# DERIVATION OF A TEST FOR MEASURING DEGREE OF ENVIRONMENTAL EDUCATION

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# ABSTRACT

The need to derive a test for measuring degree of environmental education in the South African context was perceived. A test aimed at standard 6 pupils was devised based on three components: knowledge, feeling and action.

Three item pools were developed and scrutinised by panels of experts and a pilot test was formulated. The results of the pilot test were analysed statistically and the test refined into a shorter, final test which was found to be both reliable and valid.

This final test was implemented with a sample population of some 300 pupils and was found to discriminate between those who are environmentally educated and those who are not. Several uses of the test are suggested.

An attempt to use teacher judgement as an independent means of identifying environmentally educated pupils was not successful.

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# CHAPTER 1

## 1 INTRODUCTION

### 1.1 The Problem

#### 1.1.1 Need for an Index of Environmental Education

There is in South African schools the need for an index to measure the degree to which a pupil is environmentally educated, as this would add a valuable dimension to the existing but narrow profiles most schools have of their pupils' academic achievement in the classroom. An environmentally educated person is one who knows about, feels about and is prepared to do something about environmental issues.

Extensive research into such indices has been done in the U.S.A., by Maloney & Ward (1973), Fleetwood & Hounshell (1976), Quinn (1976), Kifer (1977), Moyer (1977), Dunlap & van Liere (1978), Pettus, Frary & Teates (1978), Borden & Schettino (1979) and Kinsey & Wheatley (1980).

Some research in this field has been done in Canada by Hart & McClaren (1978) and in Britain by Gardner (1973) and Black & Dockrell (1980). Research into some aspects of environmental awareness, such as teaching with an environmental approach, conservation awareness or attitudes to nature recreation has been done in South Africa by Cadieux (1979), Hurry (1980), Opie (1980), Keogh (1981) and Irwin (1982). This research project looks at measuring environmental education in a broad context.

#### 1.1.2 Scope and Definition of Environmental Education

Defining 'Environmental Education' is not an easy task. Unlike other curriculum areas, the specific content of environmental education has never been well defined. The extent of environmental education may be viewed through various parameters or dimensions.

##### 1.1.2.1 Multi-Disciplinary Nature of Environmental Education

It is generally agreed that environmental education should be multi-

disciplinary, drawing from geographical, biological, sociological, anthropological, economic, political and humanistic sources. As Mitzel points out :

> It is impossible to make wise decisions about the environment without an understanding of economics, anthropology, political science, sociology, history, and the humanities as well as the natural and physical sciences.
>
> (Mitzel 1982, p. 576)

1.1.2.2 Conceptual Base of Environmental Education

It is widely agreed that a conceptual approach to teaching environmental education is best. A number of recent studies, such as those of Roth, Pella & Schoenfeld (1970), Klausmeier, Ghatala & Frayer (1974) and Jeter, Jordan & Ingison (1976), have dealt with the identification of concepts to be included in environmental education programmes.

1.1.2.3 Values Component of Environmental Education

A further perspective is that environmental education has a moral or values component. Harshman (1978 - 1979) and Baer (1980) emphasise the need for environmental educators to familiarise themselves with value clarification and moral development processes in implementing environmental education conceptual frameworks. Supporting this, Raths, Harmin & Simon (1966), designed a conceptual framework which they termed 'The process of valuing'. This framework incorporates three components :

> Choosing: (1) freely
> (2) from alternatives
> (3) after thoughtful consideration of the consequences of each alternative
>
> Prizing: (4) cherishing, being happy with the choice
> (5) willing to affirm the choice publicly
>
> Acting: (6) repeatedly, in some pattern of life
>
> (Raths et al 1966, p. 30)

Two definitions of 'Environmental Education' seem to embody most of the essential components discussed above. The first is that contained in The United States Environmental Education Act of 1970 :

> Environmental education means the educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, economic impact, and urban and rural planning to the total human environment.
>
> (United States Code, 1976)

The second definition is that suggested by I.U.C.N., The International Union for the Conservation of Nature and Natural Resources (1970) :

> Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his bio-physical surroundings.
>
> Environmental education also entails practice in decision-making and the self-formulation of a code of behaviour about issues concerning environmental quality.
>
> (I.U.C.N., 1970)

1.1.2.4 Idealistic Component of Environmental Education

Fuggle (1982) has reservations in accepting the two definitions quoted above. He points out that neither of these definitions includes an idealistic dimension emphasising the development of personality and the recognition of universal values. Fuggle stresses that the ultimate purpose of environmental education must be to develop spiritual, moral, intellectual and aesthetic qualities in pupils, and that in environmental education we are dealing not with a particular subject such as ecology or

geography, but with an entire approach to education. Meaningful environmental education programmes need to stress the environmental ethic, the moral aspects of environmental awareness.

1.1.2.5 The Goal of Environmental Education

Returning to the statement that an environmentally educated person is one who knows about, feels about and is prepared to do something about environmental issues, it is necessary to emphasise the tripartite nature of environmental education: it has a cognitive, an affective and a conative component.

Reference to this tripartite nature of environmental education is made in The Belgrade Charter of 1975, which states that the goal of enviromental education is

> to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skill, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones.
>
> (UNESCO-UNEP, 1975, p.2)

From an educational point of view, therefore, individual forms of environmental education should not be isolated. The interrelatedness of the cognitive, the affective and the conative domains has been emphasised by numerous writers such as Williams (1968), Stronck (1974), Winston (1974), Opie (1980) and Kinsey & Wheatley (1980).

1.1.3 Educational Objectives and Environmental Education

There have been several attempts to bring order to the development of educational objectives (Bloom, 1956; Krathwohl, Bloom & Masia, 1964; Roberts, 1976; Kifer, 1977; Hill & McGaw, 1981). These attempts have assumed that learning outcomes can be ranked hierarchically. This makes

it possible to classify educational objectives, and in the same way to consider environmental education on the appropriate levels in the cognitive, affective and conative domains.

1.1.3.1 Objectives in the Cognitive Domain

The Cognitive domain is related to knowing. Bloom's Cognitive Taxonomy (Bloom, 1956) is widely accepted. He classified cognitive learning outcomes from simple recall through a range of increasing complexity to a highly original and creative combination and synthesis of new ideas.

1.1.3.2 Objectives in the Affective Domain

The Affective domain is related to feeling. Krathwohl et al (1964) have identified the components in this domain and have classified these along a continuum ranging from simple awareness of phenomena to the formulation of a sophisticated philosophy of life. As a person's level of affective response moves to higher levels in the continuum, the given phenomena or values are increasingly appropriated to the structure of personality, modifying and refining it.

1.1.3.3 Objectives in the Conative Domain

The Conative domain embraces the action or behavioural tendencies of an individual. Although no suitable model relevant to a hierarchy of conative components was found in the literature, some help was gleaned from authors such as Thomas (1977), who sees the conative component as including a whole range of behavioural dispositions, from neutrality, through selective action and reluctant compliance under coercion to voluntary and total commitment.

A worthwhile environmental education programme should bear this knowledge-feeling-action triad in mind, and designers of environmental education programmes should include objectives in all three domains in the formulation of objectives. A person's degree of environmental education in turn should be assessed with all three domains in mind.

## 1.2 The Aim of this Project

### 1.2.1 Primary Aim

The aim of this project is to formulate a test that will indicate whether or not a person is environmentally educated. As all three components mentioned above, i.e. knowledge, feeling and action, are components of an environmentally educated person, it seems then that it should be possible to use this classification to devise a series of questions, to ascertain whether or not a person is environmentally educated. It is intended that the indices selected be applicable within the South African context.

### 1.2.2 Motivation for Establishing an Environmental Education Index

Several motivating factors have inspired this research. These stem from the author's belief that an index of environmental education would be of value both within the teaching and within the teacher-training situation.

#### 1.2.2.1 Need for Broad-based Assessment

Teachers are often called upon to nominate candidates for awards or selection, or to provide a reference where character attributes are to be considered. Much has been written of the need to assess pupils across a broader spectrum of attitudes and qualities than is conventionally done. Many writers, particularly in the U.K. (Raths et al, 1966; Nelson, 1970; Harrison, 1971; Gardner, 1973; Quinn, 1976; Black and Dockrell, 1980) have been concerned with establishing attitude profiles for students. An environmental education measure would provide a valuable dimension to such a profile according to Moyer (1977).

#### 1.2.2.2 Extra-Curricular Activity Design

A teacher or leader of an extra-curricular activity would be assisted in the design of an environmentally-orientated programme if the pupils' existing state of environmental education could be determined. Both content planning and group structures could be rationally decided if level of environmental education could be tested.

#### 1.2.2.3 Evaluation of Environmental Education Courses

The application of the test in a pre- and post-instruction mode would allow for evaluation of an environmental education course and would also, thus, point the way for any changes needed to the course, as indicated by Black and Dockrell (1980).

#### 1.2.2.4 Values Education

The significance of values education needs to be stressed in South African schools today. In environmental education there is a need to do more than lead pupils to an understanding of the interrelationships between man and his environment. Fuggle (1982) suggests that educators inculcate a concern for quality, truth and beauty and help pupils develop values and a commitment to environmental conservation as a moral code. A measure of environmental education at all levels is therefore essential.

#### 1.2.2.5 Teacher Training

The author's concern is largely teacher training. An effective long-term way of creating environmentally educated school children is to create environmentally educated student teachers. For the same reasons given above for school education, an appropriate test could be useful at college level, by making available to students such a test. It is hoped that this project will assist the author in achieving these linked objectives.

## 1.3 Procedure to be Adopted

### 1.3.1 Derivation of a Set of Questions

The approach adopted in this project was to derive a set of questions which, when administered to a group of standard 6 pupils, would separate the environmentally educated from the environmentally uneducated. Pupils in standard 6, (also known as Form 1) in the Transvaal, would be in their eighth year of schooling, having just completed seven years at primary school. With a school-starting age of six years, standard 6 pupils, in their first year of secondary school, are generally thirteen or fourteen years of age.

In order that the items selected constitute a valid indicator, an external

reference was needed. In this research project the author used two separate external means of validation.

Firstly, the item pools, or sets of questions were submitted to two carefully chosen panels of experts, all lecturers at the Johannesburg College of Education from a wide range of disciplines. They were asked for their comments as to the validity of each item for measuring environmental attitudes, the wording, clarity of meaning and the general suitability for standard 6 pupils. The submission of items to these panels, a method suggested by Oppenheim (1966, p. 151) with an overview of comments on the items is discussed in Section 2.2.4.2.

Secondly, the author considered that it may be useful to use teachers as an additional independent measure. A group of at least five teachers at each school was requested to select pupils whom they considered to be environmentally educated. The environmentally educated pupils would accordingly be selected by two independent measures:

(i) as a result of the questionnaire
(ii) as a result of the teachers' selection

The aim may thus be extended : is it possible to derive a short set of questions which, when administered to a group of standard 6 pupils, will identify the same environmentally educated pupils as those perceived by teachers?

The author had certain reservations about the ability of teachers in a subject-orientated school system, to identify environmentally educated children, and hence the reliance on the two panels of experts. The low correlations and subsequent interviews with some teachers (as reported in Chapter 4) are an indication of this inability.

### 1.3.2 Selection of Schools, Teachers and Pupils

#### 1.3.2.1 Choice of Schools

The author had intended selecting schools randomly for use in this study. However, a Transvaal Education Department request that its permission to

conduct the research in T.E.D. schools should not be used as a lever to gain co-operation from schools, but that the author should enlist the personal goodwill and co-operation of each individual principal, placed definite restrictions on the author's choice of schools.

As the author had, in his eighteen years of teaching come to know principals of a broad cross-section of schools in the Johannesburg area, those schools in which the principals were known personally to him were used for the study. Of the ten schools used four were boys' schools, three girls' schools and three co-educational schools. Three schools drew pupils from a high socio-economic income area, three from a low and four from a middle income group. Two schools had a high proportion of immigrant pupils.

For the pilot study the author selected the school in the Johannesburg area at which he had previously taught. This was a co-educational school which drew pupils from a wide cross-section of socio-economic groups. It was considered to be representative of the sample population.

1.3.2.2 Choice of Pupils

For the purpose of this research, the author chose standard 6 pupils. There were two main reasons for choosing pupils at this level. Firstly, they take a wide variety of subjects at school, and hence are known to at least eight or nine teachers. Senior classes take only six subjects. Secondly, the author did not wish to disturb the academic progress of senior classes.

1.3.2.3 Choice of Teachers

In a brief interview with the principal, the research project was outlined, and permission to administer the questionnaire (the development of which is outlined in Section 2.2) to one standard 6 class was sought. The principal was requested to set up a meeting with all the teachers of that specific class, so that at least five teachers could aid in the identification of environmentally educated pupils. In selecting teachers, the author took the view that no one subject area assumes guardianship of the environment and therefore all willing teachers, regardless of their subject, were considered equally competent to assist in the research project, which was conducted in the second half of the school year.

### 1.3.3 Implementation of Pilot Study and Refining of the Test

Once the schools, pupils and teachers had been chosen, the pilot study was implemented. A detailed analysis of the items and pupils' responses to the items followed. This led to the refining of the pilot test into a shorter test. This test was then administered by the author to some 300 standard 6 pupils at the ten schools described in Section 1.3.2.1. Fifty teachers, five from each school, were used as an independent measure.

Chapter 2, which follows, considers the theory of testing and measuring of attitudes, and the development of a questionnaire to measure environmental attitudes.

# CHAPTER 2

## 2 TESTING AND MEASURING OF ATTITUDES

### 2.1 Testing

Oppenheim, in providing guidance for the design of a questionnaire, sees a questionnaire as

> ... not just a list of questions or a form to be filled out. It is essentially a scientific instrument for measurement and for collection of particular kinds of data. ... it has to be specially designed according to particular specifications and with specific aims in mind, and the data it yields are subject to error .
>
> (Oppenheim, 1966, p.2)

In designing a questionnaire to determine environmental attitudes it is essential to understand the nature of attitudes.

#### 2.1.1 Definitions and Nature of Attitudes

There is a vast literature in the journals of psychology, sociology and education dealing with attitudes. Authors such as Edwards (1957) and Warren & Jahoda (1973) record how recent interest in attitudes manifests itself in two forms: firstly in research into attitudinal content, considering the theory and nature of attitudes and the way in which attitudes are defined, and secondly in methods by which attitudes might be measured, including the construction of scaling techniques for the quantification of attitude assessment.

Essentially attitude relates to how we feel about something, whether we like it or not. Applying Edwards' definition of attitude in general (Edwards, 1957, p.2) to attitude towards the environment in particular an individual who has associated positive affect or feeling with the environment is said to like the environment or to have a favourable attitude towards it. The converse applies to an individual who has negative feeling or affect.

Attitudes have been defined, both by sociologists (Fuson, 1942) and by psychologists (Campbell, 1950) simply in terms of the probability of the occurrence of a specified behaviour in a specified situation. Such definitions, while devoid of conceptual content, serve to remind us that the ultimate referent of attitudes is behaviour. Newcomb (in Jahoda & Warren, 1966) defines an attitude as the individual's organization of psychological processes, as inferred from his behaviour. Attitudes persist, even during periods of behavioural quiescence. This notion of the dormancy of attitudes is emphasised by Oppenheim (1966, p.106), who states that a person's attitudes become aroused and expressed only when some issue connected with the object of the attitude (environment) arises.

In considering the components of an attitude, several authors, such as Oppenheim (1966), Warren & Jahoda (1973), and Thomas (1977) refer to the tripartite nature of attitudes incorporating cognition, affect and conation, which is the knowledge-feeling-behavioural tendency triad referred to in the previous chapter as being the integral components of an environmentally educated person.

An adaptation of a diagram by Triandis (1971) on the components of an attitude, shows how each of the three components of a pupil's attitude towards environment may manifest itself in three different ways.

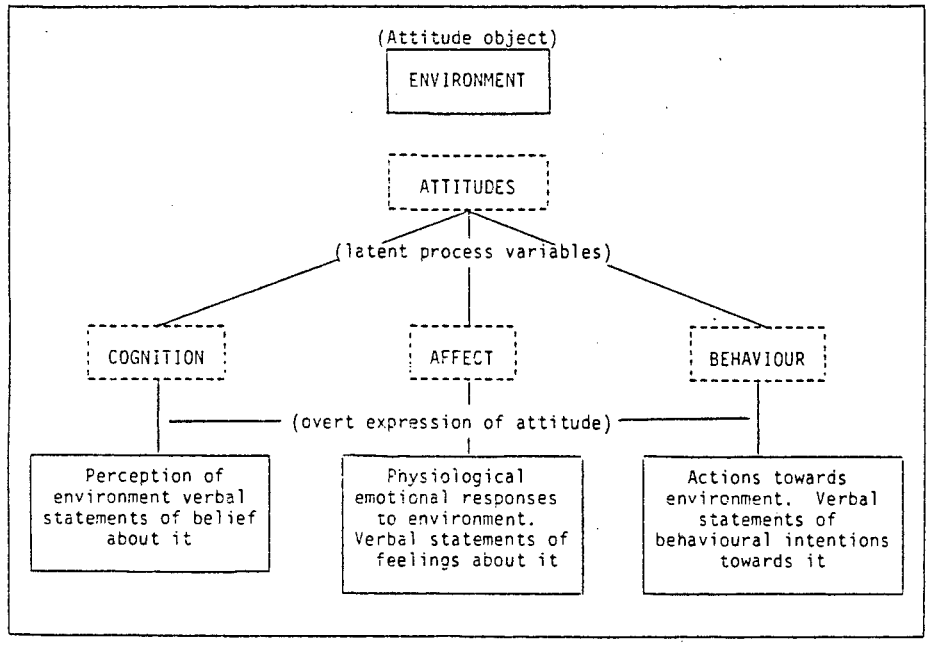


Fig. 1. A representation of the three components of attitude (After Triandis, 1971)

The cognitive, affective and conative components may be viewed as an interdependent system; often, as experience leads to an increase in knowledge about the environment there will be a consequent change in beliefs about it, leading to changes in feelings and behavioural intentions towards it.

