	3735	9.0	6	0.1708
29	3735	10.2	6	0.1154
30	3736	8.1	6	0.2292
31	3732	11.9	6	0.0622
32	3724	8.0	6	0.2329
33	3727	3.9	6	0.6795
34	3727	8.0	6	0.2359
35	3724	5.9	6	0.4283
36	3729	9.6	6	0.1420
37	3730	15.2	6	0.0182
38	3731	7.2	6	0.2965
39	3726	5.4	6	0.4827
40	3724	11.3	6	0.1770
41	3722	10.4	6	0.1060
42	3724	2.9	6	0.8126
43	3724	12.5	6	0.0513
44	3724	2.7	6	0.8441
45	3726	2.2	6	0.8934

* $p \leq 0.0001$

SCHOOL SIZE FORM B

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3662	10.8	9	0.2893
2	3666	20.6	9	0.0144
3	3661	36.8	9	0.0000*
4	3658	2.9	9	0.9652
5	3626	36.3	9	0.0000*
6	3659	11.9	9	0.2185
7	3661	20.9	9	0.0127
8	3665	20.8	9	0.0132
9	3666	23.7	9	0.0046
10	3666	20.1	9	0.0173
11	3666	8.2	9	0.5065
12	3662	31.9	9	0.0002
13	3638	14.9	9	0.0934
14	3658	6.8	9	0.6548
15	3662	6.5	9	0.6847
16	3662	16.9	9	0.0500
17	3663	18.4	9	0.0307
18	3657	17.6	9	0.0399
19	3660	54.0	24	0.0004
20	3665	33.4	24	0.0958
21	3668	9.2	6	0.1607
22	3665	18.7	6	0.0047
23	3664	7.8	6	0.2523
24	3666	9.5	6	0.1463
25	3667	21.9	6	0.0012
26	3665	18.6	6	0.0048
27	3661	8.1	6	0.2259
28	3665	18.1	6	0.0059
29	3658	8.7	6	0.1890
30	3667	5.2	6	0.5087
31	3667	14.6	6	0.0235
32	3660	19.5	6	0.0033
33	3661	5.6	6	0.4631
34	3662	7.9	6	0.2420
35	3663	9.2	6	0.1618
36	3657	10.1	6	0.1165
37	3661	5.9	6	0.4253
38	3656	5.9	6	0.4299
39	3657	6.1	6	0.4099
40	3659	18.9	6	0.0043
41	3660	12.6	6	0.0498
42	3661	7.1	6	0.3093
43	3661	5.7	6	0.4526
44	3662	11.4	6	0.0747
45	3661	7.3	6	0.2918

$^{*}p \leq 0.0001$

SCHOOL SIZE FORM C

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3593	18.6	9	0.0284
2	3597	17.6	9	0.0397
3	3587	14.7	9	0.0991
4	3588	6.9	9	0.6372
5	3593	6.6	9	0.6704
6	3581	20.5	9	0.0147
7	3588	7.4	9	0.5875
8	3584	8.3	9	0.4955
9	3587	6.4	9	0.6908
10	3591	6.0	9	0.7345
11	3587	27.2	9	0.0013
12	3592	14.0	9	0.1193
13	3592	16.1	9	0.0642
14	3573	21.9	9	0.0091
15	3578	10.6	9	0.2969
16	3587	11.8	9	0.2244
17	3591	10.2	9	0.3300
18	3590	10.5	9	0.3091
19	3591	34.6	24	0.0739
20	3592	20.3	24	0.6742
21	3598	8.0	6	0.2378
22	3593	13.1	6	0.0410
23	3596	13.6	6	0.0337
24	3594	13.5	6	0.0349
25	3594	13.8	6	0.0311
26	3594	8.1	6	0.2286
27	3589	5.3	6	0.5015
28	3592	6.4	6	0.3726
29	3591	4.7	6	0.5720
30	3589	23.2	6	0.0007
31	3592	6.3	6	0.3816
32	3583	10.9	6	0.0900
33	3588	1.8	6	0.9315
34	3584	3.4	6	0.7443
35	3589	4.8	6	0.5639
36	3589	2.9	6	0.8182
37	3584	15.9	6	0.0142
38	3589	13.2	6	0.0390
39	3588	5.2	6	0.5127
40	3583	1.4	6	0.9600
41	3586	6.7	6	0.3471
42	3585	8.3	6	0.2131
43	3584	2.1	6	0.9007
44	3579	6.3	6	0.3803
45	3586	2.6	6	0.8526

*$p \leq 0.0001$

REGION FORM A

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3415	64.0	24	0.0000*
2	3413	34.6	24	0.0738
3	3407	36.3	24	0.0504
4	3403	31.5	24	0.1380
5	3409	74.6	24	0.0000*
6	3402	40.8	24	0.0172
7	3405	29.3	24	0.2068
8	3397	36.6	24	0.0477
9	3406	36.6	24	0.0476
10	3398	63.4	24	0.0000*
11	3408	31.4	24	0.1416
12	3376	32.4	24	0.1165
13	3413	46.8	24	0.0035
14	3396	29.1	24	0.2158
15	3406	36.7	24	0.0464
16	3402	29.1	24	0.2158
17	3411	33.5	24	0.0938
18	3409	50.3	24	0.0013
19	3412	169.9	64	0.0000*
20	3406	113.3	64	0.0001*
21	3415	30.8	16	0.0140
22	3413	37.6	16	0.0017
23	3414	26.6	16	0.0445
24	3414	26.7	16	0.0447
25	3412	31.6	16	0.0110
26	3416	26.0	16	0.0538
27	3413	22.4	16	0.1287
28	3411	27.4	16	0.0366
29	3411	20.7	16	0.1873
30	3412	28.3	16	0.0290
31	3408	14.2	16	0.5822
32	3401	21.5	16	0.1578
33	3403	29.8	16	0.0189
34	3403	15.9	16	0.4548
35	3401	11.0	16	0.8076
36	3405	27.9	16	0.0321
37	3407	26.3	16	0.0496
38	3407	51.7	16	0.0000*
39	3402	35.3	16	0.0035
40	3400	26.3	16	0.0494
41	3398	46.1	16	0.0001*
42	[illegible]	20.4	16	0.2006
43	3400	11.0	16	0.8055
44	3400	19.7	16	0.2313
45	3402	17.5	16	0.3504

* $p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3335	54.3	24	0.0004
2	3339	35.1	24	0.0669
3	3334	51.6	24	0.0009
4	3331	38.7	24	0.0293
5	3299	41.0	24	0.0165
6	3333	23.4	24	0.4906
7	3334	77.4	24	0.0000*
8	3338	37.9	24	0.0351
9	3339	76.6	24	0.0000*
10	3339	28.8	24	0.2258
11	3339	20.8	24	0.6450
12	3335	45.2	24	0.0055
13	3313	59.1	24	0.0001*
14	3331	32.0	24	0.1256
15	3335	54.7	24	0.0003
16	3335	22.0	24	0.5765
17	3336	42.4	24	0.0115
18	3330	67.7	24	0.0000*
19	3333	210.1	64	0.0000*
20	3338	120.1	64	0.0000*
21	3341	27.0	16	0.0413
22	3338	22.8	16	0.1186
23	3337	55.1	16	0.0000*
24	3339	46.3	16	0.0001*
25	3340	26.3	16	0.0488
26	3338	21.8	16	0.1481
27	3334	16.7	16	0.4039
28	3338	25.2	16	0.0664
29	3331	27.0	16	0.0409
30	3340	22.0	16	0.1410
31	3340	22.5	16	0.1273
32	3333	32.7	16	0.0080
33	3335	20.9	16	0.1794
34	3335	23.0	16	0.1115
35	3336	17.2	16	0.3689
36	3331	16.7	16	0.4048
37	3334	11.8	16	0.7545
38	3330	32.7	16	0.0079
39	3330	18.2	16	0.3078
40	3332	21.2	16	0.1687
41	3333	26.2	16	0.0503
42	3334	16.5	16	0.4141
43	3334	22.2	16	0.1367
44	3335	16.1	16	0.4419
45	3334	48.5	16	0.0000*

*$p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3274	49.6	24	0.0016
2	3278	48.3	24	0.0023
3	3268	28.8	24	0.2247
4	3270	33.4	24	0.0947
5	3274	62.0	24	0.0000*
6	3264	26.7	24	0.3162
7	3269	40.8	24	0.0172
8	3266	49.7	24	0.0015
9	3268	26.0	24	0.3486
10	3273	47.5	24	0.0028
11	3268	43.6	24	0.0084
12	3273	40.9	24	0.0167
13	3273	36.8	24	0.0454
14	3257	14.0	24	0.9466
15	3259	34.3	24	0.0782
16	3268	31.8	24	0.1301
17	3273	53.9	24	0.0004
18	3272	49.7	24	0.0015
19	3273	204.8	64	0.0000*
20	3273	106.6	64	0.0004
21	3279	22.6	16	0.1229
22	3274	46.5	16	0.0001*
23	3277	27.5	16	0.0355
24	3275	31.2	16	0.0126
25	3275	19.7	16	0.2300
26	3275	15.4	16	0.4900
27	3271	19.2	16	0.2547
28	3273	27.7	16	0.0336
29	3272	15.9	16	0.4530
30	3271	15.1	16	0.5166
31	3274	18.1	16	0.3170
32	3265	38.0	16	0.0015
33	3270	29.1	16	0.0229
34	3266	18.4	16	0.0258
35	3271	17.7	16	0.3408
36	3271	14.2	16	0.5792
37	3267	21.2	16	0.1702
38	3271	14.3	16	0.5737
39	3270	11.4	16	0.7841
40	3266	25.2	16	0.0647
41	3268	26.4	16	0.0480
42	3267	29.0	16	0.0235
43	3267	11.9	16	0.7505
44	3263	24.5	16	0.0785
45	3268	29.6	16	0.0199

$^*p \leq 0.0001$

SAMPLING METHOD FORM A

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3679	17.0	3	0.0007
2	3677	18.9	3	0.0003
3	3672	7.6	3	0.0535
4	3667	1.0	3	0.7862
5	3675	19.6	3	0.0002
6	3667	5.6	3	0.1290
7	3670	6.8	3	0.0756
8	3663	3.2	3	0.3567
9	3669	4.1	3	0.2448
10	3664	12.9	3	0.0048
11	3671	1.8	3	0.5976
12	3634	3.8	3	0.2831
13	3677	3.9	3	0.2661
14	3661	20.5	3	0.0001*
15	3670	7.6	3	0.0542
16	3668	3.8	3	0.2779
17	3675	0.2	3	0.9767
18	3673	5.9	3	0.1152
19	3676	17.6	8	0.0243
20	3672	22.2	8	0.0044
21	3679	4.9	2	0.0861
22	3677	14.4	2	0.0007
23	3678	10.2	2	0.0060
24	3678	2.1	2	0.3352
25	3676	3.2	2	0.1982
26	3680	6.1	2	0.0460
27	3676	1.8	2	0.3928
28	3675	3.7	2	0.1562
29	3675	1.2	2	0.5257
30	3676	3.0	2	0.2231
31	3672	2.1	2	0.3442
32	3665	2.8	2	0.2450
33	3667	7.3	2	0.0256
34	3667	9.1	2	0.0106
35	3664	1.1	2	0.55[illegible]7
36	3669	1.7	2	0.4150
37	3670	0.3	2	0.8260
38	3671	19.1	[illegible]	0.0001*
39	3666	4.4		0.1064
40	3664	3.8	2	0.1487
41	3662	3.4	2	0.1824
42	3664	2.2	2	0.3269
43	3664	1.8	2	0.3915
44	3664	5.0	2	0.0802
45	3666	0.5	2	0.7586

*p ≤ 0.0001

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3602	11.1	3	0.0107
2	3605	17.5	3	0.0006
3	3600	7.9	3	0.0472
4	3599	8.5	3	0.0360
5	3571	9.2	3	0.0265
6	3598	5.1	3	0.1591
7	3600	0.5	3	0.9049
8	3605	7.6	3	0.0534
9	3606	7.5	3	0.0574
10	3605	0.4	3	0.9306
11	3605	0.9	3	0.8237
12	3603	7.9	3	0.0479
13	3580	8.6	3	0.0343
14	3598	3.1	3	0.3659
15	3603	6.5	3	0.0891
16	3602	11.2	3	0.0106
17	3602	6.1	3	0.1051
18	3596	3.2	3	0.3539
19	3599	12.4	8	0.1313
20	3604	7.0	8	0.5260
21	3607	2.7	2	0.2489
22	3604	6.2	2	0.0435
23	3603	3.4	2	0.1792
24	3605	9.7	2	0.0077
25	3606	0.4	2	0.7974
26	3604	0.5	2	0.7436
27	3600	2.0	2	0.3524
28	3604	2.0	2	0.3554
29	3597	0.1	2	0.929[illegible]
30	3606	6.1	2	0.04[illegible]5
31	3606	0.5	2	0.[illegible]72
32	3599	3.1	2	0.2050
33	3600	2.6	2	0.2659
34	3601	3.6	2	0.1576
35	3603	2.4	2	0.2985
36	3597	1.0	2	0.5808
37	3600	0.2	2	0.86[illegible]8
38	3595	1.2	2	0.5409
39	3596	1.8	2	0.3887
40	3598	0.5	2	0.7538
41	3600	0.1	2	0.9305
42	3601	2.5	2	0.2729
43	3600	0.2	2	0.8908
44	3601	0.8	2	0.6436
45	3601	7.6	2	0.0223

$*p \leq 0.0001$

Question Number	Number of Responses	Chi Square	Degrees of Freedom	Level of Significance
1	3532	5.3	3	0.1470
2	3536	19.9	3	0.0002
3	3526	6.3	3	0.0963
4	3527	2.1	3	0.5348
5	3532	3.1	3	0.3658
6	3520	0.3	3	0.9514
7	3527	7.0	3	0.0718
8	3523	2.3	3	0.4976
9	3526	7.2	3	0.0631
10	3530	2.8	3	0.4121
11	3526	1.8	3	0.6127
12	3531	2.9	3	0.4000
13	3531	2.4	3	0.4772
14	3512	4.4	3	0.2166
15	3517	3.6	3	0.3012
16	3526	5.8	3	0.1181
17	3530	2.6	3	0.4408
18	3529	8.8	3	0.0307
19	3530	21.2	8	0.0065
20	3531	4.0	8	0.8522
21	3537	0.5	2	0.7636
22	3532	9.4	2	0.0087
23	3535	11.4	2	0.0033
24	3533	1.4	2	0.4734
25	3533	3.2	2	0.2015
26	3533	4.5	2	0.1011
27	3528	6.5	2	0.0370
28	3531	2.9	2	0.2334
29	3530	6.2	2	0.0436
30	3528	2.6	2	0.2649
31	3531	1.6	2	0.4401
32	3522	9.0	2	0.0107
33	3527	1.5	2	0.4644
34	3524	1.2	2	0.5426
35	3528	4.8	2	0.0878
36	3528	2.0	2	0.3562
37	3523	7.1	2	0.0276
38	3528	2.2	2	0.3278
39	3527	3.3	2	0.1920
40	3522	0.2	2	0.8839
41	3525	0.7	2	0.6729
42	3524	3.5	2	0.1672
43	3523	1.4	2	0.4831
44	3518	1.0	2	0.5934
45	3525	14.6	2	0.0007

*$p \leq 0.0001$

APPENDIX G

Frequency of Correct Responses on (1) Factual Knowledge, (2) Conceptual Knowledge, and (3) Belief Items by

(a) Sex

(b) School Type

(c) School Sex

(d) School Size

(e) Region

FREQUENCY OF CORRECT RESPONSES TO FACTUAL KNOWLEDGE ITEMS BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX, (4) SCHOOL SIZE, AND (5) REGION

	ABC1	ABC2	ABC3	ABC4	A5
Sex					
Male	57.5	39.6	59.5	70.9	50.5
Female	34.1	28.8	54.0	68.3	44.4
X^2 (3 df)	649.3*	203.8*	109.0*	114.3*	17.4
School Type					
Comprehensive	44.0	34.2	55.8	69.5	45.4
Sec. Modern	39.7	28.9	51.9	68.1	40.3
Grammar	58.3	39.1	66.3	71.1	61.1
Non-maintained	59.4	46.0	63.3	73.2	60.5
X^2 (9 df)	266.3*	300.6*	273.2*	86.8*	168.9*
School Sex					
All Boy	68.6	46.0	66.1	71.5	60.2
All Girl	38.7	31.0	56.7	69.5	46.7
Mixed	42.7	32.4	54.6	69.2	44.7
X^2 (6 df)	454.6*	289.7*	133.7*	75.3*	75.5*
School Size					
Under 400	39.9	28.2	51.7	68.0	44.3
400 - 799	47.9	35.6	57.8	69.7	47.8
800 - 1199	46.3	34.2	57.3	69.4	46.4
Over 1200	43.2	33.6	55.7	70.5	49.4
X^2 (9 df)	39.3*	48.6*	35.5*	4.6	23.2
Region					
1. North	42.2	27.8	54.2	66.0	48.8
2. Y.& H.	45.1	36.0	52.0	69.8	44.1
3. N.W.	45.4	31.5	56.6	71.4	41.7
4. E. Mid.	39.7	29.4	51.8	66.4	42.4
5. W. Mid.	48.0	34.8	57.5	68.9	43.6
6. E. Ang.	40.9	35.1	54.9	69.5	47.6
7. London	49.4	35.4	60.4	70.1	45.1
8. S.E.	46.9	33.2	59.2	71.0	55.6
9. S.W.	33.9	33.6	51.4	64.9	39.9
X^2 (24 df)	112.6*	65.7*	74.6*	46.4	74.6*