A problem with this tripartite view of attitude is that the three components may not coincide. A litterbug for example may litter in spite of knowing that this is the wrong thing to do. Similarly, as attitudes are predispositions to respond, and not fixed responses, they may or may not lead to a certain behaviour. "For all we know," states Oppenheim (1966, p.107) "attitudes may be shaped more like concentric circles or overlapping ellipses or three-dimensional cloud formations."

In using the concept of attitude as a means of measuring a person's feelings and potential behaviour towards environment, we recognise that attitudes have several dimensions or attributes:

(i) Attitudes vary in extremeness; i.e. the degree to which they are positively or negatively oriented. This variation in degree applies to each of the three components mentioned above.

(ii) Attitudes vary in complexity. A person may hold a negative attitude towards one aspect of environment, but be positively disposed to another. He may for example be anti pollution, but hold the view that South Africa will benefit from the mining of coal in the Kruger National Park.

(iii) Attitudes vary in intensity. An important dimension here is the extent to which the attitude is related to, and integrated with, other attitudes. Few attitudes exist in complete isolation; most form clusters with other attitudes.

Bearing the complex nature of attitudes in mind, the researcher recognizes the difficulties inherent in any attempt, however well-planned, to measure environmental attitudes.

### 2.1.2 Measuring Environmental Attitudes

The use of the questionnaire as a research tool for measuring environmental attitudes merits some discussion.

The author chose to use the group administered questionnaire for this research project on the basis of its advantages. It is ideally suited to groups of respondents assembled together, such as school children. It is possible to check finished questionnaires for completeness. This ensures 100% returns, that all respondents answer the questions in the same order and that all have the same amount of time to do so. Groups of 30 can readily be controlled in this way.

At the same time, the author is aware of the disadvantages of using this mode of data collecting.

Researchers have found that eliciting information from respondents via questionnaires is fraught with difficulties. According to Oppenheim

> Some people still design questions as if the process of ... filling out a questionnaire were rather like unloading a ship, with every item of cargo labeled and with a specific destination, picked out of the hold and set down according to a pattern. In reality, questioning people is more like trying to catch a particularly elusive fish, by hopefully casting different kinds of bait at different depths, without knowing what goes on beneath the surface.
>
> (Oppenheim, 1966, p.49)

A number of factors over which the researcher has little or no control might well come into play in the act of responding to a questionnaire. Even though the respondent understands the questions, he may be influenced by a desire to please the research worker, or to give the answer he knows to be the socially acceptable one, or he may be unwilling to spend time and effort on responding and thus record answers whimsically.

These and other factors make it difficult to obtain a reliable and unbiased answer. Copying, talking and asking questions are a constant danger.

However, there are some precautions that the researcher can take, to make the questionnaire an effective testing device. Edwards (1957) and Oppenheim (1966) draw the researcher's attention to certain important considerations in designing and drawing up a questionnaire.

The content of the questions must be correct, the wording must be appropriate to the group being tested, and the context, sequence and response categories must help the respondent without biasing the answers. Items must be selected and carefully edited according to certain criteria.

A basic consideration in the measurement of attitudes is that the measurement must be both reliable and valid; reliable in that it must be consistent in what it measures, and valid in that it measures what we actually want it to measure.

As far as possible all the above criteria were taken into account by the author in the development of the questionnaire, a discussion of which follows.

Invaluable assistance in the design of this questionnaire was obtained from work done in related fields of environmental and other attitude testing, both in South Africa by researchers such as Pope (1978), Cadieux (1979), Hurry (1980), Opie (1980), Keogh (1981) and Irwin (1982), and abroad by researchers like Maloney et al (1975), Fleetwood & Hounshell (1976), Quinn (1976), Kifer (1977), Moyer (1977), Born & Wieters (1978), Hart & McClaren (1978), Pettus et al (1978), Borden & Schettino (1979), Black & Dockrell (1980) and Kinsey & Wheatley (1980).

Many ideas in design and construction were incorporated from these studies and some questions were used or adapted to suit the particular needs of this research project.

## 2.2 Development of a Questionnaire

In order to understand the design of this questionnaire, to measure environmental education, the reader's attention is drawn to the discussion in the previous chapter on the scope and definition of environmental education, particularly the three main components of an environmentally educated person: knowledge, feeling and action.

### 2.2.1 Research Design

The test was designed so that each of the three components of environmental education was investigated. Three groups of indicators were formulated, based on the knowledge-feeling-action triad discussed previously.

#### 2.2.1.1 The Cognitive Component

The model upon which the selection of indicators in the cognitive domain was based was adapted from Bloom's Taxonomy (Bloom, 1956). The major categories in the Cognitive Domain of the Taxonomy of Educational Objectives are :

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

For the purposes of this specific research project, the first two categories, Knowledge and Comprehension, were combined, as they were both considered to test related educational outcomes. Similarly the highest three categories, Analysis, Synthesis and Evaluation, were combined, as the author felt, in concurrence with other researchers in the field, that behavioural components in the upper hierarchy were not easily distinguishable as they overlapped considerably. Ormell (1974) criticises the main headings of the classification and the precise order of importance implied by the ordering of the hierarchy. Although he

admits that the taxonomy works, he sees a distinct overlap of the upper categories, and states that in places inversions of the normal hierarchical order may be expected to occur. Fleetwood & Hounshell (1976), in designing their environmental science test to measure the degree to which an individual can demonstrate his understanding of certain environmental education concepts, surveyed the first four of Bloom's major categories. Their research found these to be adequate in designing a reliable and effective index. Researchers such as Williams (1968) and Stronck (1974) express reservations about the exclusiveness of the cognitive domain, especially in the upper levels. Kunen (1981) tested the cumulative hierarchical assumption of Bloom's Taxonomy in the cognitive domain using Australian subjects. He found Bloom's Taxonomy to possess some cross-national validity, but the study considered the Evaluation category to be misplaced as the apex of the taxonomy.

The major categories in Bloom's model,

1. Knowledge and Comprehension
2. Application
3. Analysis, Synthesis and Evaluation,

formed the basis of the pool of items framed by the author to measure the cognitive component of environmental education in the selected group of standard 6 pupils in this study. The derivation of this item pool is discussed later in this chapter.

2.2.1.2 The Affective Component

The model upon which the selection of indicators in the affective domain was based, was adapted from Krathwohl's Taxonomy (1964). The major categories in the Affective Domain of the Taxonomy of Educational Objectives are :

1. Receiving
2. Responding
3. Valuing
4. Organization
5. Characterization

The author used the major categories of the affective domain as the basis for deriving the pool of items to measure the affective component of environmental education in the selected group of pupils. The 4th and 5th categories were combined in framing the items.

In combining levels 4 and 5 of Krathwohl's Taxonomy, the author recognises the difficulty in placing particular behaviour patterns neatly into the taxonomy. Behaviour patterns in the affective domain may easily fit into more than one level. The affective item pool is discussed later in this chapter.

2.2.1.3 The Conative Component

Although no suitable model pertaining to a hierarchy of conative components was found in the literature, some help was gleaned from Thomas (1977) who sees the conative component as including a whole range of behavioural dispositions from neutrality, through reluctant compliance under coercion, and selective action to voluntary and total commitment.

In looking at the range of positive commitment, or behavioural response in favour of the environment, three levels are distinguishable, emanating from those mentioned in the affective domain:

1. Acquiescence in responding (the pupil will pick up litter if requested to do so)

2. Willingness to respond (the pupil voluntarily picks up litter)

3. Satisfaction in responding (the pupil will organise and participate in a clean-up campaign for enjoyment and pleasure)

The author is aware of the shortcomings of the questionnaire method to test the conative component of an environmentally educated person. It is difficult to assess the sincerity of a verbal commitment. There is no way in a questionnaire of verifying that a verbal commitment is backed by an actual commitment. Actual commitment implies behaviours in which the individual is currently engaged and not in which he says he is

currently engaged. Maloney & Ward (1973) found that most people have a high degree of verbal commitment and feeling towards environmental matters such as pollution problems, but in actual fact do little and know even less. Authors such as Cadieux (1979) investigated environmental awareness through people's participation in outdoor recreation. He considers that the leisure seeker's attitude towards environment is manifest through the quality of his recreational behaviour. In order to qualify as recreation, Cadieux states (p.6) that ".....an activity must do something desirable physically, psychologically, spiritually and mentally to the participant, and must be socially acceptable." This concept of quality was emphasised by Nash (1964) when he placed recreation pursuits into a hierarchy on the basis of their potential value to the individual and to society. According to Nash's quality concept (p.69), recreation is the process of engaging in activities during leisure time, with a set of attitudes that makes possible the attainment of leisure values. On the lower end of Nash's scale are acts against society, like crime and delinquency. Moving up the scale is the passive spectator, whose amusement or simple entertainment is sought as an antidote to boredom. Higher up is the active spectator, where an emotional participation involves appreciation, with the active participant and creativity at the apex of the scale.

### 2.2.2 Representative Sample

The author recognises that it is impossible to include every indicator of the variable being measured, in view of the broadness of the concept of environmental education, so a representative sample of items was used. As there was no available test suitable for the purposes of this investigation (although items exist for specialised tests on selected topics) it was necessary to construct a new set of indicators for the measuring of environmental education in each of the three domains.

### 2.2.3 Mode of Scoring

The questionnaire was designed so that the scoring would be done according to the widely used Likert method of summated ratings as outlined in Edwards (1957), Anastasi (1961), Oppenheim (1966) and Gronlund (1976). It allows

the choice of several (usually five) responses. This range of responses permitted to an item in a Likert-type scale provides more precise information about the individual's opinion on the issue referred to by the item.

Each item was given a rating of positive or negative, with approximately the same number of items in each class. A positive value was allocated to what is considered to be a positive attitude to the environment and a negative value to a negative attitude to the environment.

In scoring the responses to the positive items, the

"strongly agree" response was given a weight of 5;
"agree" response was given a weight of 4;
"uncertain" response was given a weight of 3;
"disagree" response was given a weight of 2;
"strongly disagree" response was given a weight of 1.

For the negative items, the scoring system was reversed. The

"strongly disagree" response was given a weight of 5;
"disagree" response was given a weight of 4;
"uncertain" response was given a weight of 3;
"agree" response was given a weight of 2;
"strongly agree" response was given a weight of 1.

For each respondent, a total score was obtained by adding the scores for the individual items.

### 2.2.4 Derivation of Questions - Three Item Pools

The first step was to assemble a large number of items in each of the three domains. This collection of attitude statements would comprise the item pools from which a representative sample would be drawn to form the pilot test. The pilot test would be used to iron out ambiguities and inconsistencies and to make sure the administration of the final questionnaire would run smoothly. The questions were grouped into clusters or question areas based on the models used.

2.2.4.1 Emphasis on the Affective Domain

Environmental education relates largely to developing informed attitudes of concern for the environment. The essence of positive environmental attitudes and behaviour relates predominantly to the affective domain. In view of this emphasis the largest component of questions formulated was in the affective domain. Much of the literature points to the interrelatedness and inseparability of the cognitive, affective and conative domains. In analysing the affective domain Scheerer reminds us that

> ... behavior may be conceptualised as being embedded in a cognitive-emotional-motivational matrix in which no true separation is possible. No matter how we slice behavior, the ingredients of motivation-emotion-cognition are present in one order or another.
>
> (Scheerer, 1954, p.123)

In 1890 William James explained how cognitive behaviour was involved in affective behaviour (James 1890, p.478). Similarly Rokeach (1960, p.399) points out that in analysing cognitive behaviour we are at the same time working with affective states, for every cognitive act has its affective counterpart. Krathwohl too (Krathwohl, 1964) reminds us that nearly all cognitive objectives have an affective component if we search for it. Teachers hope their students will have learned certain attitudes towards the environmental phenomena dealt with or towards the way in which environmental problems are approached; but they often leave these goals unspecified. This means that many of the objectives which are classified in the cognitive domain have an implicit but unspecified affective component that could be concurrently classified in the affective domain. When one looks at both taxonomies (Krathwohl, 1964, pp.49-50) an overlap is apparent. The two domains are tightly intertwined. Each cognitive behaviour has an affective behaviour counterpart. Because of this overlap, and because cognitive testing is far more widespread than affective, and because affective testing needs further exploration, the author's emphasis

in this research project lies in the affective domain. With this emphasis in mind, the derivation of the affective items is discussed first.

2.2.4.2 The Affective Item Pool

A total of 193 attitude statements in the Affective domain was assembled, many adapted from other tests, some original. (See Section 2.1.2) These statements are related to feelings, attitudes, beliefs, values, morality and ethics concerning the environment. The first task that had to be performed was to sort the statements which could be used in a manner that would facilitate a Likert-type response. Many multiple-choice statements had to be eliminated on account of their unsuitability. For example the following questions are not suitable :

(1) Armscor will soon be using the De Hoop Nature Reserve to test strategic weapons. Do you feel this will

(i) do harm
(ii) do good
(iii) do neither harm nor good to the environment?

(2) Do you feel that conservation is saving our environment

(i) too fast
(ii) too slowly
(iii) just right?

The next step in the filtering process was to scrutinise each of the 193 questions with the intention of eliminating duplicate or overlapping questions and of formulating clusters of items, or question areas, related to the desired structure of the questionnaire, i.e. using Krathwohl (1964) as the basis for the item set in the affective domain.

The clusters, or question areas for this research project were

1. Receiving
2. Responding

3. Valuing
4. Organization and Characterization

A set of 113 items was derived, and these formed the next stage in the selection of suitable items. The items were grouped into 4 clusters, with a 1, 2, 3 or 4, according to the taxonomic level of the model, indicated next to each item.

The essential task in assigning a test item to a category of the affective taxonomy is to determine what maximum degree of internalization can be assumed from the response situation. Although the actual affective level of the pupil may indeed be higher than the level of the item, the author did not infer this when a pupil chose the response alternative that was keyed to the particular taxonomic category of the item.

A positive or negative rating was ascribed to each of these 113 items, according to whether the pupil's response would indicate a positive or a negative attitude to the environment. Approximately the same number of positive and negative i.e. favourable and unfavourable, statements was formulated.

The set of 113 questions was further scrutinised for ambiguities, double distractors, double negatives and poor wording, and a set of 83 items emerged, in clusters to which was added an indication of the taxonomic level, and the positive or negative value of each item. Some overlapping questions were included, such as items 13, 14, 15 and 16, as the best of these was still to be selected. The set of 83 items is appended as Appendix B. The original number (indicating the source), the desired response, and the taxonomic level of each item are documented.

At this stage it was deemed desirable to submit the pool of 83 items to two separate and independent panels of judges as outlined in Section 1.3.1.

The first panel, consisting of five lecturers at the Johannesburg College of Education, covering Geography, Botany, Zoology, Professional Studies and Educational Studies, was to consider each item in turn to determine

whether it merited the positive or negative value allocated by the author. Items were retained or eliminated on the basis of a 100%, or in some cases an 80% consensus. As a result of this scrutiny, about 40% or 33 out of the 83 items were eliminated.

The second panel, consisting of eight lecturers at the Johannesburg College of Education, and covering Physical Science, Botany, Zoology, History, Geography, English and Educational Studies, was to scrutinise each item giving consideration to its validity for testing environmental attitude, ambiguity, wording, phrasing and general suitability for standard 6 pupils.

In the setting of questions Oppenheim reminds us :

> Do we know why the question was asked at all? Very often problems of question construction make us realize that we are not clear enough in our own minds as to what the questions are about .... Greater precision concerning the purpose of the questions will sometimes make it easier to avoid ambiguity in question-wording.
>
> (Oppenheim, 1966, p.52)

Comments by the panel of eight were noted and tabulated, to find common points of criticism. Criticism consisted of comments such as :

(i) low validity e.g. item 75
(ii) duplication of questions e.g. items 5 and 22
(iii) two distractors e.g. items 1 and 4
(iv) wording too difficult or inappropriate e.g. item 74
(v) incorrect terminology e.g. items 16 and 32
(vi) lack of clarity e.g. item 65
(vii) avoid religious topics e.g. items 28 and 73
(viii) complex implications e.g. item 83

Again, items were retained or eliminated on the basis of consensus, in this case of 75%, or concurrence by 6 out of 8 judges. On the basis of

comments made by this panel of judges, about 25 items, or 30% were eliminated. Many were the same questions rejected on the basis of the first panel's criticism. Items that fared badly, where consensus was less than 62% i.e. consensus by fewer than 5 out of 8 judges were 1, 4, 10, 11, 22, 51, 52, 53, 72, 76 and 83. Some items were retained, but with the faults as pointed out by the judges, removed. This included items such as 1, 4, 8, 16, 18, 24, 27, 38, 41, 45, 50 and 58.

On the basis of judges' comments and criticisms, the item pool in the affective domain was reduced from 83 items to 45 items.

The 45 items retained, to form Section A of the pilot test, are shown in Appendix C. The desired response, positive or negative, is shown by the letters P and N, and the clustering according to the taxonomic level 1 - 4 is indicated.

Items 1 to 12 form a cluster reflecting the Receiving level in the Affective Domain. This level refers to the pupil's willingness to attend to particular phenomena or stimuli. From a teaching standpoint, it is concerned with getting, holding and directing the pupil's attention. Learning outcomes in this area range from the simple awareness that a thing exists to selective attention on the part of the learner.

Examples of question areas at this level in the Affective Domain are shown in Table 1.

TABLE 1

Examples of question areas at the Receiving level in the Affective Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil is sensitive to the relationships between all living things and their environment | 6, 7 |
| The pupil is sensitive to the beauty of our fauna and flora | 8 |
| The pupil is sensitive to pollution and environmental despoilation | 3, 9 |
| The pupil is aware of man's influence on living things and their environment | 10, 12 |

Items 13 to 27 form a cluster reflecting the Responding level in the Affective Domain. This level refers to active participation on the part of the pupil. At this level, he not only attends to a particular phenomenon but also reacts to it in some way. Learning outcomes in this area may emphasise acquiescence in responding, willingness to respond, or satisfaction in responding. The higher levels of this category stress the seeking out and enjoyment of particular activities.