	A6	A7	A8	A9	A10
Sex					
Male	28.7	50.0	26.2	18.5	59.0
Female	21.1	43.9	25.6	14.0	30.6
X^2 (3 df)	32.6*	46.3*	6.8	16.9	305.6*
School Type					
Comprehensive	23.9	44.3	25.1	15.2	39.8
Sec. Modern	20.1	47.3	25.8	13.7	39.5
Grammar	29.9	48.8	24.9	19.7	60.0
Non-maintained	38.0	53.7	30.2	23.9	63.3
X^2 (9 df)	75.6*	65.9*	64.6*	68.2*	131.1*
School Sex					
All Boy	34.8	53.0	27.8	23.7	70.2
All Girl	23.6	44.0	23.7	14.8	32.6
Mixed	23.1	46.2	25.9	14.9	42.2
X^2 (6 df)	42.7*	52.9*	33.7*	66.3*	198.5*
School Size					
Under 400	18.2	53.1	28.5	13.4	43.3
400 - 799	27.0	46.4	26.1	17.0	46.8
800 - 1199	22.8	46.8	23.8	16.9	43.4
Over 1200	26.1	44.5	26.5	14.6	42.2
X^2 (9 df)	44.5*	11.6	12.1	16.4	8.5
Region					
1. North	20.3	50.2	27.5	14.6	35.2
2. Y.& H.	21.4	41.2	23.9	14.5	41.5
3. N.W.	18.4	45.6	24.0	13.2	39.7
4. E. Mid.	26.1	43.9	27.8	13.7	46.4
5. W. Mid.	21.4	49.4	23.3	17.9	40.0
6. E. Ang.	27.4	43.9	29.8	16.9	46.3
7. London	24.3	42.5	22.5	13.7	35.2
8. S.E.	29.7	47.2	26.6	17.6	49.6
9. S.W.	23.5	46.2	27.6	16.8	52.8
X^2 (24 df)	40.8	29.3	36.6	36.6	63.4*

	A11	A12	A13	A14	A15
Sex					
Male	46.6	46.7	72.9	45.8	25.6
Female	47.7	36.9	72.3	38.0	14.7
X^2 (3 df)	3.8	40.9*	6.0	25.7*	73.2*
School Type					
Comprehensive	47.5	38.4	71.3	41.4	21.1
Sec. Modern	46.0	33.1	64.4	32.3	19.0
Grammar	48.0	60.1	86.8	54.8	20.4
Non-maintained	46.7	59.7	85.2	58.5	20.7
X^2 (9 df)	11.2	199.0*	132.7*	153.9*	78.7*
School Sex					
All Boy	46.7	57.4	80.4	54.0	25.7
All Girl	48.6	41.4	75.7	44.4	15.2
Mixed	46.9	38.4	69.8	38.6	20.2
X^2 (6 df)	8.0	70.5*	30.0*	52.4*	44.3*
School Size					
Under 400	46.2	34.0	70.8	40.3	18.8
400 - 799	46.1	42.8	73.0	41.7	20.3
800 - 1199	49.7	43.3	71.4	43.7	20.3
Over 1200	46.9	41.1	73.5	40.6	20.7
X^2 (9 df)	6.1	22.4	6.7	9.2	7.9
Region					
1. North	49.4	35.2	70.7	35.0	21.1
2. Y.& H.	45.8	40.8	68.1	40.1	21.1
3. N.W.	45.5	35.4	71.2	36.0	20.6
4. E. Mid.	47.1	41.2	67.6	39.6	16.9
5. W. Mid.	44.5	43.3	70.7	38.6	24.5
6. E. Ang.	56.0	36.7	63.2	38.7	21.6
7. London	48.2	37.1	74.8	46.7	21.1
8. S.E.	47.7	45.1	76.4	44.4	17.2
9. S.W.	48.3	39.4	66.4	39.1	19.2
X^2 (24 df)	31.4	32.4	46.8	29.1	36.7

	A16	A17	B5	B6	B7
Sex					
Male	82.2	44.2	45.2	56.0	36.1
Female	66.8	43.9	44.0	59.9	33.5
X^2 (3 df)	126.9*	0.4	6.3	14.2	22.1*
School Type					
Comprehensive	75.3	44.1	43.5	58.7	35.3
Sec. Modern	66.6	40.1	32.7	53.9	26.8
Grammar	83.7	48.4	61.9	66.4	45.2
Non-maintained	84.6	51.9	64.5	55.8	47.1
X^2 (9 df)	105.1*	27.8	220.0*	84.3*	99.5*
School Sex					
All Boy	84.8	49.0	54.3	55.7	40.3
All Girl	70.0	44.9	51.7	64.3	38.6
Mixed	73.3	42.6	40.7	56.8	32.7
X^2 (6 df)	56.4*	9.2	58.1*	61.8*	32.2*
School Size					
Under 400	74.1	40.1	36.3	52.8	28.2
400 - 799	73.7	43.1	46.3	58.5	35.7
800 - 1199	76.0	45.8	44.2	58.3	34.4
Over 1200	74.6	46.1	45.6	58.8	36.9
X^2 (9 df)	12.1	18.4	36.3*	11.9	20.9
Region					
1. North	72.1	39.7	38.2	54.7	27.6
2. Y.& H.	72.4	44.2	43.6	55.8	32.2
3. N.W.	72.6	40.4	40.0	60.9	31.7
4. E. Mid.	72.5	41.5	38.0	58.5	35.5
5. W. Mid.	76.3	44.7	44.4	58.1	38.6
6. E. Ang.	72.6	42.4	42.2	56.5	29.8
7. London	69.8	45.5	46.0	59.3	34.2
8. S.E.	75.8	46.2	47.7	58.7	35.0
9. S.W.	74.0	40.2	36.2	56.5	32.5
X^2 (24 df)	29.1	33.5	41.0	23.4	77.4*

	B8	B9	B10	B11	B12
Sex					
Male	40.4	84.8	41.9	58.3	49.0
Female	40.0	66.0	43.9	38.8	41.1
X^2 (3 df)	10.7	181.5*	16.9	160.4*	81.2*
School Type					
Comprehensive	38.9	75.0	43.5	49.7	45.6
Sec. Modern	37.7	69.4	41.8	45.4	40.6
Grammar	41.7	84.2	42.5	49.2	49.1
Non-maintained	52.0	84.7	44.6	52.9	51.4
X^2 (9 df)	32.4	77.4*	14.2	38.1*	86.4*
School Sex					
All Boy	44.0	89.3	46.5	60.2	51.9
All Girl	42.2	70.5	44.7	44.1	41.0
Mixed	38.8	73.7	41.5	47.0	44.4
X^2 (6 df)	10.7	79.3*	12.6	51.3*	68.6*
School Size					
Under 400	39.9	66.8	42.9	45.3	39.6
400 - 799	42.7	76.9	41.5	48.5	43.0
800 - 1199	36.4	74.4	44.3	48.7	50.4
Over 1200	38.7	78.3	44.6	50.0	45.5
X^2 (9 df)	20.8	23.7	20.1	8.2	31.9
Region					
1. North	38.8	66.0	43.1	47.2	42.3
2. Y.& H.	39.9	71.0	42.6	51.7	43.8
3. N.W.	31.8	69.5	44.3	49.2	46.1
4. E. Mid.	41.3	75.1	42.8	50.4	45.1
5. W. Mid.	37.8	72.7	39.0	47.7	42.7
6. E. Ang.	37.1	76.4	44.4	39.5	50.0
7. London	39.3	76.3	45.4	45.9	42.5
8. S.E.	42.1	83.0	41.8	49.6	47.0
9. S.W.	43.8	74.9	43.1	42.8	38.5
X^2 (24 df)	37.9	76.6*	28.8	20.8	45.2

	B13	B14	B15	B16	B17
<u>Sex</u>					
Male	50.1	49.9	7.0	23.1	65.2
Female	53.6	45.5	6.6	18.2	55.4
X^2 (3 df)	6.7	16.9	11.4	25.9*	55.4*
<u>School Type</u>					
Comprehensive	47.7	46.6	6.3	20.3	58.2
Sec. Modern	45.4	46.7	8.4	19.3	53.7
Grammar	67.5	50.5	5.3	24.2	73.3
Non-maintained	67.7	52.6	5.2	21.1	73.4
X^2 (9 df)	136.4*	11.8	22.0	15.9	108.4*
<u>School Sex</u>					
All Boy	60.7	49.6	6.7	25.8	71.8
All Girl	58.6	45.7	5.7	18.9	57.5
Mixed	48.2	47.8	7.1	20.0	58.4
X^2 (6 df)	43.2*	3.5	8.3	19.8	47.2*
<u>School Size</u>					
Under 400	50.0	49.6	7.7	15.0	53.4
400 - 799	53.5	49.2	7.3	21.7	61.8
800 - 1199	48.7	46.5	5.9	20.6	59.5
Over 1200	53.2	44.4	6.4	21.2	61.3
X^2 (9 df)	14.9	6.8	6.5	16.9	18.4
<u>Region</u>					
1. North	39.2	43.7	9.4	16.6	56.9
2. Y.& H.	43.1	48.1	7.0	21.4	56.5
3. N.W.	48.8	49.0	7.4	20.6	60.6
4. E. Mid.	50.9	48.0	6.9	19.6	59.6
5. W. Mid.	49.8	53.6	8.3	22.1	59.9
6. E. Ang.	63.3	41.0	6.6	20.5	61.3
7. London	48.9	39.4	3.9	20.0	59.6
8. S.E.	57.5	47.9	5.9	19.8	61.8
9. S.W.	51.2	46.6	8.5	24.9	50.9
X^2 (24 df)	59.1*	32.0	54.7	22.0	42.4

	C5	C6	C7	C8	C9
Sex					
Male	60.0	70.5	34.5	25.7	39.4
Female	40.0	60.2	31.2	22.8	31.9
X^2 (3 df)	224.8*	45.0*	64.5*	41.5*	33.0*
School Type					
Comprehensive	50.1	62.6	32.5	24.8	33.9
Sec. Modern	44.9	57.2	31.6	20.4	29.3
Grammar	55.7	81.1	37.5	28.3	47.4
Non-maintained	61.1	83.3	32.3	28.6	46.7
X^2 (9 df)	68.4*	149.9*	18.3	41.4*	84.7*
School Sex					
All Boy	66.2	82.7	36.1	28.3	50.1
All Girl	40.2	66.9	30.9	23.3	32.1
Mixed	49.0	60.9	32.6	23.6	33.3
X^2 (6 df)	135.2*	103.6*	27.2*	53.4*	68.6*
School Size					
Under 400	51.0	62.7	34.1	20.1	31.9
400 - 799	50.4	68.2	33.0	25.0	35.0
800 - 1199	50.6	63.2	32.6	25.4	38.3
Over 1200	48.1	61.4	32.2	22.7	35.5
X^2 (9 df)	6.6	20.5	7.4	8.3	6.4
Region					
1. North	50.2	62.0	33.3	19.0	32.1
2. Y.& H.	54.4	60.4	34.2	25.7	30.2
3. N.W.	46.2	62.1	34.5	21.3	31.1
4. E. Mid.	55.1	67.3	30.9	26.2	34.9
5. W. Mid.	55.9	66.4	30.2	25.1	33.3
6. E. Ang.	42.1	58.3	31.4	17.5	36.7
7. London	51.5	65.6	34.1	28.5	35.4
8. S.E.	45.1	62.3	32.8	23.6	38.8
9. S.W.	39.4	65.7	34.3	23.3	38.0
X^2 (24 df)	62.0*	26.7	40.8	49.7	26.0

	C10	C11	C12	C13	C14
Sex					
Male	43.5	70.3	57.0	12.3	71.4
Female	42.0	64.4	33.2	9.1	64.2
X^2 (3 df)	42.0*	16.2	213.4*	13.5	24.6*
School Type					
Comprehensive	43.1	63.8	41.7	10.2	65.8
Sec. Modern	40.8	60.6	38.0	10.9	60.6
Grammar	43.9	80.7	59.2	10.2	80.0
Non-maintained	47.2	86.8	65.8	14.1	82.6
X^2 (9 df)	37.9*	132.9*	147.3*	25.5	105.5*
School Sex					
All Boy	48.7	79.5	71.2	13.2	78.5
All Girl	39.1	72.7	35.6	9.9	69.5
Mixed	42.4	63.2	41.7	10.3	65.0
X^2 (6 df)	64.4*	70.4*	194.1*	6.7	47.8*
School Size					
Under 400	39.7	58.1	39.3	12.7	62.1
400 - 799	42.5	69.8	45.3	10.4	68.4
800 - 1199	41.1	68.2	46.2	11.6	68.8
Over 1200	43.2	63.8	46.1	9.1	67.9
X^2 (9 df)	6.0	27.2	14.0	16.1	21.9
Region					
1. North	38.0	57.4	37.1	9.7	65.0
2. Y.& H.	38.8	65.2	39.2	10.5	64.3
3. N.W.	38.6	66.6	43.7	12.5	64.7
4. E. Mid.	39.7	64.6	43.8	9.9	67.6
5. W. Mid.	43.9	67.0	42.7	9.1	67.1
6. E. Ang.	43.0	51.7	50.4	6.6	66.1
7. London	40.6	69.9	41.9	13.0	65.0
8. S.E.	48.5	68.1	47.4	9.6	69.2
9. S.W.	44.4	62.0	39.7	9.4	65.9
X^2 (24 df)	47.5	43.6	40.9	36.8	14.0

	C15	C16	C17
Sex			
Male	73.2	62.8	52.9
Female	61.7	46.8	38.6
X^2 (3 df)	56.1*	101.6*	73.7*
School Type			
Comprehensive	65.3	53.6	43.2
Sec. Modern	63.3	45.4	42.4
Grammar	75.5	69.6	54.4
Non-maintained	78.4	72.4	55.3
X^2 (9 df)	71.2*	143.7*	61.2*
School Sex			
All Boy	81.9	71.7	57.1
All Girl	65.7	50.3	38.3
Mixed	64.7	52.2	45.1
X^2 (6 df)	67.1*	82.3*	47.4*
School Size			
Under 400	67.1	51.6	43.6
400 - 799	67.9	54.1	47.0
800 - 1199	67.7	56.8	42.5
Over 1200	66.3	56.1	48.6
X^2 (9 df)	10.6	11.8	10.2
Region			
1. North	70.5	52.5	41.9
2. Y.& H.	60.1	48.2	43.9
3. N.W.	63.6	51.5	38.1
4. E. Mid.	64.4	49.6	42.6
5. W. Mid.	66.9	55.2	47.3
6. E. Ang.	70.2	57.9	43.0
7. London	65.4	55.8	43.0
8. S.E.	70.3	56.5	50.5
9. S.W.	67.5	49.6	48.6
X^2 (24 df)	34.3	31.8	53.9

* $p \leq 0.0001$.

FREQUENCY OF CORRECT RESPONSES TO CONCEPTUAL KNOWLEDGE ITEMS
BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX,
(4) SCHOOL SIZE, AND (5) REGION

	ABC21	ABC22	ABC23	A24	A25
<u>Sex</u>					
Male	59.8	53.4	77.3	77.2	78.0
Female	60.6	48.5	66.7	73.8	76.9
X^2 (2 df)	0.7	34.6*	168.2*	6.6	1.0
<u>School Type</u>					
Comprehensive	57.9	47.4	69.7	75.0	75.3
Sec. Modern	56.8	39.3	62.7	68.4	73.3
Grammar	70.7	72.3	88.7	86.3	84.5
Non-maintained	65.9	75.9	89.8	84.9	89.5
X^2 (6 df)	128.6*	763.6*	556.6*	85.8*	62.1*
<u>School Sex</u>					
All Boy	65.8	69.9	86.8	82.7	83.4
All Girl	64.0	57.4	72.4	77.8	83.0
Mixed	58.0	45.0	68.6	73.2	74.6
X^2 (4 df)	51.6*	379.3*	241.9*	25.1*	35.6*
<u>School Size</u>					
Under 400	58.5	43.0	66.8	70.5	78.2
400-799	61.1	53.5	72.9	76.3	77.9
800-1199	58.8	50.9	72.4	74.9	76.0
Over 1200	60.8	48.4	71.9	76.6	77.5
X^2 (6 df)	14.2	45.7*	17.1	6.1	2.1
<u>Region</u>					
1. North	59.4	42.8	65.4	70.4	74.5
2. Y.& H.	59.0	48.6	69.1	72.6	73.4
3. N.W.	61.7	47.6	69.3	71.1	75.4
4. E. Mid.	54.7	46.2	68.6	74.1	74.1
5. W. Mid.	62.2	48.8	69.8	74.0	76.0
6. E. Ang.	63.8	45.7	69.2	71.2	71.0
7. London	59.2	[illegible]	72.6	76.7	83.2
8. S.E.	60.5	53.8	75.8	79.8	77.2
9. S.W.	54.7	40.2	64.4	74.1	76.5
X^2 (16 df)	41.2	79.1*	79.2*	26.7	31.6