Examples of question areas at the Responding level are shown in Table 2.

TABLE 2

Examples of question areas at the Responding level in the Affective Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil acquires an interest in all living things and how they relate to himself | 23 |
| The pupil enjoys learning about interrelationships between all living things and their environment | 20, 21, 22 |
| The pupil shows an interest in logical argument as an approach to environmental problem solving | 16 |
| The pupil wants to know more about conservation topics | 24 |

Items 28 to 38 form a cluster reflecting the Valuing level in the Affective Domain. This is concerned with the worth or value a student attaches to a particular object, phenomenon or behaviour. This ranges in degree from the more simple acceptance of a value to the more complex level of commitment. Learning outcomes are concerned with behaviour that is consistent and stable enough to make the value clearly identifiable.

Examples of question areas at this level are shown in Table 3.

TABLE 3

Examples of question areas at the Valuing level in the Affective Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil shows concern for, and resentment at all forms of environmental despoilation | 34, 35, 38 |
| The pupil demonstrates commitment to environmental improvement | 30 |
| The pupil has respect for environmental research work and its methods | 32 |
| The pupil would like to join a conservation society | 37 |

Items 39 to 45 form a cluster reflecting the Organization and Characterization levels in the Affective Domain. These levels are concerned with bringing together different values, and resolving conflicts between them. This leads to the building of an internally consistent value system. Behaviour is pervasive, consistent and predictable.

Examples of question areas at these levels are shown in Table 4.

TABLE 4

Examples of question areas at the Organization and Characterization levels in the Affective Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil has a balanced view of the contributions and limitations of science to solve society's problems | 39, 40 |
| The pupil appreciates the conflict of interests between human needs and the conservation ideal | 42, 43, 45 |

2.2.4.3 The Cognitive Item Pool

The process of deriving a set of items in the Cognitive domain, for use in the pilot study, followed the same pattern as that for the set of items in the Affective domain. In view of the emphasis in environmental education on the environmental ethic, or affective component, a larger set of items was framed in the affective domain than in the cognitive.

A set of 20 items in the cognitive domain was assembled, some of which were adapted from other tests (see Section 2.1.2) and some of which were original. These items are related to pupils' thoughts, ideas, knowledge and understanding of environmental matters.

Once these statements had been assembled, consideration was given to those which could be presented so that a Likert-type response was possible. Some had to be eliminated and others could be adapted.

The same process as for the affective items, i.e. that of arranging the items in clusters, was followed. The clusters or question areas, adapted from Bloom's Taxonomy (Bloom, 1956), as discussed in Section 2.2.1.1 were

1. Knowledge and Comprehension
2. Application
3. Analysis, Synthesis and Evaluation

The assigning of items to a level in the hierarchy, and the ascribing of a positive or negative rating to each followed the same pattern as for the affective domain.

After further scrutiny, a set of 13 items emerged. This set, with an indication of the taxonomic level, 1, 2 or 3, and with an indication of the desired response, positive or negative (P or N) ascribed to each, is included as Appendix D. The source and original number of each item were documented.

Again, the need for two external checks was felt i.e. for the positive or negative response and for the general suitability of the questions. The

set of items was accordingly submitted to, and underwent the scrutiny of, the same two panels of judges who had scrutinised the affective item pool. On the basis of the judges' comments and criticisms, an item pool of 12 items was formulated. This set of items, which was Section B, the Cognitive component in the pilot test, is shown as Appendix E. The taxonomic level and the desired response, positive or negative, are indicated.

Items 1 to 6 form a cluster reflecting the Knowledge and Comprehension level in the Cognitive Domain. This area involves both the recall and the understanding of a wide range of material, from specific facts to complete theories.

Examples of question areas at this level in the Cognitive Domain are shown in Table 5.

TABLE 5

Examples of question areas at the Knowledge and Comprehension level in the Cognitive Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil understands the part played by all levels of a food chain | 2, 6 |
| The pupil understands the link between animal survival and habitats | 1 |
| The pupil can estimate the environmental consequences implied in data | 3 |

Items 7 to 9 form a cluster reflecting the Application level in the Cognitive Domain. This level relates to the ability to use learned material in new and concrete situations.

Examples of question areas at this level are shown in Table 6.

TABLE 6

Examples of question areas at the Application level in the Cognitive Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil is able to apply the concept of conservation to a particular situation | 7 |
| The pupil is able to apply an understanding of the food chain to a practical situation | 8, 9 |

Items 10 to 12 form a cluster reflecting the levels of Analysis, Synthesis and Evaluation in the Cognitive Domain. Here we are concerned with the ability to break down material into its component parts so that its organizational structure may be understood, with the ability to put parts together to form a new whole, and with the ability to judge the value of material for a given purpose. These higher levels require an understanding of both content and structural form of the material, stress creative behaviours and require conscious value judgements.

Examples of question areas at these levels are shown in Table 7.

TABLE 7

Examples of question areas at the levels of Analysis, Synthesis and Evaluation in the Cognitive Domain.

| QUESTION AREA | EXAMPLES OF ITEMS |
|---|---|
| The pupil shows the ability to integrate learning about environment from different areas into a plan for solving a problem | 10 |
| The pupil recognises logical fallacies in environmental reasoning, and distinguishes between facts and inferences | 12 |

2.2.4.4 The Conative Item Pool

The derivation of a set of items in the Conative domain for use in the pilot study followed the same pattern as that for the items in both the Affective and the Cognitive domains.

The author is aware of the difficulties of testing the action component of an environmentally educated person by means of a questionnaire, as there is often a discrepancy between what people say they do and what they in fact do. (See Section 2.2.1.3). Nonetheless an attempt was made to include a set of items in this domain.

A set of 7 items in the Conative domain was submitted to the two panels of judges for their comments and criticism. These are included as Appendix F. Several suggestions enabled the author to expand this small set by adding a few related questions. The resultant set of 12 conative items, forming Section C of the pilot test i.e. that section aimed at testing the commitment to action, is shown as Appendix G.

Although no formal model underpins the clustering of items in this domain, the three levels of commitment mentioned in Section 2.2.1.3 are covered by the items. This is shown in Table 8.

TABLE 8

Levels of commitment in the Conative Domain.

| LEVEL OF COMMITMENT | EXAMPLES OF ITEMS |
|---|---|
| The pupil acquiesces in responding | 1, 2 |
| The pupil responds willingly | 3, 4, 10 |
| The pupil derives pleasure in action | 5, 6, 8 |

# CHAPTER 3

## 3 THE PILOT STUDY

The pilot survey was used to iron out ambiguities and inconsistencies in expression, and to make certain the administering of the questionnaire would run smoothly. As Oppenheim (1966, p.83) puts it: "Pilot work is needed to ensure that we use terms that are like those the respondents use themselves and that have roughly similar meanings to most of them - and to us."

The pilot test consisted of three sections: Section A, comprising 45 items in the affective domain, Section B, comprising 12 items in the cognitive domain and Section C, comprising 12 items in the conative domain.

### 3.1 Administering the Pilot Test

#### 3.1.1 Procedure with Pupils

The test was administered personally by the researcher to one standard 6 class at a co-educational school in the Johannesburg area. In compliance with a request by the Transvaal Education Department, the school's name is not mentioned. The 32 standard 6 pupils are considered to be representative of the sample population.

Each pupil was given the pilot test. This comprised

(i) three sets of questions for Sections A, B and C respectively, with instructions concerning the method of recording responses as described in Section 2.2.3, and

(ii) a printed answer sheet on which the responses were to be recorded (Appendix H). Pupils were told that the 'test' would in no way influence their school marks, and they were requested to respond as honestly as possible.

To ensure that the pupils would record their responses correctly, a trial run was held, using five items that did not appear in the pilot test. The researcher helped pupils by ironing out any difficulties in answering these five items.

The instructions pertaining to the trial run, concerning choice of response and method of recording the response, were identical to those in the pilot test, i.e. a response that might fall in the range from 'strongly agree' to 'strongly disagree'.

The trial runs were collected and destroyed. Pupils were told that they may not ask any questions during the test. If they experienced any problems in answering the items, they were to adopt the following procedure:

(i) If they did not understand a question, they were to record a question mark (?) in place of a 1, 2, 3, 4 or 5 in the response column alongside the respective item.

(ii) In addition to this, they were to ring the relevant item number on the question sheet and underline the entire question.

(iii) If they didn't understand a word or a phrase in the item, they were to record a question mark as in (i) above, and in addition to ringing the item number as in (ii) above, they were to underline the relevant word or phrase in that item.

A class list was used to check for absentees, and absent pupils' names were deleted from the list. 32 out of 34 pupils were present with approximately the same number of boys and girls being the the class. The administration of the test took 30 minutes, after which time, when all pupils had completed the test, all question and answer sheets were collected.

### 3.1.2 Instructions to Teachers

Each teacher of the selected standard 6 class received from the author a typed statement of the aims of the research project and a set of guidelines outlining the identifying of environmentally educated pupils in that class. (Appendix A)

The five teachers who indicated their willingness to act as an external reference were asked to rate each pupil in the class on a scale of 1 to 7, in terms of the pupil's level of environmental awareness. A set of criteria, linked to the scale from 1 - 7, was provided on the hand-out to

teachers (Appendix A). Teachers were requested not to confer with colleagues in their rating process. In this way the environmentally educated pupils would not be the author's subjective choice, but the common choice of the whole group of five teachers acting independently.

### 3.2 Scoring the Test

The next stage was to score the record of each respondent for each of the 3 sections in the test. It was decided that a high score meant a favourable attitude, and a low score an unfavourable one.

Meticulous care was taken with the scoring of reversals i.e. in the reversals a recorded score of 1 was converted to a 5, a recorded score of 2 became a 4, the 'uncertain' 3 remained so, a recorded score of 4 became a 2, and a 5 became a 1. A mask was designed for this purpose. Table 9 shows all the items that needed reverse scoring. All others retained the recorded score.

TABLE 9

Items requiring reverse scoring.

| SECTION | ITEMS REQUIRING REVERSE SCORING |
|---|---|
| A | 1, 2, 5, 7, 12, 13, 15, 16, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 41 |
| B | 1, 3, 4, 5, 10 |
| C | 1, 2, 3, 4, 5, 6, 7, 8, 9, 12 |

Having carefully made the necessary reversals, the item scores for each respondent were summed to obtain a total score. For Section A the highest total score was 45 x 5, i.e. 225. For Section B it was 12 x 5, i.e. 60 and for Section C it was 12 x 5, i.e. 60. The total scores for each pupil in each of the three sections of the test are shown in

Appendix I. The pupils' surnames have been removed in order to retain pupils' anonymity.

### 3.3 Analysis of Items

Pupils' responses were analysed in order to refine the test further by rejecting items which pupils found difficult, or which did not discriminate between the pupils who were environmentally educated and those who were not.

#### 3.3.1 Difficult Items

This related to pupils' problems in understanding the items.

An analysis of all the question and answer sheets revealed that 5 items in Section A had presented problems to more than one pupil. Items 11 and 42 presented problems to 4 pupils, and items 39, 40 and 43 presented problems to 2 pupils. The problems appeared to be in the wording of the items; wording not suited to the level of that standard 6 class.

A summary of the problems revealed the following information :

Section A: Item 11 : The wording was vague. Who got excited?

Item 42 : What was meant by conservationists' pleas being realistic ? The question seemed too difficult.

Items 39 & 40 : What did the terms 'science and technology' mean?

Item 43 : The wording was not understood by two pupils.

Item 21 : One pupil didn't understand the meaning of a 'fieldtrip'.

Item 27 : The word 'exterminated' presented a problem to one pupil.

Considering the pupils' difficulties, the author considered it necessary to eliminate items 11, 39, 40, 42 and 43. Items 21 and 27 could remain.

Section B: Item 2 : One pupil didn't know what a tsetse fly was.

This item could remain, since it had presented difficulties to only one pupil.

Section C : Item 1 : Three pupils queried the word 'sanctuary'.

The author decided to eliminate the item.

Item 5 : Three pupils were confused by the overlap between items 5 and 6.

The author decided to eliminate item 5 and retain item 6.

The elimination of items on the basis of pupils' difficulties is shown in Appendix J.

### 3.3.2 Non-Discriminating Items

Items that do not discriminate need to be rejected. Two methods were used to identify non-discriminating items :

#### 3.3.2.1 'Peaks of Uncertainty'

In the process of rejecting non-discriminating items a detailed analysis of each item was conducted, in order to discern the frequency of each response from 1 to 5, on the scale.

A detailed item-by-item count of the number of responses in each category was made, and the totals recorded (Table 10). Histograms were drawn for each item, so that peaks of uncertainty , i.e. number '3' responses, could immediately be seen. The histograms of response frequencies for Section A, the affective domain, are shown in Fig. 2, those for Section B, the cognitive domain, are shown in Fig. 3, and those for Section C, the conative domain are shown in Fig. 4. The 'columns of uncertainty' are shaded to facilitate quick and easy perusal and immediate identification of peaks.

# TABLE 10

Frequency of responses to each item in the pilot test.

SECTION A

| Item | RESPONSE 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 4 | 10 | 12 | 6 | 0 |
| 2 | 0 | 18 | 7 | 6 | 1 |
| 3 | 2 | 5 | 4 | 15 | 6 |
| 4 | 2 | 9 | 4 | 9 | 9 |
| 5 | 14 | 14 | 2 | 1 | 1 |
| 6 | 5 | 7 | 6 | 10 | 4 |
| 7 | 5 | 14 | 5 | 7 | 1 |
| 8 | 2 | 4 | 6 | 14 | 6 |
| 9 | 1 | 3 | 3 | 8 | 17 |
| 10 | 2 | 3 | 1 | 4 | 22 |
| 11 | 1 | 2 | 6 | 15 | 4 |
| 12 | 15 | 9 | 2 | 6 | 0 |
| 13 | 1 | 7 | 11 | 10 | 3 |
| 14 | 1 | 6 | 5 | 9 | 11 |
| 15 | 15 | 10 | 3 | 4 | 0 |
| 16 | 14 | 13 | 1 | 4 | 0 |
| 17 | 1 | 0 | 3 | 5 | 23 |
| 18 | 0 | 1 | 1 | 4 | 26 |
| 19 | 0 | 1 | 3 | 7 | 21 |
| 20 | 10 | 21 | 0 | 1 | 0 |
| 21 | 7 | 15 | 4 | 5 | 1 |
| 22 | 5 | 4 | 6 | 7 | 10 |
| 23 | 8 | 16 | 5 | 3 | 0 |

| Item | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 24 | 11 | 12 | 6 | 2 | 1 |
| 25 | 10 | 12 | 5 | 5 | 0 |
| 26 | 11 | 18 | 2 | 1 | 0 |
| 27 | 1 | 2 | 5 | 7 | 17 |
| 28 | 6 | 13 | 10 | 3 | 0 |
| 29 | 6 | 11 | 12 | 3 | 0 |
| 30 | 15 | 8 | 3 | 5 | 1 |
| 31 | 11 | 11 | 4 | 2 | 4 |
| 32 | 14 | 11 | 4 | 1 | 2 |
| 33 | 2 | 7 | 12 | 6 | 5 |
| 34 | 5 | 18 | 6 | 3 | 0 |
| 35 | 3 | 8 | 5 | 11 | 5 |
| 36 | 11 | 13 | 3 | 5 | 0 |
| 37 | 4 | 10 | 9 | 7 | 2 |
| 38 | 14 | 7 | 6 | 5 | 0 |
| 39 | 2 | 6 | 13 | 7 | 2 |
| 40 | 1 | 6 | 18 | 2 | 3 |
| 41 | 9 | 16 | 6 | 1 | 0 |
| 42 | 3 | 8 | 17 | 0 | 0 |
| 43 | 1 | 5 | 8 | 10 | 6 |
| 44 | 0 | 0 | 2 | 13 | 16 |
| 45 | 9 | 8 | 9 | 5 | 1 |

SECTION B

| Item | RESPONSE 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 21 | 10 | 1 | 0 | 0 |
| 2 | 4 | 6 | 9 | 8 | 4 |
| 3 | 27 | 3 | 1 | 0 | 1 |
| 4 | 9 | 21 | 1 | 1 | 0 |
| 5 | 1 | 13 | 11 | 6 | 1 |
| 6 | 1 | 4 | 10 | 13 | 4 |
| 7 | 0 | 2 | 3 | 12 | 15 |
| 8 | 2 | 3 | 6 | 7 | 13 |
| 9 | 1 | 2 | 3 | 12 | 14 |
| 10 | 17 | 9 | 5 | 0 | 1 |
| 11 | 3 | 2 | 1 | 10 | 16 |
| 12 | 4 | 8 | 10 | 8 | 2 |

SECTION C

| Item | RESPONSE 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 3 | 13 | 7 | 6 | 2 |
| 2 | 3 | 17 | 4 | 6 | 2 |
| 3 | 2 | 12 | 8 | 9 | 1 |
| 4 | 1 | 10 | 12 | 6 | 3 |
| 5 | 2 | 5 | 4 | 14 | 5 |
| 6 | 1 | 6 | 7 | 14 | 4 |
| 7 | 9 | 13 | 7 | 3 | 0 |
| 8 | 6 | 8 | 11 | 7 | 0 |
| 9 | 6 | 8 | 10 | 6 | 2 |
| 10 | 2 | 8 | 3 | 15 | 4 |
| 11 | 1 | 7 | 5 | 17 | 2 |
| 12 | 0 | 13 | 12 | 4 | 2 |

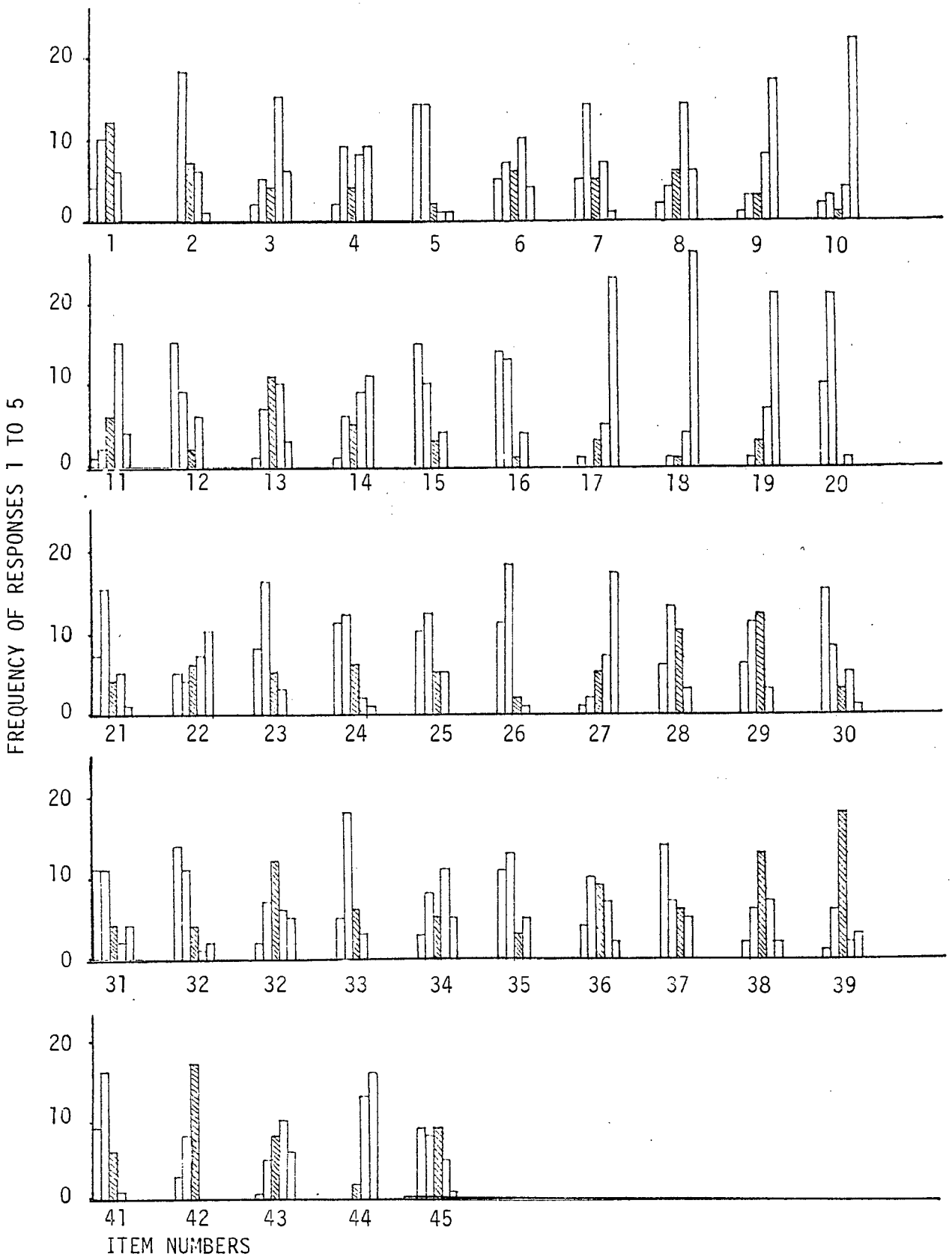


Fig. 2. Histograms showing peaks of 'uncertain' responses in Section A of the pilot test.

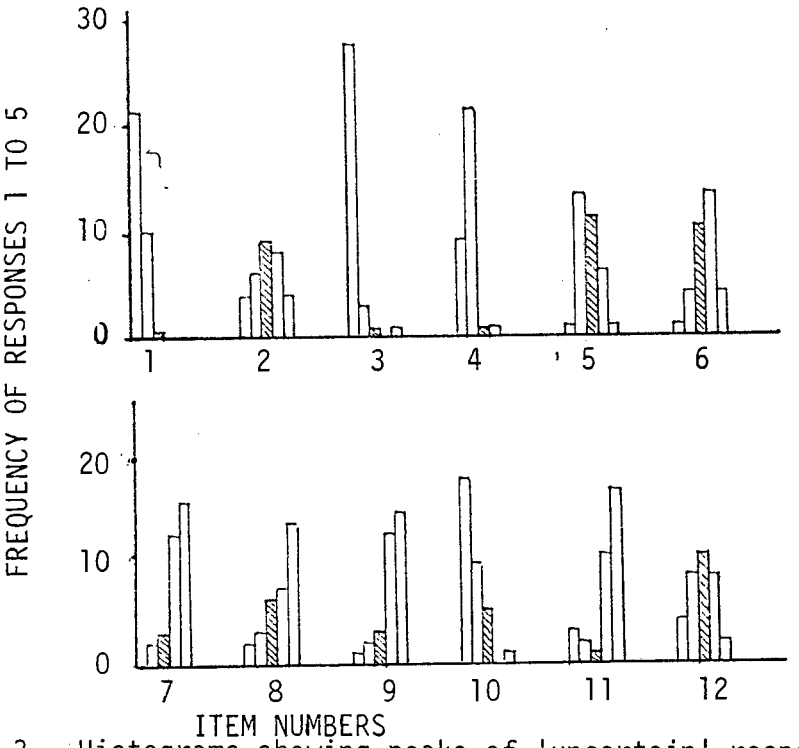


Fig. 3. Histograms showing peaks of 'uncertain' responses in Section B of the pilot test.

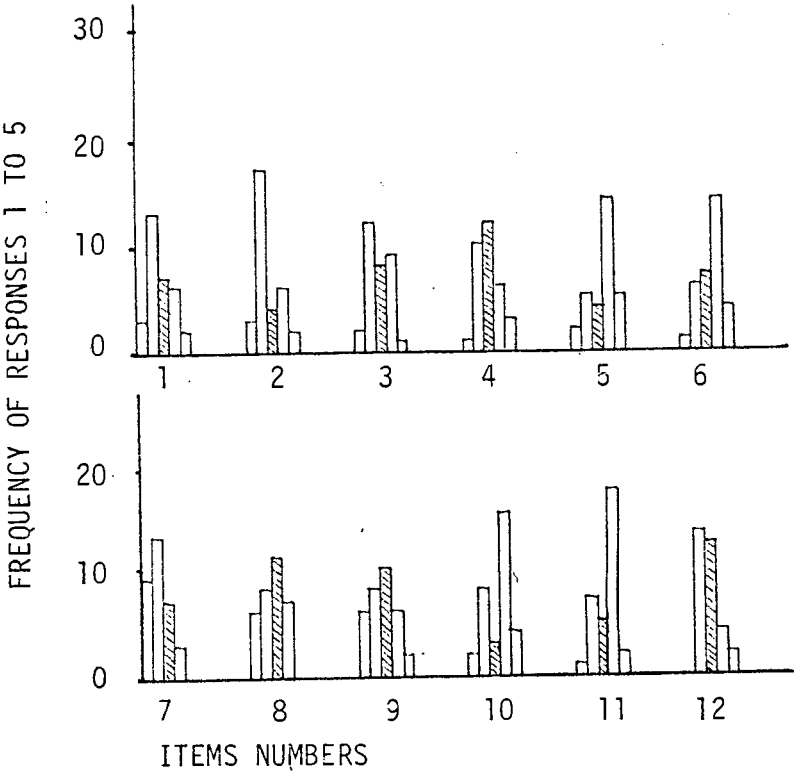


Fig 4. Histograms showing peaks of 'uncertain' responses in Section C of the pilot test.

Table 11 shows an analysis of items of 'high uncertainty' responses. The table shows the item number and the percentage response in the 'uncertain' category.

TABLE 11

Analysis of items with a 'high uncertainty' response.

| Section | Item No. | Frequency of '3' response (N = 32) | % '3' response |
|---|---|---|---|
| A | 1 | 12/32 | 37,5% |
| | 2 | 7/32 | 21,9% |
| | 13 | 11/32 | 34,4% |
| | 28 | 10/32 | 31,2% |
| | 29 | 12/32 | 37,5% |
| | 33 | 12/32 | 37,5% |
| | 37 | 9/32 | 28,1% |
| | 39 | 13/32 | 40,6% |
| | 40 | 18/32 | 56,2% |
| | 42 | 17/32 | 53,1% |
| | 43 | 8/32 | 25% |
| | 45 | 9/32 | 28,1% |
| B | 2 | 9/32 | 28,1% |
| | 5 | 11/32 | 34,4% |
| | 6 | 10/32 | 31,2% |
| | 12 | 10/32 | 31,2% |
| C | 3 | 7/32 | 21,9% |
| | 4 | 12/32 | 37,5% |
| | 8 | 11/32 | 34,4% |
| | 9 | 10/32 | 31,2% |
| | 12 | 12/32 | 37,5% |

In the analysis of items with a high incidence of 'uncertain' responses a cutoff point of 20% was taken.

In Section A, 12 out of 45 items, or 27%, had an 'uncertain' response in excess of 20%, with two items, 40 and 42 having an 'uncertain' response of over 50%.

In Section B, 4 out of 12 items, or 33%, exceeded the 20% mark. These were items 2, 5, 6 and 12. The highest incidence of 'uncertain' responses, 34,4%, was recorded for item 5.

In Section C, 5 out of 12 items, or 42%,exceeded 20%, with items 4 and 12 peaking at 37,5%.

Appendix J shows the items needing elimination on the basis of a higher-than-20% peak of 'uncertain' responses.

3.3.2.2 Discrimination Index

Several methods of item analysis are possible. Murphy & Likert (1937) found for example that the rank ordering of 15 statements upon the basis of the magnitude of the difference between the means of a high and low group agreed well with the ordering of the same statements in terms of the magnitude of the correlation between the item response and total score.

The method used here is that suggested by Edwards (1957, p.155) where the difference between the means of a high and low group on the individual statements is used as a basis for selecting items desired for the scale.

A detailed item analysis was conducted to determine which of the items discriminated most clearly between the high scorers and the low scorers on the total scale in each of the 3 sections. The responses of those pupils whose total scores were in the upper 40% and the responses of those in the lower 40% were analysed, item by item, in order to determine

for each item the extent to which the responses of these 2 groups differ. Items that did not elicit different responses from those who scored high and those who scored low on the total of each section of the test were eliminated to ensure that the questionnaire was internally consistent i.e. that every item was related to the same general attitude : a positive one to the environment.

The procedure was as follows :

(i) In each of the Sections, A, B and C, the total scores obtained by the pupils were ranked. In Section A, totals ranged from 196 out of a possible 225, to 105 out of a possible 225; in Section B, from 56 out of a possible 60 to 38 out of 60; in Section C, from 45 out of a possible 60 to 38 out of 60.

(ii) Top and bottom groups of 40% each, i.e. 12 out of 32 pupils in each group, were formed. Scores were summed and a mean established. The data for these top and bottom groups are shown in Tables 12, 13 and 14 respectively.

TABLE 12

Summed scores for top and bottom groups for Section A of pilot test.

SECTION A (Score out of a possible 225)

| | | | |
|---|---|---|---|
| Top 12 | 1 | Deborah | 196 |
| | 2 | Deon | 192 |
| | 3 | Caron | 190 |
| | 4 | Terence | 187 |
| | 5 | Belinda | 186 |
| | 6 | Glen | 184 |
| | 7 | Dale | 183 |
| | 8 | Fran | 180 |
| | 9 | Michael | 179 |
| | 10 | Angela | 177 |
| | 11 | Cornelia | 177 |
| | 12 | Craig | 175 |

$\Sigma$ 2206 $\div$ 12 = 183.83

| | | | |
|---|---|---|---|
| Bottom 12 | 21 | Andrea | 163 |
| | 22 | Bruce | 162 |
| | 23 | Warren | 162 |
| | 24 | Philip | 160 |
| | 25 | Bradley | 158 |
| | 26 | Grant | 156 |
| | 27 | Raphael | 151 |
| | 28 | Kerry | 144 |
| | 29 | Angus | 142 |
| | 30 | Leonard | 136 |
| | 31 | Linton | 128 |
| | 32 | Ann | 105 |

$\Sigma$ 1767 $\div$ 12 = 147.25

TABLE 13

Summed scores for top and bottom groups for Section B of pilot test.

SECTION B (Score out of a possible 60)

| | | | |
|---|---|---|---|
| Top 12 | 1 | Peter | 56 |
| | 2 | Michelle | 54 |
| | 3 | Glen | 54 |
| | 4 | Deborah | 53 |
| | 5 | Warren | 53 |
| | 6 | Caron | 51 |
| | 7 | Cornelia | 51 |
| | 8 | Deon | 51 |
| | 9 | Angela | 50 |
| | 10 | Dale | 50 |
| | 11 | Leonard | 50 |
| | 12 | Fran | 49 |

$\Sigma$ 622 ÷ 12 = 51.83

| | | | |
|---|---|---|---|
| Bottom 12 | 21 | Belinda | 45 |
| | 22 | Duncan | 44 |
| | 23 | Philip | 44 |
| | 24 | Elizabeth | 43 |
| | 25 | Raphael | 42 |
| | 26 | Michael | 42 |
| | 27 | Deborah | 40 |
| | 28 | Kerry | 40 |
| | 29 | Linton | 40 |
| | 30 | Ann | 38 |
| | 31 | Clinton | 38 |
| | 32 | Chris | 38 |

$\Sigma$ 494 ÷ 12 = 41.17

TABLE 14

Summed scores for top and bottom groups for Section C of pilot test.

SECTION C (Score out of a possible 60)

| | | | |
|---|---|---|---|
| Top 12 | 1 | Deborah | 52 |
| | 2 | Belinda | 49 |
| | 3 | Philip | 49 |
| | 4 | Caron | 48 |
| | 5 | Dale | 47 |
| | 6 | Craig | 45 |
| | 7 | Deon | 45 |
| | 8 | Duncan | 45 |
| | 9 | Fran | 44 |
| | 10 | Cornelia | 44 |
| | 11 | Andrea | 43 |
| | 12 | Elizabeth | 42 |

$\Sigma$ 553 ÷ 12 = 46.08

| | | | |
|---|---|---|---|
| Bottom 12 | 21 | Angela | 38 |
| | 22 | Peter | 36 |
| | 23 | Bruce | 36 |
| | 24 | Bradley | 34 |
| | 25 | Raphael | 32 |
| | 26 | Kerry | 31 |
| | 27 | Linton | 30 |
| | 28 | Chris | 28 |
| | 29 | Angus | 27 |
| | 30 | Clinton | 21 |
| | 31 | Ann | 18 |
| | 32 | Leonard | 18 |

$\Sigma$ 349 ÷ 12 = 29.08

(iii) A detailed item-by-item analysis followed. For each item, in each of the 3 sections, the total score of the top group was recorded, as was that of the bottom group, and a mean score for each item, for top and bottom groups derived. The differences of the means were calculated, and these differences were ranked.

Table 15 shows the data for Section A, Table 16 those for Section B and Table 17 those for Section C.

An analysis of the differences of the means in these three sets of data reveals the discriminating power of each item.

In Section A a cutoff point was chosen so that the 15 items with the lowest discriminating power were eliminated. These are, commencing with the lowest discriminating power, items 39, 3, 45, 32, 7, 27, 5, 23, 19, 10, 13, 22, 18, 30 and 36. The rejection of items is shown in Appendix J.

In Section B items 4 and 5 were eliminated, for having low discriminating power. This, too, is shown in Appendix J.

In Section C, item 12 had the lowest discriminating power, and was accordingly eliminated from the final test. This, too, is shown in Appendix J.

The above procedures led to the further refinement of the items used. It was necessary in addition to ascertain from the scores whether or not the test was reliable.