	A26	A27	A28	A29	A30
Sex					
Male	46.7	65.4	52.4	77.2	73.8
Female	48.0	73.5	45.7	73.6	68.4
X^2 (2 df)	4.5	43.7*	37.0	9.9	14.1
School Type					
Comprehensive	45.6	67.8	47.5	74.1	69.7
Sec. Modern	43.4	62.2	41.0	68.0	64.8
Grammar	54.8	85.2	63.0	86.2	81.7
Non-Maintained	56.2	75.9	63.9	89.8	82.1
X^2 (6 df)	36.2*	116.3*	111.2*	109.2*	76.8*
School Sex					
All Boy	52.5	72.6	60.8	85.1	79.1
All Girl	52.8	77.8	51.9	76.8	71.7
Mixed	44.6	66.4	45.8	72.8	69.0
X^2 (4 df)	29.7*	40.4*	46.2*	41.2*	26.6*
School Size					
Under 400	48.4	63.7	46.2	73.4	68.5
400-799	47.4	71.1	50.1	77.2	72.3
800-1199	46.8	69.3	47.8	74.1	69.2
Over 1200	46.8	67.3	49.8	72.8	71.5
X^2 (6 df)	1.6	11.7	9.0	10.2	8.1
Region					
1. North	40.5	68.0	41.3	77.7	70.4
2. Y.& H.	43.4	65.7	42.7	72.0	63.8
3. N.W.	44.2	67.4	47.6	70.3	66.4
4. E. Mid.	53.2	72.3	42.2	75.5	72.6
5. W. Mid.	46.0	68.7	51.5	75.7	70.3
6. E. Ang.	36.8	66.4	45.6	67.7	70.4
7. London	46.9	70.9	51.6	74.6	70.1
8. S.E.	49.5	70.2	51.6	76.1	74.7
9. S.W.	49.3	66.4	45.1	72.4	69.2
X^2 (16 df)	26.0	22.4	27.4	20.7	28.3

	B24	B25	B26	B27	B28
<u>Sex</u>					
Male	63.3	77.8	76.0	42.1	76.6
Female	54.6	77.1	72.7	31.7	78.5
X^2 (2 df)	28.3*	0.3	16.3	76.4*	1.9
<u>School Type</u>					
Comprehensive	56.6	74.5	73.1	35.6	76.4
Sec. Modern	46.9	73.4	67.9	31.4	71.6
Grammar	79.3	88.0	84.6	46.0	87.2
Non-Maintained	80.4	89.0	86.9	46.2	88.7
X^2 (6 df)	231.0*	92.6*	86.9*	61.4*	80.4*
<u>School Sex</u>					
All Boy	75.7	82.1	83.1	48.0	82.9
All Girl	62.5	83.8	78.5	34.9	82.4
Mixed	54.3	74.8	71.3	34.8	75.0
X^2 (4 df)	92.1*	33.9*	44.5*	43.2*	29.3*
<u>School Size</u>					
Under 400	54.0	75.3	65.4	33.2	72.0
400-799	60.2	79.1	75.2	37.6	79.6
800-1199	57.4	74.8	74.4	36.7	75.7
Over 1200	60.9	78.1	76.9	37.0	77.5
X^2 (6 df)	9.5	21.9	18.6	8.1	18.1
<u>Region</u>					
1. North	49.4	70.0	66.4	31.7	72.9
2. Y.& H.	54.2	73.2	72.9	35.4	76.6
3. N.W.	55.6	78.2	74.7	34.7	72.7
4. E. Mid.	52.5	73.2	71.1	33.6	73.6
5. W. Mid.	57.0	74.3	74.5	40.1	78.2
6. E. Ang.	59.7	79.0	73.2	33.1	81.5
7. London	58.0	78.6	73.8	34.3	78.0
8. S.E.	65.6	79.1	76.4	38.2	79.0
9. S.W.	49.1	78.1	67.0	36.0	75.6
X^2 (16 df)	46.3*	26.3	21.8	16.7	25.2

	B29	B30	C24	C25	C26
Sex					
Male	44.3	45.6	58.9	90.0	50.5
Female	39.7	45.4	65.6	89.5	49.2
X^2 (2 df)	14.0	10.0	30.0*	10.2	8.3
School Type					
Comprehensive	41.2	44.2	60.8	88.4	46.0
Sec. Modern	38.3	40.8	59.8	86.6	46.6
Grammar	48.4	56.0	70.8	96.1	55.9
Non-Maintained	50.8	52.0	64.9	96.9	59.9
X^2 (6 df)	31.0*	45.9*	37.7*	56.2*	34.1*
School Sex					
All Boy	48.3	52.0	62.3	95.4	57.3
All Girl	40.6	49.5	70.8	91.9	50.0
Mixed	41.0	43.0	60.1	87.9	48.0
X^2 (4 df)	10.8	20.4	35.1*	35.8*	16.5
School Size					
Under 400	41.8	42.2	57.8	85.8	50.6
400-799	41.4	45.3	63.1	89.9	50.7
800-1199	44.7	44.8	62.4	90.4	48.8
Over 1200	40.0	48.9	62.2	90.4	48.0
X^2 (6 df)	8.7	5.2	13.5	13.8	8.1
Region					
1. North	43.5	40.5	63.3	83.5	51.1
2. Y.& H.	39.3	46.9	58.8	87.6	51.8
3. N.W.	43.6	41.3	67.5	90.2	45.3
4. E. Mid.	33.7	41.7	60.1	87.5	46.3
5. W. Mid.	42.5	45.5	57.5	91.2	52.5
6. E. Ang.	41.9	41.9	62.0	91.7	54.5
7. London	40.6	49.3	67.1	90.2	49.0
8. S.E.	45.0	47.5	61.9	89.2	47.5
9. S.W.	33.2	43.8	57.8	88.4	46.2
X^2 (16 df)	27.0	22.0	31.2	19.7	15.4

	C27	C28	C29	C30
Sex				
Male	29.6	78.6	51.9	50.2
Female	21.5	75.0	53.8	51.7
X^2 (2 df)	32.2*	9.2	1.2	4.2
School Type				
Comprehensive	22.9	73.9	53.1	47.0
Sec. Modern	21.2	74.5	55.2	40.5
Grammar	38.1	86.2	46.6	71.2
Non-Maintained	33.6	84.3	53.9	72.3
X^2 (6 df)	75.0*	56.1*	15.4	206.4*
School Sex				
All Boy	37.6	83.9	54.3	62.8
All Girl	22.9	77.4	51.5	60.6
Mixed	23.5	75.0	52.9	45.8
X^2 (4 df)	52.1*	20.2	1.6	81.7*
School Size				
Under 400	22.0	74.9	53.8	47.2
400-799	25.8	78.0	53.1	53.2
800-1199	26.9	77.0	51.8	53.0
Over 1200	25.0	74.0	53.4	43.0
X^2 (6 df)	5.3	6.4	4.7	23.2
Region				
1. North	19.5	75.5	51.7	46.8
2. Y.& H.	23.8	75.2	53.8	47.0
3. N.W.	24.4	74.1	50.7	49.4
4. E. Mid.	23.0	79.0	52.8	50.9
5. W. Mid.	23.9	75.1	50.6	47.8
6. E. Ang.	28.9	77.7	61.2	43.8
7. London	29.0	81.7	56.7	52.0
8. S.E.	25.8	74.0	52.6	50.4
9. S.W.	24.5	77.3	52.0	45.1
X^2 (16 df)	19.2	27.7	15.9	15.1

*$p \leq 0.0001$

FREQUENCY OF BELIEF RESPONSES IN AGREEMENT WITH PANEL
BY (1) SEX, (2) SCHOOL TYPE, (3) SCHOOL SEX,
(4) SCHOOL TYPE, AND (5) REGION