TABLE 15

Item-by-item analysis of mean scores for top and bottom groups in Section A of pilot test, including the ranking of items according to their discriminating power.

| ITEM | TOP GROUP TOTAL | BOTTOM GROUP TOTAL | TOP GROUP MEAN | BOTTOM GROUP MEAN | MEAN DIFFERENCE | RANKING OF ITEMS ACCORDING TO DISCRIMINATING POWER | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | ITEM | MEAN DIFFERENCE | |
| 1 | 50 | 35 | 4,17 | 2,91 | 1,26 | 4 | 2,00 | |
| 2 | 43 | 34 | 3,58 | 2,83 | 0,75 | 38 | 2,00 | |
| 3 | 38 | 43 | 3,16 | 3,58 | -0,42 | 31 | 1,75 | |
| 4 | 50 | 26 | 4,17 | 2,17 | 2,0 | 25 | 1,58 | |
| 5 | 53 | 50 | 4,42 | 4,17 | 0,25 | 21 | 1,5 | |
| 6 | 39 | 30 | 3,25 | 2,50 | 0,75 | 37 | 1,42 | |
| 7 | 41 | 39 | 3,41 | 3,25 | 0,16 | 8 | 1,33 | |
| 8 | 49 | 33 | 4,08 | 2,75 | 1,33 | 29 | 1,33 | |
| 9 | 56 | 48 | 4,67 | 4,00 | 0,67 | 43 | 1,33 | |
| 10 | 55 | 50 | 4,58 | 4,17 | 0,41 | 1 | 1,26 | |
| 11 | 49 | 36 | 4,08 | 3,00 | 1,08 | 35 | 1,25 | |
| 12 | 53 | 39 | 4,42 | 3,25 | 1,17 | 28 | 1,25 | |
| 13 | 36 | 31 | 3,00 | 2,58 | 0,42 | 12 | 1,17 | |
| 14 | 50 | 41 | 4,17 | 3,42 | 0,75 | 15 | 1,09 | |
| 15 | 56 | 43 | 4,67 | 3,58 | 1,09 | 11 | 1,08 | |
| 16 | 54 | 43 | 4,50 | 3,58 | 0,92 | 33 | 1,08 | |
| 17 | 60 | 50 | 5,00 | 4,17 | 0,83 | 16 | 0,92 | |
| 18 | 60 | 53 | 5,00 | 4,42 | 0,58 | 40 | 0,91 | |
| 19 | 56 | 52 | 4,67 | 4,33 | 0,34 | 17 | 0,83 | |
| 20 | 54 | 46 | 4,50 | 3,83 | 0,67 | 34 | 0,83 | |
| 21 | 53 | 35 | 4,42 | 2,92 | 1,5 | 41 | 0,83 | |
| 22 | 37 | 30 | 3,08 | 2,50 | 0,58 | 42 | 0,83 | |
| 23 | 48 | 44 | 4,00 | 3,67 | 0,33 | 2 | 0,75 | |
| 24 | 50 | 41 | 4,12 | 3,42 | 0,75 | 6 | 0,75 | |
| 25 | 55 | 36 | 4,58 | 3,00 | 1,58 | 14 | 0,75 | |
| 26 | 55 | 46 | 4,58 | 3,83 | 0,75 | 24 | 0,75 | |
| 27 | 51 | 48 | 4,25 | 4,00 | 0,25 | 26 | 0,75 | |
| 28 | 53 | 38 | 4,42 | 3,17 | 1,25 | 9 | 0,67 | |
| 29 | 51 | 35 | 4,25 | 2,92 | 1,33 | 20 | 0,67 | |
| 30 | 52 | 44 | 4,33 | 3,67 | 0,66 | 44 | 0,67 | CUTOFF POINT |
| 31 | 56 | 35 | 4,67 | 2,92 | 1,75 | 36 | 0,66 | ITEMS ELIMINATED ON THE BASIS OF THEIR LOW DISCRIMINATING POWER |
| 32 | 48 | 47 | 4,00 | 3,92 | 0,08 | 30 | 0,66 | |
| 33 | 42 | 29 | 3,50 | 2,42 | 1,08 | 18 | 0,58 | |
| 34 | 51 | 41 | 4,25 | 3,42 | 0,83 | 22 | 0,58 | |
| 35 | 46 | 31 | 3,83 | 2,58 | 1,25 | 13 | 0,42 | |
| 36 | 52 | 44 | 4,33 | 3,67 | 0,66 | 10 | 0,41 | |
| 37 | 47 | 30 | 3,92 | 2,50 | 1,42 | 19 | 0,34 | |
| 38 | 59 | 35 | 4,92 | 2,92 | 2,00 | 23 | 0,33 | |
| 39 | 31 | 42 | 2,58 | 3,50 | -0,92 | 5 | 0,25 | |
| 40 | 40 | 29 | 3,33 | 2,42 | 0,91 | 27 | 0,25 | |
| 41 | 52 | 42 | 4,33 | 3,50 | 0,83 | 7 | 0,16 | |
| 42 | 42 | 32 | 3,50 | 2,67 | 0,83 | 32 | 0,08 | |
| 43 | 49 | 33 | 4,08 | 2,75 | 1,33 | 45 | -0,25 | |
| 44 | 57 | 49 | 4,75 | 4,08 | 0,67 | 3 | -0,42 | |
| 45 | 28 | 31 | 2,33 | 2,58 | -0,25 | 39 | -0,92 | |

TABLE 16

Item-by-item analysis of mean scores for top and bottom groups in Section B of pilot test, including the ranking of items according to their discriminating power.

| | | | | | | RANKING OF ITEMS ACCORDING TO DISCRIMINATING POWER | |
|---|---|---|---|---|---|---|---|
| ITEM | TOP GROUP TOTAL | BOTTOM GROUP TOTAL | TOP GROUP MEAN | BOTTOM GROUP MEAN | MEAN DIFFERENCE | ITEM | MEAN DIFFERENCE |
| 1 | 57 | 53 | 4,75 | 4,42 | 0,33 | 8 | 1,75 |
| 2 | 47 | 29 | 3,92 | 2,42 | 1,52 | 2 | 1,5 |
| 3 | 60 | 53 | 5,00 | 4,42 | 0,58 | 12 | 1,17 |
| 4 | 50 | 50 | 4,17 | 4,17 | 0,00 | 6 | 1,16 |
| 5 | 38 | 37 | 3,12 | 3,08 | 0,04 | 11 | 1,08 |
| 6 | 49 | 35 | 4,08 | 2,92 | 1,16 | 9 | 1,00 |
| 7 | 55 | 44 | 4,58 | 3,67 | 0,91 | 10 | 1,00 |
| 8 | 56 | 35 | 4,67 | 2,92 | 1,75 | 7 | 0,91 |
| 9 | 56 | 44 | 4,67 | 3,67 | 1,00 | 3 | 0,58 |
| 10 | 57 | 45 | 4,75 | 3,75 | 1,00 | 1 | 0,33 CUTOFF POINT |
| 11 | 54 | 41 | 4,5 | 3,42 | 1,08 | 5 | 0,04 |
| 12 | 42 | 28 | 3,5 | 2,33 | 1,17 | 4 | 0,00 |

TABLE 17

Item-by-item analysis of mean scores for top and bottom groups in Section C of pilot test, including the ranking of items according to their discriminating power.

| | | | | | | RANKING OF ITEMS ACCORDING TO DISCRIMINATING POWER | |
|---|---|---|---|---|---|---|---|
| ITEM | TOP GROUP TOTAL | BOTTOM GROUP TOTAL | TOP GROUP MEAN | BOTTOM GROUP MEAN | MEAN DIFFERENCE | ITEM | MEAN DIFFERENCE |
| 1 | 47 | 29 | 3,92 | 2,42 | 1,5 | 10 | 2,09 |
| 2 | 49 | 31 | 4,08 | 2,58 | 1,5 | 3 | 1,83 |
| 3 | 48 | 26 | 4,00 | 2,17 | 1,83 | 3 | 1,75 |
| 4 | 45 | 24 | 3,75 | 2,00 | 1,75 | 8 | 1,75 |
| 5 | 42 | 23 | 3,5 | 1,92 | 1,58 | 5 | 1,58 |
| 6 | 40 | 24 | 3,3 | 2,00 | 1,3 | 1 | 1,5 |
| 7 | 54 | 38 | 4,5 | 3,17 | 1,33 | 2 | 1,5 |
| 8 | 51 | 30 | 4,25 | 2,5 | 1,75 | 7 | 1,33 |
| 9 | 46 | 32 | 3,83 | 2,67 | 1,16 | 6 | 1,3 |
| 10 | 50 | 25 | 4,17 | 2,08 | 2,09 | 9 | 1,16 |
| 11 | 41 | 35 | 3,42 | 2,92 | 0,5 | 11 | 0,5 CUTOFF POINT |
| 12 | 40 | 35 | 3,33 | 2,92 | 0,41 | 12 | 0,41 |

## 3.4 Test for Reliability

Next to validity, reliability is the most important characteristic of evaluation results. Reliability provides the consistency which makes validity possible, and indicates how much confidence we can place in our results.

A suitable method for estimating the reliability of test scores where a test is administered once, is the split-half method as described by Gronlund (1976, p.111). The test is administered to a group of pupils in the usual manner and then is divided in half for scoring purposes. To split the test into halves which are most equivalent, the usual procedure is to score the even-numbered items and the odd-numbered items separately. This provides two scores for each pupil which, when correlated, provide a measure of internal consistency. This coefficient indicates the degree to which the two halves of the test are equivalent. To estimate the reliability of the scores based on the full-length test the Spearman-Brown formula was applied. Pearson's Product Moment was used in the split-half correlations.

Analysis of the results shows the following correlation coefficients :

Section A (Affective Domain)

| | | |
|---|---|---|
| Split-half correlation | r = | 0,858 |
| Reliability on full test | r = | 0,92 |

Section B (Cognitive Domain)

| | | |
|---|---|---|
| Split-half correlation | r = | 0,376 |
| Reliability on full test | r = | 0,54 |

Section C (Conative Domain)

| | | |
|---|---|---|
| Split-half correlation | r = | 0,879 |
| Reliability on full test | r | 0,935 |

The correlations in the affective and conative domains are good. The fairly low correlation in the cognitive domain (Section B) is probably best explained in terms of the small number of questions in that section.

### 3.5 Analysis of Teachers' Ratings

As an additional independent measure of the test's validity, the ratings of a group of five teachers at the school were considered. The panel of teachers, all of whom taught the standard 6 class in question covered a range of subjects.

Appendix A shows the information that was given to the teachers concerning the rating scale from 1 to 7 and the criteria for giving a particular rating to each pupil.

All of the teachers expressed a willingness to assist, but all expressed reservations about their competence in assessing pupils' level of environmental education.

The author, aware of the problems and constraints facing subject-teachers in the carrying out of this task, took the precaution of using a panel of experts to validate the test, by submitting to them the items for scrutiny. This method, suggested by Oppenheim (1966, p.151) is described in Chapters 1 and 2.

The teachers' ratings were recorded separately on class lists and collected by the author after a week. The individual ratings were then transferred onto one class list and a summated score for each pupil was calculated.

Using Pearson's Product Moment Correlation, the following linear correlations were calculated :

(i) The teachers' ratings with pupils' scores in Section A

(ii) The teachers' ratings with pupils' scores in Section B

(iii) The teachers' ratings with pupils' scores in Section C

The raw data for the correlation between teachers' ratings and pupils' scores, and the calculations for the 3 correlations are shown in Appendix K.

Each of the 3 correlation coefficients is rather low.

r for teachers and Section A is 0,225

r for teachers and Section B is 0,207

r for teachers and Section C is 0,160

The author notes the self-expressed reservations by each of the teachers of his or her ability to rate the children on a scale that is foreign to his or her normal assessment. The author suggests that the teachers' reliability is in question. Quinn (1976) feels that teachers are not trained to test environmental attitudes and should be encouraged to write their own value sheets on the basis of their perception of environmental problems in their own locality.

The author suggests that future research could address this problem.

### 3.6 Derivation of Final Questionnaire

On the basis of the statistical and item analysis carried out on the pilot study and presented earlier in this chapter, several items in each of the three sections were eliminated, thus forming a smaller set of more discriminating items that would constitute the final test, to be administered to a group of 300 standard 6 pupils. The elimination of items is shown in Appendix J, and items to be included in the final test are shown in Appendix L.

The final test consists of 20 items in Section A, 7 in Section B and 5 in Section C.

In considering the relatively small number of items in Sections B and C, Oppenheim suggests

> ... we must not judge the relatively small number of attitude statements in a finished scale at their face value; they are the outcome of a process of complicated sifting and represent all the preliminary work and thought ... that has gone into them.
>
> (Oppenheim, 1966, p.120)

The split-half method test for reliability was used to test the reliability on the revised test, with the following results :

Section A

Split-half correlation $r = 0,72$

Reliability on full test $r = 0,84$

Section B

Split-half correlation $r = 0,63$

Reliability on full test $r = 0,77$

Section C

Split-half correlation $r = 0,70$

Reliability on full test $r = 0,82$

In noting the slight drop in the correlation coefficients for Sections A and C from the pilot study to the revised test, the author feels this is probably best explained in terms of the considerable reduction in the number of items from 45 to 20 in Section A, and from 12 to 5 in Section C. However, it is felt that all of the correlation coefficients are well within the limits expected in a reliable correlation coefficient.

The statistical significance of the 'r' values was calculated for both the split-half correlations and the teachers' correlations.

In the case of the split-half correlations (for both the pilot and the final test), most correlations were found to be significant at the 1% level

of confidence with many being significant at less than the 0,2% level of confidence. Certainly no levels of confidence were higher than 5%. This renders all of these correlations statistically significant in terms of the levels of significance acceptable for social research.

In the case of teachers' correlations, however, no correlation was found to be significant even at the 10% level of confidence. This indicates that these correlations are not statistically significant in terms of the levels of significance acceptable for social research.

# CHAPTER 4

## 4 THE MAIN SURVEY

### 4.1 Introduction

The filtering process carried out in the pilot study served to eliminate ambiguities and inconsistencies in expression, and ensured that administration of the main survey ran smoothly. The trial run had also proved to be valuable in ensuring that pupils knew how to record their responses. An extra column was added to the response section of the answer sheet, to allow for easy scoring and totalling of responses after the necessary reversals had been made. The final test (Appendix L) consists of the same three sections, A, B and C as was the case in the pilot test, but with fewer items in each Section :

Section A, the affective domain, has twenty items,
Section B, the cognitive domain, has seven items, and
Section C, the conative domain, has five items.

### 4.2 Administering the Final Test

#### 4.2.1 Procedure with Pupils

The procedure with pupils at each of the ten schools followed closely that employed in the pilot study. The test was administered personally by the researcher, with the same briefing to each class, to ensure uniformity and to minimise bias. Again, at the request of the Transvaal Education Department the schools are not named. Surnames have been removed from all class lists. At each school the same introductory trial run was held, to iron out difficulties in answering procedures. The same procedure (as in the pilot test) was followed where pupils experienced difficulties in responding to any of the items. The collection procedure was the same as that for the pilot test. In addition, because the final test was shorter than the pilot, administration together with the briefing and the introductory trial run took only 25 minutes. As all periods were at least 30 minutes long the researcher was able to elicit comments from pupils about the test in the last five minutes, after all the tests had been collected and counted to ensure 100% returns. Comments were noted and a summary is offered later in this chapter (Section 4.4.3).

#### 4.2.2 Instructions to Teachers

Meetings with and briefing of teachers willing to assist in the project

followed the same routine as in the case of the pilot test. (Section 3.1.2 and Appendix A). Once again, teachers were generally willing, but expressed reservations concerning their own competence in selecting environmentally educated pupils. This is discussed later in this chapter.

## 4.3 Scoring the Test

The same scoring procedure as for the pilot test was followed with the results from each of the 10 schools : a high score meant a favourable attitude towards the environment, and vice versa. Meticulous care was taken with the scoring of reversals. A new mask had to be constructed, to cater for the refined, smaller test. Table 18 shows all the items that needed reverse scoring. All others retained the recorded score.

TABLE 18

Items in the final test requiring reverse scoring.

| SECTION | ITEMS REQUIRING REVERSE SCORING |
|---|---|
| A | 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 18, 19 |
| B | 1, 2, 6 |
| C | 1, 2, 3 |

Having made the necessary reversals, each item's score was recorded in the extra column included for this purpose (Appendix L). The item scores for each respondent were summed, to obtain a total score in each section :

for Section A the highest total score was 20 x 5 i.e. 100,
for Section B the highest total score was 7 x 5 i.e. 35, and
for Section C the highest total score was 5 x 5 i.e. 25.

## 4.4 Analysis of Responses

### 4.4.1 Range of Scores

Table 19 shows the range of scores in each of the sections of the test at

each of the 10 schools.

TABLE 19

Range of scores in each section at each of the ten schools.

| SCHOOL | SECTION A HIGHEST TOTAL: 100 | | SECTION B HIGHEST TOTAL: 35 | | SECTION C HIGHEST TOTAL: 25 | |
|---|---|---|---|---|---|---|
| | TOP SCORE | BOTTOM SCORE | TOP SCORE | BOTTOM SCORE | TOP SCORE | BOTTOM SCORE |
| 1 | 93 | 66 | 35 | 21 | 25 | 9 |
| 2 | 93 | 57 | 35 | 19 | 25 | 12 |
| 3 | 90 | 59 | 35 | 23 | 22 | 7 |
| 4 | 90 | 48 | 34 | 21 | 24 | 6 |
| 5 | 98 | 71 | 35 | 23 | 24 | 9 |
| 6 | 91 | 56 | 35 | 23 | 23 | 14 |
| 7 | 94 | 58 | 35 | 25 | 25 | 10 |
| 8 | 93 | 56 | 35 | 23 | 22 | 11 |
| 9 | 87 | 60 | 35 | 18 | 23 | 5 |
| 10 | 96 | 44 | 35 | 25 | 25 | 11 |

From the information given in Table 19 it is apparent that each school shows a wide range of total scores in each section. This indicates the ability of the test to discriminate between those pupils who are environmentally educated and those who are not.

4.4.2. Difficult Items

Pupils had been asked to indicate difficulties in responding to items, as was the case with the pilot test. Very few problems were encountered throughout the 10 schools involved, and those that were, were relatively minor, such as the following :

(i) 3 pupils didn't know what a scavenger was (A9)
(ii) 2 pupils had never encountered the term 'fieldtrip' (A11)
(iii) 1 pupil was not sure where the 'cigarettes, pipes, matches and lighters' were to be left, in or out of the forest (A15)
(iv) 7 pupils didn't understand the meaning of 'why this is wrong' (A19)

(v) 2 pupils in one class underlined almost every question in the entire test.

On speaking to the teachers of these pupils, it was ascertained that in most cases the pupils experiencing these difficulties were recent immigrants to South Africa and were having similar difficulties in their general schooling. It was their poor knowledge of English, and not the difficulty of the questions that was the problem.

### 4.4.3 Pupils' Comments

As stated earlier, the pilot test had been refined and shortened to the extent that its implementation was efficient and took only 25 minutes. This made possible a valuable, brief discussion with each class, in the last 5 minutes of the average 30 minute period.

The pupils were generally perceptive and some useful comments were offered. The main ones were :

(i) "Some questions were too restricting. We wanted to voice an opinion or express ourselves more freely and not just record a 1 or a 5."

(ii) "In some cases, the 1 to 5 answer gave us a sense of frustration at not being able to show our anger or to let off steam (e.g. The killing of animals with valuable skins.)"

(iii) "I don't get any pocket money" (C1)

(iv) "The choice (agree-disagree) is not the best one for the question 'I take an active role ...' The possible answers should have been 'yes/no'" (C2)

(v) "The test has too great an emphasis on nature conservation. What about preservation of historical buildings or other aspects of environment?"

(vi) "Multiple choice answers may have been good in some cases :

(a) It is the government's responsibility ...
(b) It is our responsibility ...
(c) It is both our and the government's responsibility ... " (A1)

## 4.5 Test for Reliability

Once again, as with the pilot study, the split-half method for estimating the reliability of the test scores was used (Gronlund,1976, p.111). The test was split into two equivalent halves, consisting of the odd-numbered and the even-numbered items respectively. This provided two scores for each pupil; these scores were correlated to provide a measure of internal consistency. Pearson's Product Moment was used in the split-half correlations, and Spearman Brown's formula for estimating the reliability of the scores based on the full length test. Table 20 shows the correlations on the half test, and on the whole test.

TABLE 20

Reliability co-efficients on two equivalent halves of Section A of the final test, with estimated reliability of scores for the full-length test.

| School | 'r' value on half test | 'r' value on full test |
|---|---|---|
| 1 | 0,5 | 0,67 |
| 2 | 0,61 | 0,75 |
| 3 | 0,6 | 0,75 |
| 4 | 0,67 | 0,8 |
| 5 | 0,67 | 0,8 |
| 6 | 0,64 | 0,76 |
| 7 | 0,62 | 0,76 |
| 8 | 0,48 | 0,65 |
| 9 | 0,45 | 0,62 |
| 10 | 0,69 | 0,81 |

Bearing in mind that reliability measures are influenced by factors such as length of test (Gronlund, 1976, p.117), where the longer the test the higher the reliability, the author performed the reliability test only on Section A, with its 20 items. Even this test is short, so that in the 'r' values for the two half-tests ranging from 0,45 to 0,69 (shown in Table 20) a chance factor like guessing may have played a part. The 'r'

values representing the estimated reliabilities of the scores for the full-length test, ranging from 0,62 to 0,81 (shown in the last column of Table 20) accord with the expected increase in reliability when the test is doubled (Gronlund, 1976, p.118) and are within the limits expected in a reliable correlation coefficient.

### 4.6 Teachers' Ratings

The information in Appendix A was given to the teachers who had agreed to assist in rating pupils according to their level of environmental education. As with the pilot test, the individual teachers' ratings were recorded on separate class lists, after which they were transferred onto one class list, and a summated score for each pupil was calculated. Teachers' ratings of pupils' levels of environmental education at each of the ten schools are shown in Appendix M. Comments on these ratings are made in Section 4.7.

#### 4.6.1 Correlations With Whole Class

To pursue the notion that teachers may be able to identify environmentally educated pupils, in spite of teachers' own reservations in this regard, the researcher calculated linear correlations for each class, in the following way :

(i) teachers' ratings with pupils' scores in Section A

(ii) teachers' ratings with pupils' scores in Section B

(iii) teachers' ratings with pupils' scores in Section C

These correlations are shown in Table 21.

TABLE 21

Correlations between teachers' ratings and pupils' scores in final test at ten schools, using Pearson's Product Moment Correlation method.

| School | 'r' value for Section A | 'r' value for Section B | 'r' value for Section C |
|---|---|---|---|
| 1 | 0,43 | 0,64 | 0,099 |
| 2 | 0,425 | 0,395 | 0,602 |
| 3 | 0,302 | 0,149 | 0,444 |
| 4 | - | - | - |
| 5 | 0,158 | 0,337 | 0,116 |
| 6 | 0,006 | 0,31 | 0,26 |
| 7 | 0,228 | 0,254 | 0,258 |
| 8 | 0,334 | 0,07 | 0,20 |
| 9 | 0,41 | 0,63 | 0,26 |
| 10 | 0,399 | 0,429 | 0,508 |

An analysis of the data shown in Table 21 reveals a set of poor correlations. (The teachers of school 4 were, for various reasons unable to give any ratings at all.) Comments related to a likely explanation of these low correlations are given in Section 4.7.

### 4.6.2 Correlations with Five Highest Scorers

In noting the low correlations between teachers' ratings and pupils' scores, and the teachers' own expressed reservations concerning their ability to rate a whole class according to level of environmental education, the researcher considered that teachers might be able to identify five environmentally educated pupils out of an entire class of about 30 pupils. Accordingly two further sets of correlations were calculated :

(i) The five highest scorers in Section A of the test with the teachers' ratings for those same five pupils, and

(ii) The five highest scorers according to the summed teachers' ratings, with the Section A scores attained by those same five pupils.

These correlations were calculated with Section A only, as this section had a larger number of items than did each of the other two sections in the test. Also, this section, focussing on feelings and attitudes, the essence of environmental awareness, would require teachers to consider an aspect other than straight cognitive ability, which is the one they generally think of.

The correlation coefficients ('r') for these sets of data, together with those for the previous correlations (for the whole class in Section A) are shown in Table 22.

TABLE 22

Correlation coefficients ('r') for

(i) teachers' ratings and pupils' scores in Section A
(ii) five highest scorers in Section A, and teachers' ratings for those five pupils
(iii) five highest scorers on teachers' ratings, and Section A scores for those five pupils

| | COLUMN 1 | COLUMN 2 | COLUMN 3 |
|---|---|---|---|
| School | 'r' value for Section A scores and teachers' ratings on whole class | 'r' value for five highest scorers in Section A, and teachers' ratings for those five pupils | 'r' value for five highest scorers on teachers' ratings and scores on Section A |
| 1 | 0,43 | 0,84 | 0,14 |
| 2 | 0,425 | 0,14 | -0,8 |
| 3 | 0,302 | 0,28 | -0,14 |
| 4 | - | - | - |
| 5 | 0,158 | 0,11 | -0,02 |
| 6 | 0,006 | -0,87 | 0,62 |
| 7 | 0,228 | 0,9 | 0,49 |
| 8 | 0,334 | 0,78 | 0,81 |
| 9 | 0,41 | 0,05 | 0,69 |
| 10 | 0,339 | 0,03 | 0,37 |

An analysis of these correlations reveals no clear pattern, other than that the correlations are poor, with some negative 'r' values. It was thought that perhaps teachers would be able to identify the same 5 pupils as those who had scored highly in Section A of the test. The only cases where this does occur (Column 2) are in schools 1 ('r' = 0,84), 7 ('r' = 0,9) and 8 ('r' = 0,78), where the correlations are high.

From the information provided in Column 3 there is no significant evidence to indicate that the teachers were able to identify independently the 5 most environmentally educated pupils as indicated by the test. The only instances where teachers' ratings and equivalent test scores show a moderately high correlation are in schools 8 and 9 ('r' = 0,81 and 0,69 respectively). No significance is attached to these values.

Some individual pupils ranked highly both in Section A of the test and in the teachers' ratings. Data for high scorers both in Section A of the test, and on the summed ratings of the groups of teachers, are shown in Appendix N, and the number of pupils (out of 5) at each school who scored highly in both of these may be seen in Table 23.

TABLE 23

Pupils scoring highly both in Section A of the test and according to teachers' ratings.

| SCHOOL | NUMBER OF PUPILS (OUT OF 5) WHO SCORED HIGHLY BOTH IN SECTION A AND IN TEACHERS' RATINGS |
|---|---|
| 1 | 2 (Robert and Kevin) |
| 2 | 2 (Margalda and Maria) |
| 3 | 2 (Charles and Nerina) |
| 4 | 0 |
| 5 | 2 (Kerry and Nicolette) |
| 6 | 0 |
| 7 | 1 (Rod) |
| 8 | 1 (Jonathan) |
| 9 | 3 (Kevin, Brian and Douglas) |
| 10 | 3 (Laurie, Eric and Jenny) |

Possibly these pupils are known better to the teachers, or the high ratings they received may be based on an impromptu remark or an informal discussion with teachers.

## 4.7 Discussion of Correlation Coefficients

Oppenheim (1966, p.70), in suggesting the use of a criterion or independent measure to validate a test, cautions that "many criteria that might be suggested are themselves unreliable and of doubtful validity, for instance teachers' ratings .... "

It was with this caution in mind that the author used as the main criterion to validate the test, the panels of experts, a method also suggested by Oppenheim and discussed in Section 1.3.1.

The author suggests that in this research project the teachers were not a reliable external reference for the test's validity. This unreliability was demonstrated in the following ways :

### 4.7.1. Inconsistent Ratings

Countless inconsistencies in the ratings can be seen in all the schools. The following inconsistencies may be cited (Table 24). These are taken from the set comprising Appendix M :

TABLE 24

Inconsistencies in teachers' ratings, based on a scale of 1 to 7 (Data from Appendix M).

| SCHOOL | PUPILS | INDIVIDUAL TEACHERS' RATINGS | | | | | |
|---|---|---|---|---|---|---|---|
| | | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ |
| 1 | 3. Michael | 5 | 6 | 6 | 2 | 4 | 3 |
| 1 | 16. Alito | 5 | 2 | 2 | 7 | 6 | 3 |
| 2 | 5. Paulina | 5 | 1 | 7 | 6 | | |
| 2 | 19. Zelia | 4 | 6 | 3 | 1 | | |
| 2 | 27. Rosemaria | 6 | 2 | 3 | 4 | | |
| 3 | 11. Sean | 2 | 6 | 2 | 4 | 4 | |
| 5 | 7. Dale | 4 | 3 | 2 | 1 | 5 | |
| 5 | 10. Julie | 6 | 3 | 5 | 1 | 4 | |
| 6 | 15. Theodosia | 6 | 2 | 6 | 5 | 3 | 3 |
| 6 | 16. Carla | 5 | 1 | 6 | 5 | 4 | 3 |
| 6 | 19. Tanya | 4 | 1 | 7 | 3 | 1 | 4 |
| 6 | 23. Sonett | 2 | 4 | 6 | 3 | 2 | 7 |
| 6 | 27. Jacky | 4 | 1 | 6 | 2 | 3 | 3 |
| 7 | 8. Nicholas | 3 | 6 | 5 | 1 | 1 | 7 |
| 8 | 6. Charles | 1 | 4 | 4 | 2 | 1 | 3 |
| 9 | 7. Mark | 2 | 3 | 5 | 2 | | |
| 10 | 13. Juan | 3 | 6 | 2 | 2 | | |
| 10 | 29. Desiree | 4 | 7 | 6 | 3 | | |

A perusal of these ratings by groups of teachers of the same pupils, puts a question mark on the reliability of the teachers, to give an accurate assessment of the level of environmental education of the pupils concerned.

### 4.7.2 Unreliable Ratings

One teacher gave a 3 or a 4 to all pupils. This set of ratings had to be discarded.

Several teachers gave ratings to pupils who had left the particular school a considerable while back.

A few teachers gave ratings from 1 to 5, thinking that to be the scale. This was in spite of their having been given a set of criteria and the scale of 1 to 7 (Appendix A).

One teacher recorded a rating of 'pass' or 'fail'.

Several teachers had forgotten to rate the pupils, but managed to produce a completed class list within minutes of the researchers' arrival to fetch these lists.

### 4.7.3 Interviews with Teachers

Teachers were invited to comment on the task of rating pupils according to level of environmental education. These are the main comments that represent the feelings of most of the teachers :

(i) "I don't really know my pupils beyond my own subject. Environmental education is a dimension completely unfamiliar to me. I cannot give an accurate rating in this area."

(ii) "If I'm honest I gave high ratings to 'clever' pupils and low ratings to the 'dumb' ones."

(iii) "I am too busy teaching them my subject to know how they feel about environmental issues."

(iv) "I could only do a few, so I gave all the others a 3 or a 4."

(v) "I don't know my own pupils, even in my own subject. I only know how well they do when I've given them a test."

(vi) "I feel this external control is not valid, as I am basing my ratings on my knowledge of their personal response to me."

(vii) "My ratings are based not on my knowledge of the pupils' environmental awareness, but on how I have come to know them as people and how I imagine they would consider the environment."

(viii) "I didn't want to let you down, so I did the best I could, but I really don't know how the children feel."

All the above, and the low correlations, point to the fact that the teachers, through the nature of their subject-based teaching, and the constraints of time, are in fact unable to identify environmentally educated pupils in the normal course of their teaching. This requires a knowledge of a dimension of the pupils not encountered in the normal course of their duties.

Various insights have been gained from the analysis of pupils' responses and teachers' ratings, and from teachers' and pupils' comments. These are outlined in Chapter 5.

# CHAPTER 5

## 5 CONCLUSIONS

### 5.1 Comments on the Test Itself

The test, formulated to indicate whether or not a pupil in standard 6 is environmentally educated, as judged by pupils' answers being in accord with the judgement of an expert panel, was found to be effective. The wide range of scores at every school and in all sections demonstrated the test's ability to discriminate between pupils who are environmentally educated and those who are not. The detailed item-by-item analysis ensured that each individual item in the final test discriminated, and the test for reliability revealed correlation coefficients that are statistically significant at high levels of confidence.

The length of the test is ideally suited to the average thirty-minute period, and the wording of the items is considered appropriate to the standard 6 level. The test however has a language base, and was found not suitable for new immigrants. A good working knowledge of English is a prerequisite for understanding the items.

Discussion with pupils at the end of the test revealed that the Likert-type response of 1 to 5 that was demanded for each item, placed restrictions on certain pupils who wished to express their feelings and emotions about some of the issues raised. Several pupils felt that a more open-ended mode of responding would have allowed more latitude and freedom of expression. A few pupils noticed a bias in the test in favour of nature conservation, and suggested the inclusion of items related to other aspects of the environment such as the preservation of buildings in an urban context.

The purpose of this project was not to analyse particular responses or attitudes to specific issues. Consequently such analysis is not undertaken here. Such an analysis may be made in future to gain insight into pupil reaction to particular issues tested.

### 5.2 Comments on the Derivation of the Test

Pilot testing is essential, not only to iron out ambiguities and to ensure the smooth running of the final test, but to eliminate unforseen problems, however small, and to ensure that nothing is taken for granted.

In this research the pilot test was refined and improved in that difficult items were removed and all non-discriminating items eliminated.

In addition the researcher found that by implementing a pilot study he was able to administer and analyse the final test more effectively.

The author found that teachers were not useful as an external reference. It emerged from this research that although pupils do vary notably in their level of environmental education, teachers were not able to discriminate among them according to this criterion (a finding which accords with that of Quinn, 1976).

The external panel of judges, however, was more useful in determining the validity of the test. This panel, though, could have been even more efficient had it identified the bias in emphasis of the items, as noticed by some of the pupils. Possibly the researcher needed to be more specific in his instructions to the panel, which had been asked, among other things, to comment on the validity of each item for testing environmental attitudes. The panel should possibly in addition have been asked to consider the scope of the entire test, to ensure that it embraced widely the concept of environmental education.

## 5.3 Implications and Inferences

The value of a test for identifying environmentally educated pupils is highlighted by the teachers' inability to identify this dimension in pupils, and the test devised in this research project is shown to be useful for this purpose. Most teachers, in the normal course of their teaching, are concerned primarily with the academic progress of their pupils and are not called upon to assess pupils beyond that perspective. The identification of environmentally aware pupils requires of teachers the knowledge of a dimension of their pupils not within the normal boundaries of their duties.

Teachers' inability in this regard to some extent points to the low significance of environmental education in the school curriculum. The subject-orientated school curriculum as it exists makes environmental education an unfamiliar dimension to most teachers. Possibly this is a problem that could receive serious attention. Environmental education is

possibly a dimension that needs to enter the school curriculum at all levels and teachers of all subjects need to be alerted to this extra dimension. This might eventually enable teachers to assess pupils across a broader spectrum than is conventionally done.

The test, tried in the standard 6 situation, discriminates between the more and the less environmentally educated. It should also prove useful for evaluating an environmentally oriented course or programme, if applied in a pre- and post- instruction mode, and so might further the aims of environmental education.

The test ranked environmentally educated pupils along a continuum and it could be of use in selecting pupils for environmental awards.

As stated, the Likert-type response was restrictive in some cases. Possibly in a real-life situation it would be useful to use the test to discriminate, and then to follow up with interviews with pupils in order to gain greater insights, especially in the conative domain where it is difficult by means of a questionnaire alone to verify the sincerity of a verbal commitment to action in favour of the environment.

Although the test as it stands is appropriate to the standard 6 level, the researcher feels that a satisfactory procedure for deriving a test has been established. Accordingly and bearing in mind the lessons learnt from this project, the researcher feels that the test could be modified to suit other levels, including those in the teacher-training phase.

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# APPENDIX A

A guide for teachers assisting in identifying environmentally educated pupils.

There is a need in South African schools to develop an Index to measure the degree to which a pupil is environmentally educated.

An environmentally educated person is one who

(a) knows about,
(b) feels about, and
(c) is prepared to do something about environmental issues.

The aim of this research project, in part fulfilment of a Master's Degree in Environmental Studies at the University of Cape Town, is to formulate a test that will indicate whether or not a person is environmentally educated. The target group for this research project is a sample of some 300 standard 6 pupils at ten schools in the Johannesburg area.

Because the three abovementioned components, knowledge, feeling and action are all ingredients of an environmentally educated person, the test includes questions related to each of these components.

It is believed that the establishment of a South African Index of Environmental Education will be of value to teachers and teacher-trainers alike. Teachers are often called upon to nominate candidates for awards or selection, or to provide a reference where character attributes are to be considered.

In order to ensure that the questions are a valid indicator of an environmentally educated person, an external reference is needed. For this reason a team of five teachers at each of ten schools are requested independently to rate all the pupils of one selected standard 6 class, taught by all five teachers, on a scale of 1 to 7 in terms of the pupils' level of environmental awareness.

To assist teachers in their rating of pupils, the three components that make a person environmentally educated may be considered:

(a) Knowledge: the pupil has thoughts, ideas and understanding of (

environmental matters;

(b) Feeling: the pupil has positive feelings, attitudes, values and beliefs about environmental matters;

(c) Action: the pupil has translated his knowledge and feelings into a commitment to action. i.e. he/she is prepared to do something in favour of the environment.

SCALE:
1. totally unaware and lacking in knowledge
2. slightly aware with some knowledge
3. moderately aware and knowledgeable
4. aware, knowledgeable and concerned about environmental issues
5. strongly aware, knowledgeable and concerned about environmental issues
6. exceptionally knowledgeable, aware and concerned about environmental issues
7. exceptionally knowledgeable, aware, concerned, and committed to action

Teachers who are willing to assist in this research project are requested to rate each of the pupils in the selected class without any discussion with colleagues. A class list with the ratings should be inserted into an envelope and sealed. These envelopes will remain sealed until the research questionnaire has been administered to the selected class, and the results analysed. In this manner the environmentally educated pupils will be selected by two independent measures:

1. As a results of teachers' independent ratings
2. As a result of the Questionnaire.

Teachers' help is greatly appreciated, and the Transvaal Education Department is thanked for permission to conduct this worthwhile research in schools.