	ABC31	ABC32	ABC33	ABC34	A35
Sex					
Male	79.3	49.3	62.2	56.9	84.9
Female	80.8	41.7	56.2	59.0	84.2
X^2 (2 df)	20.3*	176.8*	77.9*	4.7	4.8
School Type					
Comprehensive	80.8	43.3	58.6	57.7	83.2
Sec. Modern	77.2	36.2	58.3	54.4	81.7
Grammar	83.6	61.6	63.0	65.6	89.6
Non-Maintained	81.8	62.6	59.8	60.7	92.6
X^2 (6 df)	45.5*	434.3*	25.4	76.3*	36.2*
School Sex					
All Boy	81.9	58.8	62.6	59.3	87.9
All Girl	80.0	48.0	55.3	60.9	85.9
Mixed	79.6	41.8	59.4	56.9	83.4
X^2 (4 df)	18.8	189.8*	64.9*	18.0	8.2
School Size					
Under 400	77.2	40.8	58.8	53.6	83.4
400-799	79.4	45.7	58.7	58.3	85.2
800-1199	81.0	48.2	59.2	57.6	85.3
Over 1200	82.0	43.4	60.9	60.1	82.0
X^2 (6 df)	27.9*	29.3*	7.9	13.2	5.9
Region					
1. North	78.2	40.1	59.2	53.5	82.9
2. Y.& H.	81.1	41.5	55.7	57.2	82.2
3. N.W.	76.5	44.1	56.5	57.0	85.0
4. E. Mid.	80.8	38.7	63.8	54.4	85.6
5. W. Mid.	79.5	46.5	61.4	60.0	82.3
6. E. Ang.	83.5	39.7	66.8	59.6	82.4
7. London	79.7	44.7	55.7	58.3	82.0
8. S.E.	81.3	48.0	60.4	58.6	85.8
9. S.W.	80.9	40.4	58.2	59.1	82.5
X^2 (16 df)	29.3	63.8*	41.2	24.1	11.0

	A36	A37	A38	A39	A40
Sex					
Male	77.0	48.6	70.7	38.9	49.4
Female	75.9	53.9	67.7	37.5	40.4
X^2 (2 df)	17.8*	10.4	13.0	4.5	51.0*
School Type					
Comprehensive	75.2	52.8	67.3	38.7	45.8
Sec. Modern	71.6	52.8	61.0	35.9	40.0
Grammar	84.6	48.1	82.6	39.5	50.5
Non-Maintained	86.1	43.7	87.0	40.7	49.7
X^2 (6 df)	57.6*	23.0	139.3*	44.4*	31.3*
School Sex					
All Boy	82.1	47.5	78.1	40.7	57.1
All Girl	80.7	55.4	72.6	39.3	40.7
Mixed	74.0	51.1	66.3	37.3	43.2
X^2 (4 df)	31.4*	10.4	37.3*	16.4	49.5*
School Size					
Under 400	72.0	53.4	65.2	36.2	38.9
400-799	77.0	48.6	69.0	38.6	44.2
800-1199	77.2	55.4	69.5	38.4	45.9
Over 1200	76.1	51.5	71.6	37.9	48.8
X^2 (6 df)	9.6	15.2	7.2	5.4	11.3
Region					
1. North	72.1	53.8	64.4	33.6	39.7
2. Y.& H.	72.4	51.6	57.9	37.6	38.2
3. N.W.	74.5	57.6	63.2	39.9	40.8
4. E. Mid.	73.6	48.2	63.3	33.8	42.8
5. W. Mid.	78.6	52.1	67.2	42.2	45.6
6. E. Ang.	72.8	47.2	68.8	35.2	49.6
7. London	78.4	55.5	69.7	43.7	46.3
8. S.E.	77.3	46.9	74.8	37.0	49.7
9. S.W.	74.1	54.4	73.8	31.9	45.8
X^2 (16 df)	27.9	26.3	51.7*	35.3	26.3

	A41	A42	A43	A44	A45
Sex					
Male	20.9	78.1	62.0	84.0	52.5
Female	23.2	78.0	56.9	83.9	60.7
X^2 (2 df)	93.7*	2.7	10.2	0.0	51.5*
School Type					
Comprehensive	22.0	76.7	59.2	82.7	56.5
Sec. Modern	21.3	71.8	53.6	79.1	56.4
Grammar	24.0	89.5	68.4	91.8	59.0
Non-Maintained	22.2	86.4	68.5	93.8	54.0
X^2 (6 df)	89.4*	88.3*	50.7*	73.6*	5.7
School Sex					
All Boy	17.9	83.3	66.1	89.1	51.2
All Girl	25.5	82.1	59.6	87.4	58.9
Mixed	22.2	75.5	58.0	81.8	57.1
X^2 (4 df)	71.3*	27.3*	20.8	28.3*	15.2
School Size					
Under 400	23.4	75.5	52.4	83.8	58.7
400-799	21.5	77.9	59.5	83.7	56.3
800-1199	21.5	78.6	62.6	84.1	55.6
Over 1200	24.1	78.0	58.9	84.4	57.4
X^2 (6 df)	10.4	2.9	12.5	2.7	2.2
Region					
1. North	15.0	73.7	63.0	80.3	62.8
2. Y.& H.	25.1	76.2	58.6	83.8	58.7
3. N.W.	19.3	75.2	60.7	81.5	55.8
4. E. Mid.	18.3	70.9	57.6	81.2	56.5
5. W. Mid.	23.8	76.5	58.4	84.6	53.1
6. E. Ang.	21.6	78.4	55.2	82.4	62.4
7. London	25.3	80.6	57.1	82.8	54.8
8. S.E.	24.8	80.2	59.9	84.8	54.5
9. S.W.	19.6	78.0	53.0	81.8	62.6
X^2 (16 df)	46.1*	20.4	11.0	19.7	17.5

	B35	B36	B37	B38	B39
Sex					
Male	41.6	56.9	84.8	39.5	76.6
Female	35.2	60.4	84.5	50.4	75.1
X^2 (2 df)	41.2*	10.8	4.6	55.3*	1.2
School Type					
Comprehensive	37.1	58.2	84.4	46.1	75.4
Sec. Modern	40.4	56.3	80.4	39.9	75.4
Grammar	38.7	61.7	91.2	50.7	75.6
Non-Maintained	38.5	63.5	90.2	46.3	80.4
X^2 (6 df)	11.1	23.8	44.1*	23.9	7.5
School Sex					
All Boy	41.3	58.4	88.3	39.2	77.4
All Girl	37.8	58.8	85.2	54.6	76.3
Mixed	38.0	58.5	83.5	43.6	75.3
X^2 (4 df)	5.2	5.0	9.0	38.5*	2.9
School Size					
Under 400	38.4	58.4	83.0	41.4	78.9
400-799	40.7	59.0	84.9	43.9	74.8
800-1199	36.6	56.4	84.2	45.8	76.5
Over 1200	35.1	60.5	85.0	48.2	75.7
X^2 (6 df)	9.2	10.1	5.9	5.9	6.1
Region					
1. North	39.7	56.9	85.3	40.9	69.6
2. Y.& H.	37.3	57.8	83.9	45.4	73.1
3. N.W.	37.6	56.0	83.2	50.1	77.3
4. E. Mid.	37.7	62.9	80.4	40.2	75.4
5. W. Mid.	37.0	60.1	87.4	40.9	73.2
6. E. Ang.	43.9	56.9	84.6	39.0	76.4
7. London	39.5	56.8	83.1	43.8	76.1
8. S.E.	38.8	58.1	84.6	48.2	76.2
9. S.W.	38.9	57.2	82.3	42.6	79.4
X^2 (16 df)	17.2	16.7	11.8	32.7	18.2

	B40	B41	B42	B43	B44
<u>Sex</u>					
Male	46.7	73.1	84.9	58.3	70.0
Female	51.5	70.9	88.2	62.6	68.5
X^2 (2 df)	11.1	2.0	9.2	19.5*	4.0
<u>School Type</u>					
Comprehensive	51.7	70.9	86.1	60.6	70.1
Sec. Modern	47.3	63.3	81.3	59.8	64.6
Grammar	48.3	86.7	93.2	60.9	75.4
Non-Maintained	45.6	84.7	96.3	61.2	70.6
X^2 (6 df)	11.3	133.9*	78.0*	1.5	27.0*
<u>School Sex</u>					
All Boy	44.8	78.6	90.6	56.6	71.0
All Girl	54.0	76.9	89.6	64.4	72.4
Mixed	48.9	69.2	84.8	60.3	67.9
X^2 (4 df)	13.6	31.4*	22.7*	10.3	6.7
<u>School Size</u>					
Under 400	51.7	67.0	84.1	62.7	62.4
400-799	45.9	71.9	86.9	60.8	69.1
800-1199	50.9	72.3	85.7	58.6	69.9
Over 1200	54.7	74.5	88.5	61.0	72.0
X^2 (6 df)	18.9	12.6	7.1	5.7	11.4
<u>Region</u>					
1. North	47.4	66.8	83.4	61.8	66.8
2. Y.& H.	54.7	68.6	85.2	66.0	68.6
3. N.W.	51.2	72.9	86.0	59.2	68.8
4. E. Mid.	45.8	65.8	84.4	59.3	66.7
5. W. Mid.	47.1	72.3	85.8	56.8	68.7
6. E. Ang.	50.4	75.4	86.9	61.8	64.2
7. London	51.7	73.7	88.7	62.7	71.7
8. S.E.	49.5	72.5	86.3	60.2	72.2
9. S.W.	46.1	64.9	81.9	57.8	65.2
X^2 (16 df)	21.2	26.2	16.5	22.2	16.1