RALPH POHORILLE 1984.

# APPENDIX B

Set of 83 items in the affective item bank, before scrutiny by the panels of judges.

| | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|
| 1. I wish I had more time to devote to studying nature and problems in nature. | 1 | P | 1 |
| 2. It is necessary to read wildlife magazines in order to keep up with matters of environmental interest and importance. | 11 | P | 1 |
| 3. It is not necessary for us to know a lot about the environmental problems of people in other countries. | 12 | N | 1 |
| 4. It is the Government's responsibility to look after the environment and to solve environmental problems. | 13 | N | 1 |
| 5. It is often necessary to get out into the country, away from "civilization". | 14 | P | 1 |
| 6. Only people who are going to do scientific work should have to study ecology (how the environment works). | 48 | N | 1 |
| 7. The discoveries of historians, geographers and biologists do not concern me personally. | 50 | N | 1 |
| 8. To understand more about the environment we should have a good grasp of History, Geography, Science and Biology, and not just of one subject. | 53 | P | 1 |
| 9. A geographer who studies History or Biology is wasting his time. | 55 | P | 1 |
| 10. Marine Biologists deserve more recognition for the role they play in discovering new sources of food. | 55 | P | 1 |
| 11. Zoologists deserve more recognition for the role they play in discovering how animals adapt to new environments. | 56 | P | 1 |
| 12. I find plants and animals interesting. | 57 | P | 1 |

| | | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|---|
| 13. | People make too much fuss about beautiful scenery. | 9 | N | 1 |
| 14. | People make too much fuss about wildlife. | 59 | N | 1 |
| 15. | People make too much fuss about pollution. | 60 | N | 1 |
| 16. | People make too much fuss about animals and birds in danger of extinction. | 61 | N | 1 |
| 17. | I don't know why people get so excited about visiting nature reserves. | 63 | N | 1 |
| 18. | Everyone in South Africa should make some contribution towards nature and wildlife conservation. | 113 | P | 1 |
| 19. | Everyone should be encouraged to join a wildlife society. | 10 | P | 2 |
| 20. | It is not my concern if someone else litters. | 17 | N | 2 |
| 21. | Every individual, including each one of you, should do something towards protecting nature. | 18 | P | 2 |
| 22. | I often find it necessary to get out into the country, away from "civilization". | 14a | P | 2 |
| 23. | The conservation of various places where animals live or plants grow is essential for the survival of wildlife. It is therefore our duty to conserve these places. | 30 | P | 2 |
| 24. | The hyena is a scavenger and serves no useful purpose. It should therefore be eliminated. | 31 | N | 2 |
| 25. | South Africa has so many birds that it doesn't really matter if the Black Eagle became extinct. | 32 | N | 2 |
| 26. | There is no harm in picking up dead wood for firewood when one is out camping. | 35 | N | 2 |

| | | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|---|
| 27. | Humans have the right to change the natural environment whenever they so wish or need to. | 40 | N | 2 |
| 28. | Mankind was created by God to rule over the rest of nature. | 41 | N | 2 |
| 29. | Plants and animals exist primarily to be used by humans as they see fit. | 42 | N | 2 |
| 30. | Seeing people dropping papers on the pavement or out of their car windows doesn't really bother me. | 64 | N | 2 |
| 31. | It is a pity to kill snakes as they are useful. | 65 | P | 2 |
| 32. | Many plants, birds and animals are of no use at all. | 66 | N | 2 |
| 33. | It is fun and interesting to explore rock pools at the beach. | 67 | P | 2 |
| 34. | I would enjoy going on a fieldtrip to learn about different animal homes. | 68 | P | 2 |
| 35. | If I found a trail of ants in the garden, I'd follow it to see where it begins or ends. | 69 | P | 2 |
| 36. | I would be interested to hear a talk on "Should coal be mined in the Kruger National Park?" | 71 | P | 2 |
| 37. | I find beautiful scenery pleasing. | 72 | P | 2 |
| 38. | I find it interesting to discuss the different ideas on the possible origins of life. | 73 | P | 2 |
| 39. | I would enjoy a holiday job as assistant to a game ranger. | 75 | P | 2 |
| 40. | I enjoy telling my friends about the nature or wildlife films I've seen, or books I've read. | 76 | P | 2 |
| 41. | I enjoy watching TV programmes that show animals living in the wild and hunting their food. | 77 | P | 2 |

| | | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|---|
| 42. | I think the people who worry about pollution are those who have nothing else to worry about. | 79 | N | 2 |
| 43. | I would like to know how game rangers care for lions injured in fights. | 80 | P | 2 |
| 44. | I am concerned about how wild animals find water in times of drought. | 81 | P | 2 |
| 45. | I think all dangerous species such as snakes and sharks should be exterminated as soon as this is practical. | 82 | N | 2 |
| 46. | It is desirable for city streets to have trees in them. | 111 | P | 2 |
| 47. | There is far too much fuss made today about nature and problems in nature. | 2 | N | 3 |
| 48. | Conservation of our natural resources is hampered by selfish individuals. | 3 | N | 3 |
| 49. | South Africa should have more game reserves than it has. | 15 | P | 3 |
| 50. | Newspapers do not have enough articles on nature. | 16 | P | 3 |
| 51. | Pollution of the environment is due to unaware citizens. | 26a | N | 3 |
| 52. | Pollution of the environment is due to unconcerned citizens. | 26b | N | 3 |
| 53. | Extinction of species of wildlife is due to uncommitted citizens. | 27 | N | 3 |
| 54. | Large parts of our country should be set aside and kept unspoilt for wild animals and plants. | 70 | P | 3 |
| 55. | I feel responsible to pick up the litter that others leave lying around at picnic spots. | 83 | P | 3 |

| | | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|---|
| 56. | People caught littering on beaches should be banned from using them for a certain time. | 84 | P | 3 |
| 57. | People entering forestry areas should be made to leave behind their cigarettes, pipes, matches and lighters. | 85 | P | 3 |
| 58. | Research workers in the field of air and water pollution deserve our respect and co-operation. | 86 | P | 3 |
| 59. | I'd be happy in my free time to measure wind speeds on our school sportsfields to help decide where to plant new trees to break the wind. | 87 | P | 3 |
| 60. | If I had the choice of helping to take air samples to test the level of air pollution in a nearby industrial area on a free afternoon, or to go home instead, I'd go home. | 88 | N | 3 |
| 61. | I wouldn't mind staying behind for a while after school to study the animals and plants that live in a pond. | 89 | P | 3 |
| 62. | I wouldn't mind staying behind for a while after school to study the types of rocks that come from the area close to school. | 90 | P | 3 |
| 63. | I get angry when I see other pupils dropping litter in the school grounds. | 94 | P | 3 |
| 64. | There is nothing wrong with helping ourselves to a few wild flowers when we want them. | 95 | N | 3 |
| 65. | It makes very little difference if you catch and keep one or two undersized crayfish. | 96 | N | 3 |
| 66. | It is not my duty to clean up the litter other people leave behind. | 97 | N | 3 |
| 67. | I would like to walk one of the many nature trails we have. | 100 | P | 3 |

| | | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|---|
| 68. | I would like to join a wildlife society. | 102 | P | 3 |
| 69. | I hate seeing people's names carved on trees. | 103 | P | 3 |
| 70. | Science and technology have caused our environmental problems. | 4 | N | 4 |
| 71. | Science and technology will eventually solve all of our environmental problems. | 5 | N | 4 |
| 72. | It is every person's responsibility to point out to those damaging nature how this is wrong. | 6 | P | 4 |
| 73. | It is foolish of starving nations to use religious reasons as an excuse not to kill animals (such as cows) for food. | 7 | N | 4 |
| 74. | It is unrealistic for conservationists to plead for the total protection of an area which is rich in mineral resources. | 22 | P | 4 |
| 75. | Land should be used in such a manner that the most people benefit from its use, even if it means giving up areas that are already preserved. | 23 | P | 4 |
| 76. | Science will eventually solve the environmental problems that really concern man. | 24 | N | 4 |
| 77. | Conservationists' pleas for protection of mineral-rich wilderness areas, no matter what the cost, are entirely realistic. | 28 | N | 4 |
| 78. | The sting of a scorpion can be fatal. I would therefore support a campaign in South Africa to exterminate all scorpions. | 33 | N | 4 |
| 79. | I don't see why we should fit in to the natural environment: we can re-make it to suit our needs with the help of technology. | 44 | N | 4 |

| | Original Number * | Desired Response | Taxonomic Level |
|---|---|---|---|
| 80. When the need for culling (shooting excess animals) arises, the animals with the most valuable skins should be killed first. | 104 | N | 4 |
| 81. Oil tankers should be banned from passing Cape Town because of the risk of oil pollution on our beaches and damage to creatures and plants of the sea. | 106 | N | 4 |
| 82. Animals and plants should never be interfered with in game and nature reserves; rangers and wardens should leave them entirely alone to reach a natural balance. | 108 | N | 4 |
| 83. Farmers who shoot a leopard that survives by killing their sheep once all its natural prey has vanished, are doing the right thing. | 109 | P | 4 |

* The original number refers to the item number in the pool of 113 items from which this set was derived.

# APPENDIX C

Forty-five items in the affective domain, forming Section A of the pilot test. The desired response, positive or negative, is shown by the letter P or N, and the clustering of items, according to taxonomic levels 1-4, is indicated.

| | Desired Response |
|---|---|
| Taxonomic Level 1. | |
| 1. I wish I had more time to study nature. | P |
| 2. It is necessary to read wildlife magazines in order to keep up with matters of environmental interest and importance. | P |
| 3. It is not necessary for us to know a lot about the environmental problems of people in other countries. | N |
| 4. It is the Government's responsibility to look after the environment. | N |
| 5. It is often necessary to get out into the country, away from "civilization". | P |
| 6. Only people who are going to do scientific work should have to study ecology (how the environment works). | N |
| 7. To understand more about the environment we should have a good grasp of history, geography, science and biology, and not just of one of these subjects. | P |
| 8. People make too much fuss about beautiful scenery. | N |
| 9. People make too much fuss about pollution. | N |
| 10. People make too much fuss about birds and other animals in danger of extinction. | N |
| 11. I don't know why people get so excited about visiting nature reserves. | N |
| 12. Everyone in South Africa should make some contribution towards wildlife conservation. | P |

| | Desired Response |
|---|---|
| Taxonomic Level 2. | |
| 13. Everyone should be encouraged to join a wildlife society. | P |
| 14. It is not my concern if someone else litters. | N |
| 15. Everyone should do something towards protecting nature. | P |
| 16. The conservation of various places where animals live and plants grow is essential for the survival of wildlife. It is therefore our duty to conserve these places. | P |
| 17. The hyena is a useless scavenger and should be destroyed. | N |
| 18. South Africa has so many birds that it doesn't really matter if the Black Eagle became extinct. | N |
| 19. Humans have the right to change the natural environment whenever they want to. | N |
| 20. It is fun and interesting to explore rock pools at the sea. | P |
| 21. I would enjoy going on a fieldtrip to learn about different animal homes. | P |
| 22. I would be interested to hear a talk on "Should coal be mined in the Kruger National Park?" | P |
| 23. I find it interesting to discuss the different ideas about how life began. | P |
| 24. I would enjoy a holiday job as assistant to a game ranger. | P |
| 25. I enjoy watching TV programmes that show animals living in the wild. | P |
| 26. I am concerned about how wild animals find water in times of drought. | P |
| 27. I think all dangerous species such as snakes and sharks should be exterminated if possible. | N |

| | Desired Response |
|---|---|
| Taxonomic Level 3. | |
| 28. South Africa should have more game reserves than it has. | P |
| 29. Newspapers should have more articles on nature. | P |
| 30. People caught littering on beaches should be banned from using them for a certain time. | P |
| 31. People entering forestry areas should be made to leave behind their cigarettes, pipes, matches and lighters. | P |
| 32. Research workers involved in air and water pollution deserve our respect and co-operation. | P |
| 33. I wouldn't mind staying behind for a while after school to study the animals and plants that live in a pond. | P |
| 34. I get angry when I see other people dropping litter in the school grounds. | P |
| 35. There is nothing wrong with helping ourselves to a few wild flowers when we want them. | N |
| 36. I would like to walk one of the many nature trails we have. | P |
| 37. I would like to join a wildlife society. | P |
| 38. I hate seeing people's names carved on trees. | P |
| Taxonomic Level 4. | |
| 39. Science and technology have caused our environmental problems. | N |
| 40. Science and technology will eventually solve all of our environmental problems. | N |
| 41. It is every person's responsibility to point out to those damaging nature why this is wrong. | P |
| 42. Conservationists' pleas for the protection of mineral-rich wilderness areas, no matter what the cost, are entirely realistic. | N |

| | Desired Response |
|---|---|
| Taxonomic Level 4 (continued) | |
| 43. I don't see why we should fit in to the natural environment; we can re-make it to suit our needs with the help of technology. | N |
| 44. When the need for culling (shooting excess animals) arises, animals with the most valuable skins should be killed first. | N |
| 45. Oil tankers should be banned from passing Cape Town because of the risk of oil pollution on our beaches and damage to creatures and plants of the sea. | N |

# APPENDIX D

Set of thirteen items in the cognitive item bank, before scrutiny by the panels of judges.

| | Desired Response |
|---|---|
| Taxonomic Level 1. | |
| 1. If we want wildlife to survive, it is essential that we look after the places where they live. | P |
| 2. The hyena is a scavenger (it eats what other predators have killed) and serves no useful purpose. | N |
| 3. It is feared that there are only 200 Siberian tigers left in the world, it is important that these 200 be saved and encouraged to breed. | P |
| 4. Our school needs to offer more courses about the environment, because people who harm the environment need to know what harm they're doing. | P |
| 5. The earth is like a spaceship with only limited room and resources. | P |
| 6. There are limits to growth beyond which our modern, technological society cannot grow. | P |
| Taxonomic Level 2. | |
| 7. Protecting small mammals is not as important as protecting large ones. | N |
| 8. If you had the opportunity to rescue a rodent which was about to be caught by an owl, you would be doing a good deed. | N |
| 9. If you had the opportunity to save a springbuck from a leopard, it would be your duty to do so. | N |
| Taxonomic Level 3. | |
| 10. The spread of cities in South Africa has removed many large herd of buck. This in turn has reduced drastically the numbers of lion, leopard and cheetah that preyed on the buck. Now there are very few carcasses left for the vultures | P |

| | Desired Response |
|---|---|
| to eat. A group of people got together and by their efforts are saving these vultures from disappearing altogether. I think what they have done is important. | |
| 11. With a growing world population, by the time your children are at school there may be very little space left for game parks and nature reserves. If your children could see wild animals only in zoos, you would be quite happy. | N |
| 12. History, Geography and Biology are all part of the same broad field of knowledge. | P |
| 13. There are very clear boundaries separating History, Geography and Biology. | N |

# APPENDIX E

Twelve items in the cognitive domain, forming Section B of the pilot test. The desired response, positive or negative, is shown by the letter P or N, and the clustering of items, according to taxonomic levels 1 to 3, is indicated.

| | Desired Response |
|---|---|
| Taxonomic Level 1. | |
| 1. If we want wildlife to survive we must look after the natural places where they live. | P |
| 2. The tsetse fly is a pest that serves no useful purpose. | N |
| 3. There are probably only 200 Siberian tigers left in the world. It is therefore important that these 200 be saved. | P |
| 4. Our school needs to offer more courses about the environment, because people who harm the environment need to know what harm they're doing. | P |
| 5. The earth is like a spaceship with only limited room and resources. | P |
| 6. Poisonous plants are of no use at all. | N |
| Taxonomic Level 2. | |
| 7. Protecting small animals is not as important as protecting large ones. | N |
| 8. If you rescued a rodent which was about to be caught by an owl, you would be doing a good deed. | N |
| 9. If you had the opportunity to save a springbuck from a leopard, it would be your duty to do so. | N |
| Taxonomic Level 3. | |
| 10. The spread of cities in South Africa has removed many large herds of buck. This in turn has reduced drastically the numbers of lion, leopard and cheetah that preyed on the buck. Now there are very few carcasses left for the vultures to eat. A group of people got together and by their efforts are saving these vultures from disappearing altogether. What they have done is important. | P |

| | Desired Response |
|---|---|
| 11. With a growing world population, by the time our children are at school there may be very little space left for game parks and nature reserves. If our children could see wild animals only in zoos, I would be quite happy. | N |
| 12. Animals and plants should never be interfered with in game and nature reserves; rangers and wardens should leave them entirely alone to reach a natural balance. | N |

# APPENDIX F

Set of seven items in the conative item bank, before scrutiny by the panels of judges.

1. I would be prepared to give my pocket money for a month towards buying land to be used as a wildlife sanctuary.
2. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a nature reserve (a place where plants, trees and flowers can grow unhindered).
3. I would be happy to give up at least two weekends in a month to help clean up a nearby portion of river.
4. We pupils should become involved after school hours in some or other environmental project.
5. I belong to, and take an active role in at least one type of nature club.
6. I would like to help with an SPCA collection at school.
7. I would be prepared to serve as a voluntary conservation officer to help protect our wildlife.