	B45	C35	C36	C37	C38
Sex					
Male	62.9	36.2	63.3	59.6	68.4
Female	53.5	34.3	71.2	49.2	59.9
X^2 (2 df)	34.8*	15.0	123.6*	44.2*	29.1*
School Type					
Comprehensive	57.1	33.0	67.0	51.9	64.4
Sec. Modern	46.1	27.4	65.1	45.2	58.0
Grammar	76.3	51.9	71.7	71.1	74.5
Non-Maintained	75.5	48.4	68.6	71.9	70.8
X^2 (6 df)	185.1*	122.6*	26.8	158.8*	53.8*
School Sex					
All Boy	70.1	46.5	63.9	70.0	71.9
All Girl	63.4	40.0	76.8	55.7	61.8
Mixed	54.1	31.5	65.5	50.6	63.0
X^2 (4 df)	58.9*	76.9*	65.5*	75.2*	17.9
School Size					
Under 400	54.3	34.1	66.7	48.0	57.3
400-799	57.4	35.1	66.9	55.0	63.9
800-1199	59.9	37.4	67.5	54.9	67.7
Over 1200	59.8	33.1	68.1	55.5	63.4
X^2 (6 df)	7.3	4.8	2.9	15.9	13.2
Region					
1. North	51.8	29.1	68.8	46.8	64.0
2. Y.& H.	52.3	31.1	67.4	46.3	61.6
3. N.W.	55.5	31.9	69.6	53.2	65.0
4. E. Mid.	54.3	32.5	64.2	50.9	64.2
5. W. Mid.	56.1	37.2	65.9	55.5	63.3
6. E. Ang.	59.0	36.4	71.9	60.3	61.2
7. London	55.1	38.0	68.9	55.2	66.3
8. S.E.	64.8	34.3	66.7	55.4	64.9
9. S.W.	50.0	35.0	61.7	49.1	56.7
X^2 (16 df)	48.5*	17.7	14.2	21.2	14.3

	C39	C40	C41	C42	C43
Sex					
Male	59.4	34.9	70.4	61.4	62.7
Female	44.9	44.0	67.6	67.6	48.4
X^2 (2 df)	95.5*	30.8*	3.5	16.3	74.3*
School Type					
Comprehensive	50.4	37.9	66.9	64.0	54.7
Sec. Modern	45.5	38.6	65.3	60.0	52.8
Grammar	63.7	42.8	80.3	73.1	61.0
Non-Maintained	67.0	44.8	74.8	69.2	61.2
X^2 (6 df)	80.8*	9.6	48.5*	34.8*	16.2
School Sex					
All Boy	67.7	35.8	73.7	66.8	65.6
All Girl	51.5	47.7	70.7	70.9	47.6
Mixed	48.9	38.1	67.6	62.4	55.4
X^2 (4 df)	73.3*	24.9*	10.0	17.8	37.7*
School Size					
Under 400	48.8	39.8	68.7	59.4	55.0
400-799	52.9	39.1	69.3	64.5	55.9
800-1199	52.4	40.3	69.0	64.7	55.2
Over 1200	51.9	39.0	68.7	67.3	55.6
X^2 (6 df)	5.2	1.4	6.7	8.3	2.1
Region					
1. North	50.4	40.1	69.6	61.0	53.4
2. Y.& H.	48.9	40.4	65.3	57.3	54.4
3. N.W.	49.5	41.2	65.8	65.8	55.8
4. E. Mid.	48.3	33.5	73.3	65.9	51.1
5. W. Mid.	49.6	38.2	65.9	62.4	56.2
6. E. Ang.	54.5	39.7	78.5	66.1	49.6
7. London	50.1	45.5	67.4	70.9	53.7
8. S.E.	54.0	35.7	69.6	65.0	57.6
9. S.W.	51.6	37.7	70.4	61.4	55.4
X^2 (16 df)	11.4	25.2	26.4	29.0	11.9

	C44	C45
Sex		
Male	55.4	50.3
Female	55.4	48.2
X^2 (2 df)	47.3*	6.4
School Type		
Comprehensive	55.9	47.6
Sec. Modern	51.0	44.2
Grammar	60.2	58.9
Non-Maintained	61.7	59.4
X^2 (6 df)	41.6*	48.7*
School Sex		
All Boy	59.2	57.4
All Girl	60.2	51.3
Mixed	53.3	46.9
X^2 (4 df)	24.2*	28.3*
School Size		
Under 400	50.1	49.3
400-799	55.3	49.3
800-1199	56.3	49.4
Over 1200	57.2	49.0
X^2 (6 df)	6.3	2.6
Region		
1. North	46.0	44.3
2. Y.& H.	54.4	39.5
3. N.W.	55.2	49.0
4. E. Mid.	55.0	47.4
5. W. Mid.	57.5	48.7
6. E. Ang.	55.4	58.7
7. London	58.4	51.0
8. S.E.	54.6	51.1
9. S.W.	52.9	46.9
X^2 (16 df)	24.5	29.6

* $p \leq 0.0001$

APPENDIX H

Multiple Regression Computer Printouts

Selected portions of printouts are presented from regression analyses conducted on the three parts of Forms A, B and C.

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE..   SCORE1   FACTUAL SCORE   FORM A

VARIABLE(S) ENTERED ON STEP NUMBER 1..   SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.39622
R SQUARE	0.15699
ADJUSTED R SQUARE	0.15516
STANDARD ERROR	2.44431

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	4097.76978	455.30775	76.20653
RESIDUAL	3683.	22004.65427	5.97465	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.15167	0.02300	0.02300	-0.15167	8.60302	1.50889
SEX	0.31075	0.09656	0.07356	-0.26578	-1.17847	-0.22163
SIZE	0.31410	0.09866	0.00210	0.00827	0.11021	0.03650
TYPE1	0.31466	0.09901	0.00035	-0.05676	-0.23658	-0.04405
TYPE2	0.39367	0.15498	0.05597	-0.19801	-0.69636	-0.12365
TYPE3	0.39388	0.15514	0.00016	0.19434	1.16117	0.15503
TYPE4	0.39388	0.15514	0.00000	0.18642	1.25342	0.13301
SCHSEX1	0.39622	0.15699	0.00184	0.26039	9.04137	1.21888
SCHSEX2	0.39622	0.15699	0.00000	-0.06044	8.54580	1.20221
(CONSTANT)					0.41842	

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE.. SCORE2 CONCEPTUAL SCORE FORM A

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.34794
R SQUARE	0.12106
ADJUSTED R SQUARE	0.11915
STANDARD ERROR	2.01491

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	2059.48020	228.83113	56.36434
RESIDUAL	3683.	14952.45210	4.05986	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.19082	0.03641	0.03641	-0.19082	2.44008	0.53012
SEX	0.20130	0.04052	0.00411	-0.05741	-0.17552	-0.04089
SIZE	0.20734	0.04299	0.00247	-0.00499	0.09722	0.03988
TYPE1	0.20919	0.04376	0.00077	-0.07283	0.78136	0.18022
TYPE2	0.34772	0.12091	0.07715	-0.21883	0.37244	0.08192
TYPE3	0.34794	0.12106	0.00015	0.25251	2.23778	0.37008
TYPE4	0.34794	0.12106	0.00000	0.17628	2.12085	0.27877
SCHSEX1	0.34794	0.12106	0.00000	0.16811	2.62129	0.43773
SCHSEX2	0.34794	0.12106	0.00000	0.07681	2.61088	0.45496
(CONSTANT)					2.99720	

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE..   SCORE3   BELIEF SCORE FORM A

VARIABLE(S) ENTERED ON STEP NUMBER 1..   SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.22067
R SQUARE	0.04870
ADJUSTED R SQUARE	0.04663
STANDARD ERROR	2.59621

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	1270.76996	141.19666	20.94812
RESIDUAL	3683.	24824.53683	6.74030	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.10719	0.01149	0.01149	-0.10719	-0.63069	-0.11063
SEX	0.11470	0.01316	0.00167	-0.03706	-0.14429	-0.02714
SIZE	0.13660	0.01866	0.00551	0.04169	0.21395	0.07087
TYPE1	0.13809	0.01907	0.00041	-0.02517	5.43843	1.01279
TYPE2	0.22011	0.04845	0.02938	-0.14816	5.14263	0.91327
TYPE3	0.22067	0.04870	0.00025	0.15743	6.59933	0.88120
TYPE4	0.22067	0.04870	0.00000	0.09401	6.41911	0.68126
SCHSEX1	0.22067	0.04870	0.00000	0.09580	-0.48814	-0.06582
SCHSEX2	0.22067	0.04870	0.00000	0.04184	-0.47361	-0.06664
(CONSTANT)					3.70775	

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE..   SCORE1   FACTUAL SCORE   FORM B

VARIABLE(S) ENTERED ON STEP NUMBER 1..   SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.36708
R SQUARE	0.13475
ADJUSTED R SQUARE	0.13283
STANDARD ERROR	2.31465

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	3009.44789	334.38310	62.41300
RESIDUAL	3607.	19324.81697	5.35759	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.16130	0.02602	0.02602	-0.16130	7.86493	1.47763
SEX	0.27084	0.07335	0.04734	-0.21240	-0.99922	-0.20105
SIZE	0.28830	0.08312	0.00976	0.05016	0.23203	0.08225
TYPE1	0.28831	0.08312	0.00000	-0.02447	0.85228	0.17001
TYPE2	0.36697	0.13466	0.05154	-0.21835	0.33945	0.06427
TYPE3	0.36708	0.13475	0.00008	0.18492	2.04462	0.28938
TYPE4	0.36708	0.13475	0.00000	0.17371	2.14180	0.24717
SCHSEX1	0.36708	0.13475	0.00000	0.21666	8.18386	1.18436
SCHSEX2	0.36708	0.13475	0.00000	-0.00697	8.18682	1.23283
(CONSTANT)					-0.22154	

* MULTIPLE REGRESSION * *

DEPENDENT VARIABLE.. SCORE2 CONCEPTUAL SCORE FORM B

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.35577
R SQUARE	0.12657
ADJUSTED R SQUARE	0.12464
STANDARD ERROR	2.02347

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	2140.19699	237.79967	58.07858
RESIDUAL	3607.	14768.67058	4.09445	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.19982	0.03993	0.03993	-0.19982	2.15126	0.46451
SEX	0.23059	0.05317	0.01324	-0.10875	-0.42548	-0.09639
SIZE	0.24617	0.06060	0.00743	0.02654	0.20721	0.08441
TYPE1	0.24921	0.06211	0.00151	-0.07228	1.88778	0.43277
TYPE2	0.35574	0.12655	0.06445	-0.21115	1.57598	0.34291
TYPE3	0.35576	0.12657	0.00001	0.23388	3.27911	0.53338
TYPE4	0.35576	0.12657	0.00000	0.18451	3.24821	0.43081
SCHSEX1	0.35577	0.12657	0.00001	0.19691	2.44878	0.40729
SCHSEX2	0.35577	0.12657	0.00000	0.06007	2.47274	0.42795
(CONSTANT)					1.74195	

* MULTIPLE REGRESSION * *

DEPENDENT VARIABLE.. SCORE3 BELIEF SCORE FORM B

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.20207
R SQUARE	0.04083
ADJUSTED R SQUARE	0.03870
STANDARD ERROR	2.69888

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	1118.42903	124.26989	17.06081
RESIDUAL	3607.	26273.15958	7.28394	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.08771	0.00769	0.00769	-0.08771	14.09077	2.39046
SEX	0.08849	0.00783	0.00014	-0.00896	-0.14167	-0.02574
SIZE	0.12242	0.01499	0.00716	0.05626	0.22971	0.07352
TYPE1	0.12242	0.01499	0.00000	0.00204	2.95184	0.53168
TYPE2	0.19860	0.03944	0.02445	-0.14974	2.55630	0.43701
TYPE3	0.19869	0.03948	0.00004	0.12853	3.93463	0.50284
TYPE4	0.19869	0.03948	0.00000	0.08449	3.90733	0.40716
SCHSEX1	0.20207	0.04083	0.00135	0.04960	13.96246	1.82458
SCHSEX2	0.20207	0.04083	0.00000	0.06177	14.40197	1.95833
(CONSTANT)					-8.14080	

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE.. SCORE1 FACTUAL SCORE FORM C

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.44014
R SQUARE	0.19372
ADJUSTED R SQUARE	0.19191
STANDARD ERROR	2.56309

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	5601.78792	622.42088	94.74539
RESIDUAL	3549.	23314.82068	6.56941	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.16465	0.02711	0.02711	-0.16465	24.05052	3.92678
SEX	0.34634	0.11995	0.09284	-0.29881	-1.46625	-0.25719
SIZE	0.35267	0.12438	0.00442	0.01086	0.20415	0.06320
TYPE1	0.35471	0.12582	0.00144	-0.07679	-6.84269	-1.18872
TYPE2	0.43689	0.19087	0.06505	-0.19666	-7.24487	-1.20083
TYPE3	0.43691	0.19089	0.00002	0.21031	-5.08465	-0.62501
TYPE4	0.43691	0.19089	0.00000	0.20042	-5.09604	-0.51070
SCHSEX1	0.44014	0.19372	0.00283	0.29692	24.63630	3.08415
SCHSEX2	0.44014	0.19372	0.00000	-0.07854	23.97534	3.14063
(CONSTANT)					-7.75603	

* M U L T I P L E   R E G R E S S I O N * *

DEPENDENT VARIABLE..   SCORE2   CONCEPTUAL SCORE   FORM C

VARIABLE(S) ENTERED ON STEP NUMBER 1..
SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.32793
R SQUARE	0.10754
ADJUSTED R SQUARE	0.10553
STANDARD ERROR	1.82680

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	1427.10791	158.56755	47.51507
RESIDUAL	3549.	11843.74176	3.33721	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.19737	0.03895	0.03895	-0.19737	-9.28270	-2.23723
SEX	0.20227	0.04091	0.00196	-0.03741	-0.03024	-0.00783
SIZE	0.21109	0.04456	0.00364	0.00092	0.14962	0.06838
TYPE1	0.21814	0.04758	0.00303	-0.09430	9.07966	2.32834
TYPE2	0.32591	0.10621	0.05863	-0.17905	8.91216	2.18050
TYPE3	0.32604	0.10630	0.00009	0.22173	10.29784	1.86851
TYPE4	0.32604	0.10630	0.00000	0.18763	10.34365	1.53013
SCHSEX1	0.32793	0.10754	0.00124	0.19114	-8.87534	-1.64010
SCHSEX2	0.32793	0.10754	0.00000	0.06333	-9.17150	-1.77344
(CONSTANT)					5.44070	

*** M U L T I P L E   R E G R E S S I O N * ***

DEPENDENT VARIABLE..   SCORE3   BELIEF SCORE   FORM C

VARIABLE(S) ENTERED ON STEP NUMBER 1..
SCHSEX3
SEX
SIZE
TYPE1
TYPE2
TYPE3
TYPE4
SCHSEX1
SCHSEX2

MULTIPLE R	0.28148
R SQUARE	0.07923
ADJUSTED R SQUARE	0.07716
STANDARD ERROR	2.79926

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	9.	2392.97523	265.88614	33.93195
RESIDUAL	3549.	27809.47939	7.83586	

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
SCHSEX3	0.14551	0.02117	0.02117	-0.14551	3.06400	0.48950
SEX	0.16112	0.02596	0.00478	-0.06408	-0.38452	-0.06599
SIZE	0.17844	0.03184	0.00588	0.03081	0.23661	0.07168
TYPE1	0.18028	0.03250	0.00066	-0.04522	2.03223	0.34544
TYPE2	0.28084	0.07887	0.04637	-0.17844	1.63248	0.26476
TYPE3	0.28140	0.07919	0.00032	0.19675	3.63681	0.43742
TYPE4	0.28140	0.07919	0.00000	0.13218	3.42066	0.33542
SCHSEX1	0.28148	0.07923	0.00005	0.13772	3.26660	0.40014
SCHSEX2	0.28148	0.07923	0.00000	0.04975	3.35235	0.42969
(CONSTANT)					3.03390	

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