# APPENDIX G

Twelve items in the conative domain, forming Section C of the pilot test. The desired response, positive or negative, is shown by the letter P or N.

| | | Desired Response |
|---|---|---|
| 1. | I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a wildlife sanctuary. | P |
| 2. | I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a nature reserve (a place where plants, trees, flowers and small animals can live unhindered). | P |
| 3. | I would be happy to give up at least two weekends in a month to help clean up a nearby portion of river. | P |
| 4. | We should become involved after school hours in some or other environmental project. | P |
| 5. | I belong to at least one type of nature club. | P |
| 6. | I take an active role in at least one type of nature club. | P |
| 7. | I would like to help with an SPCA collection at school. | P |
| 8. | I would be prepared to serve as a voluntary conservation officer to help protect our wildlife. | |
| 9. | I would be happy in my free time to measure wind speeds on our school sportsfields to help decide where to plant trees which would break the wind. | P |
| 10. | If on a free afternoon I had the choice of helping to take air samples to test the level of air pollution in a nearby industrial area, or to go home, I'd rather go home. | N |
| 11. | It is not my duty to clean up the litter that others leave lying around at picnic spots. | N |
| 12. | I often pick up the litter left by other people. | P |

# APPENDIX H

The pilot test, comprising (i) three sets of items, for Sections A, B and C respectively, with instructions concerning method of recording responses, and (ii) answer sheet for recording responses.

(i) Three sets of Items.

Read each item carefully. Choose the response that is closest to how you feel about the item. Having made your choice, place 1, 2, 3, 4 or 5 in the space next to the item number.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

SECTION A

1. I wish I had more time to study nature.
2. It is necessary to read wildlife magazines in order to keep up with matters of environmental interest and importance.
3. It is not necessary for us to know a lot about the environmental problems of people in other countries.
4. It is the Government's responsibility to look after the environment.
5. It is often necessary to get out into the country, away from "civilization".
6. Only people who are going to do scientific work should have to study ecology (how the environment works).
7. To understand more about the environment we should have a good grasp of history, geography, science and biology, and not just of one of these subjects.
8. People make too much fuss about beautiful scenery.
9. People make too much fuss about pollution.
10. People make too much fuss about birds and other animals in danger of extinction.
11. I don't know why people get so excited about visiting nature reserves.

12. Everyone in South Africa should make some contribution towards wildlife conservation.

13. Everyone should be encouraged to join a wildlife society.

14. It is not my concern if someone else litters.

15. Everyone should do something towards protecting nature.

16. The conservation of various places where animals live and plants grow is essential for the survival of wildlife. It is therefore our duty to conserve these places.

17. The hyena is a useless scavenger and should be destroyed.

18. South Africa has so many birds that it doesn't really matter if the Black Eagle became extinct.

19. Humans have the right to change the natural environment whenever they want to.

20. It is fun and interesting to explore rock pools at the sea.

21. I would enjoy going on a fieldtrip to learn about different animal homes.

22. I would be interested to hear a talk on "Should coal be mined in the Kruger National Park?"

23. I find it interesting to discuss the different ideas about how life began.

24. I would enjoy a holiday job as assistant to a game ranger.

25. I enjoy watching TV programmes that show animals living in the wild.

26. I am concerned about how wild animals find water in times of drought.

27. I think all dangerous species such as snakes and sharks should be exterminated if possible.

28. South Africa should have more game reserves than it has.

29. Newspapers should have more articles on nature.

30. People caught littering on beaches should be banned from using them for a certain time.

31. People entering forestry areas should be made to leave behind their cigarettes, pipes, matches and lighters.

32. Research workers involved in air and water pollution deserve our respect and co-operation.

33. I wouldn't mind staying behind for a while after school to study the animals and plants that live in a pond.

34. I get angry when I see other people dropping litter in the school grounds.

35. There is nothing wrong with helping ourselves to a few wild flowers when we want them.

36. I would like to walk one of the many nature trails we have.

37. I would like to join a wildlife society.

38. I hate seeing people's names carved on trees.

39. Science and technology have caused our environmental problems.

40. Science and technology will eventually solve all of our environmental problems.

41. It is every person's responsibility to point out to those damaging nature why this is wrong.

42. Conservationists' pleas for the protection of mineral-rich wilderness areas, no matter what the cost, are entirely realistic.

43. I don't see why we should fit in to the natural environment; we can re-make it to suit our needs with the help of technology.

44. When the need for culling (shooting excess animals) arises, animals with the most valuable skins should be killed first.

45. Oil tankers should be banned from passing Cape Town because of the risk of oil pollution on our beaches and damage to creatures and plants of the sea.

SECTION B

1. If we want wildlife to survive we must look after the natural places where they live.

2. The tsetse fly is a pest that serves no useful purpose.

3. There are probably only 200 Siberian tigers left in the world. It is therefore important that these 200 be saved.

4. Our school needs to offer more courses about the environment, because people who harm the environment need to know what harm they're doing.
5. The earth is like a spaceship with only limited room and resources.
6. Poisonous plants are of no use at all.
7. Protecting small animals is not as important as protecting large ones.
8. If you rescued a rodent which was about to be caught by an owl, you would be doing a good deed.
9. If you had the opportunity to save a springbuck from a leopard, it would be your duty to do so.
10. The spread of cities in South Africa has removed many large herds of buck. This in turn has reduced drastically the numbers of lion, leopard and cheetah that preyed on the buck. Now there are very few carcasses left for the vultures to eat. A group of people got together and by their efforts are saving these vultures from disappearing altogether. What they have done is important.
11. With a growing world population, by the time our children are at school there may be very little space left for game parks and nature reserves. If our children could see wild animals only in zoos, I would be quite happy.
12. Animals and plants should never be interefered with in game and nature reserves; rangers and wardens should leave them entirely alone to reach a natural balance.

SECTION C

1. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a wildlife sanctuary.
2. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a nature reserve (a place where plants, trees, flowers and small animals can live unhindered).
3. I would be happy to give up at least two weekends in a month to help clean up a nearby portion of river.

4. We should become involved after school hours in some or other environmental project.
5. I belong to at least one type of nature club.
6. I take an active role in at least one type of nature club.
7. I would like to help with an SPCA collection at school.
8. I would be prepared to serve as a voluntary conservation officer to help orotect our wildlife.
9. I would be happy in my free time to measure wind speeds on our school sportsfields to help decide where to plant trees which would break the wind.
10. If on a free afternoon I had the choice of helping to take air samples to test the level of air pollution in a nearby industrial area, or to go home, I'd rather go home.
11. It is not my duty to clean up the litter that others leave lying around at picnic spots.
12. I often pick up the litter left by other people.

## (ii) Answer Sheet

Pupil's name: .....

Read each item carefully. Choose the response that is closest to how you feel about the item. Having made your choice, place 1,2,3,4 or 5 in the space next to the item number.

1 = Strongly agree
2 = Agree
3 = Uncertain
4 = Disagree
5 = Strongly disagree

SECTION A

| Item | 1,2,3,4 or 5 |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |
| 21 | |
| 22 | |
| 23 | |

| Item | 1,2,3,4 or 5 |
|---|---|
| 24 | |
| 25 | |
| 26 | |
| 27 | |
| 28 | |
| 29 | |
| 30 | |
| 31 | |
| 32 | |
| 33 | |
| 34 | |
| 35 | |
| 36 | |
| 37 | |
| 38 | |
| 39 | |
| 40 | |
| 41 | |
| 42 | |
| 43 | |
| 44 | |
| 45 | |

SECTION B

| Item | 1,2,3,4 or 5 |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

SECTION C

| Item | 1,2,3,4 or 5 |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

# APPENDIX I

Total scores for each pupil in each of the three sections of the pilot test.

| Pupils in Class* | Number as on Class List | Scores for Section A | Scores for Section B | Scores for Section C |
|---|---|---|---|---|
| Deborah | 1 | 196 | 40 | 52 |
| Elizabeth | 2 | 166 | 43 | 42 |
| Fran | 3 | 180 | 49 | 44 |
| Michelle | 4 | 174 | 54 | 41 |
| Mandy | 5 | 168 | 47 | 41 |
| Belinda | 6 | 186 | 45 | 49 |
| Kerry | 7 | 144 | 40 | 31 |
| Deborah | 8 | 166 | 53 | 41 |
| Caron | 9 | 190 | 51 | 48 |
| Ann | 10 | 105 | 38 | 18 |
| Angela | 11 | 177 | 50 | 38 |
| Cornelia | 12 | 177 | 51 | 44 |
| Andrea | 13 | 163 | 47 | 43 |
| Dale | 14 | 183 | 50 | 47 |
| Clinton | 15 | 167 | 38 | 21 |
| Terence | 16 | 187 | 48 | 38 |
| Bradley | 17 | 158 | 45 | 34 |
| Craig | 18 | 175 | 48 | 45 |
| Bruce | 19 | 162 | 46 | 36 |
| Deon | 20 | 192 | 51 | 45 |
| Duncan | 21 | 174 | 44 | 45 |
| Linton | 22 | 128 | 40 | 30 |
| Grant | 23 | 156 | 49 | 38 |
| Christopher | 24 | 165 | 38 | 28 |
| Warren | 25 | 162 | 53 | 41 |
| Peter | 26 | 165 | 56 | 36 |
| Angus | 27 | 142 | 48 | 27 |
| Leonard | 28 | 136 | 50 | 18 |
| Raphael | 29 | 151 | 42 | 32 |
| Philip | 30 | 160 | 44 | 49 |
| Glen | 31 | 184 | 54 | 42 |
| Michael | 32 | 179 | 42 | 42 |
| (N = 32) | | $\Sigma$ = 5318 | $\Sigma$ = 1494 | $\Sigma$ = 1226 |

* The T.E.D., in granting permission for this research, requested that the author respect the anonymity of schools, pupils and teachers.

# APPENDIX J

Elimination and retention of items in pilot test.

(a) Elimination of items on the basis of

(i) pupils' difficulties
(ii) "Peaks of uncertainty"
(iii) poor or non-discriminating power (indicated by an X)

peaks of uncertainty

(b) Retention of items (indicated by the new item number)

Read each item carefully. Choose the response that is closest to how you feel about the item. Having made your choice, place 1, 2, 3, 4 or 5 in the space next to the item number.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

SECTION A

| | | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|---|
| 1. | I wish I had more time to study nature. | | X | | |
| 2. | It is necessary to read wildlife magazines in order to keep up with matters of environmental interest and importance. | | X | | |
| 3. | It is not necessary for us to know a lot about the environmental problems of people in other countries. | | | X | |
| 4. | It is the Government's responsibility to look after the environment. | | | | 1 |
| 5. | It is often necessary to get out into the country, away from "civilization". | | | X | |
| 6. | Only people who are going to do scientific work should have to study ecology (how the environment works). | | | | 2 |
| 7. | To understand more about the environment we should have a good grasp of history, geography, science and biology, and not just of one of these subjects. | | | X | |

| | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|
| 8. People make too much fuss about beautiful scenery. | | | | 3 |
| 9. People make too much fuss about pollution. | | | | 4 |
| 10. People make too much fuss about birds and other animals in danger of extinction. | | | X | |
| 11. I don't know why people get so excited about visiting nature reserves. | X | | | |
| 12. Everyone in South Africa should make some contribution towards wildlife conservation. | | | | 5 |
| 13. Everyone should be encouraged to join a wildlife society. | | X | X | |
| 14. It is not my concern if someone else litters. | | | | 6 |
| 15. Everyone should do something towards protecting nature. | | | | 7 |
| 16. The conservation of various places where animals live and plants grow is essential for the survival of wildlife. It is therefore our duty to conserve these places. | | | | 8 |
| 17. The hyena is a useless scavenger and should be destroyed. | | | | 9 |
| 18. South Africa has so many birds that it doesn't really matter if the Black Eagle became extinct. | | | X | |
| 19. Humans have the right to change the natural environment whenever they want to. | | | X | |
| 20. It is fun and interesting to explore rock pools at the sea. | | | | 10 |
| 21. I would enjoy going on a fieldtrip to learn about different animal homes. | | | | 11 |
| 22. I would be interested to hear a talk on "Should coal be mined in the Kruger National Park?" | | | X | |
| 23. I find it interesting to discuss the different ideas about how life began. | | | X | |

| | | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|---|
| 24. | I would enjoy a holiday job as assistant to a game ranger. | | | | 12 |
| 25. | I enjoy watching TV programmes that show animals living in the wild. | | | | 13 |
| 26. | I am concerned about how wild animals find water in times of drought. | | | | 14 |
| 27. | I think all dangerous species such as snakes and sharks should be exterminated if possible. | | | X | |
| 28. | South Africa should have more game reserves than it has. | | X | | |
| 29. | Newspapers should have more articles on nature. | | X | | |
| 30. | People caught littering on beaches should be banned from using them for a certain time. | | | X | |
| 31. | People entering forestry areas should be made to leave behind their cigarettes, pipes, matches and lighters. | | | | 15 |
| 32. | Research workers involved in air and water pollution deserve our respect and co-operation. | | | X | |
| 33. | I wouldn't mind staying behind for a while after school to study the animals and plants that live in a pond. | | X | | |
| 34. | I get angry when I see other people dropping litter in the school grounds. | | | | 16 |
| 35. | There is nothing wrong with helping ourselves to a few wild flowers when we want them. | | | | 17 |
| 36. | I would like to walk one of the many nature trails we have. | | | X | |
| 37. | I would like to join a wildlife society. | | X | | |
| 38. | I hate seeing people's names carved on trees. | | | | 18 |
| 39. | Science and technology have caused our environmental problems. | X | X | X | |

| | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|
| 40. Science and technology will eventually solve all of our environmental problems. | X | X | | |
| 41. It is every person's responsibility to point out to those damaging nature why this is wrong. | | | | 19 |
| 42. Conservationists' pleas for the protection of mineral-rich wilderness areas, no matter what the cost, are entirely realistic. | X | X | | |
| 43. I don't see why we should fit in to the natural environment; we can re-make it to suit our needs with the help of technology. | X | X | | |
| 44. When the need for culling (shooting excess animals) arises, animals with the most valuable skins should be killed first. | | | | 20 |
| 45. Oil tankers should be banned from passing Cape Town because of the risk of oil pollution on our beaches and damage to creatures and plants of the sea. | | X | X | |
| SECTION B | | | | |
| 1. If we want wildlife to survive we must look after the natural places where they live. | | | | 1 |
| 2. The tsetse fly is a pest that serves no useful purpose. | | X | | |
| 3. There are probably only 200 Siberian tigers left in the world. It is therefore important that these 200 be saved. | | | | 2 |
| 4. Our school needs to offer more courses about the environment, because people who harm the environment need to know what harm they're doing. | | | X | |
| 5. The earth is like a spaceship with only limited room and resources. | | X | X | |

| | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|
| 6. Poisonous plants are of no use at all. | | X | | |
| 7. Protecting small animals is not as important as protecting large ones. | | | | 3 |
| 8. If you rescued a rodent which was about to be caught by an owl, you would be doing a good deed. | | | | 4 |
| 9. If you had the opportunity to save a springbuck from a leopard, it would be your duty to do so. | | | | 5 |
| 10. The spread of cities in South Africa has removed many large herds of buck. This in turn has reduced drastically the numbers of lion, leopard and cheetah that preyed on the buck. Now there are very few carcasses left for the vultures to eat. A group of people got together and by their efforts are saving these vultures from disappearing altogether. What they have done is important. | | | | 6 |
| 11. With a growing world population, by the time our children are at school there may be very little space left for game parks and nature reserves. If our children could see wild animals only in zoos, I would be quite happy. | | | | 7 |
| 12. Animals and plants should never be interfered with in game and nature reserves; rangers and wardens should leave them entirely alone to reach a natural balance. | | X | | |
| SECTION C | | | | |
| 1. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a wildlife sanctuary. | X | | | |
| 2. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a nature reserve (a place where plants, trees, flowers and small animals can live unhindered). | | | | 1 |

| | Pupil Difficulties | High Uncertainty | Non-Discriminating | Items Retained |
|---|---|---|---|---|
| 3. I would be happy to give up at least two weekends in a month to help clean up a nearby portion of river. | | X | | |
| 4. We should become involved after school hours in some or other environmental project. | | X | | |
| 5. I belong to at least one type of nature club. | X | | | |
| 6. I take an active role in at least one type of nature club. | | | | 2 |
| 7. I would like to help with an SPCA collection at school. | | | | 3 |
| 8. I would be prepared to serve as a voluntary conservation officer to help protect our wildlife. | | X | | |
| 9. I would be happy in my free time to measure wind speeds on our school sportsfields to help decide where to plant trees which would break the wind. | | X | | |
| 10. If on a free afternoon I had the choice of helping to take air samples to test the level of air pollution in a nearby industrial area, or to go home, I'd rather go home. | | | | 4 |
| 11. It is not my duty to clean up the litter that others leave lying around at picnic spots. | | | | 5 |
| 12. I often pick up the litter left by other people. | | X | X | |

APPENDIX K

Raw data for correlations between teachers' ratings and pupils' scores in Sections A, B and C of the pilot test.

| Pupils in Class | Numbers as on Class List | X 5 Teachers' Ratings (Total) | Section A(=$Y_1$) Scores for Section A (=$Y_1$) | $XY_1$ | Section B(=$Y_2$) Scores for Section B (=$Y_2$) | $XY_2$ | Section C(=$Y_3$) Scores for Section C (=$Y_3$) | $XY_3$ |
|---|---|---|---|---|---|---|---|---|
| Deborah | 1 | 18 | 196 | 3528 | 40 | 720 | 52 | 936 |
| Elizabeth | 2 | 19 | 166 | 3154 | 43 | 817 | 42 | 798 |
| Fran | 3 | 25 | 180 | 4500 | 49 | 1225 | 44 | 1100 |
| Michelle | 4 | 17 | 174 | 2958 | 54 | 918 | 41 | 697 |
| Mandy | 5 | 22 | 168 | 3696 | 47 | 1034 | 41 | 902 |
| Belinda | 6 | 22 | 186 | 4092 | 45 | 990 | 49 | 1078 |
| Kerry | 7 | 24 | 144 | 3456 | 40 | 960 | 31 | 744 |
| Deborah | 8 | 26 | 166 | 4316 | 53 | 1378 | 41 | 1066 |
| Caron | 9 | 21 | 190 | 3990 | 51 | 1071 | 48 | 1008 |
| Ann | 10 | 11 | 105 | 1155 | 38 | 418 | 18 | 198 |
| Angela | 11 | 23 | 177 | 4071 | 50 | 1150 | 38 | 874 |
| Cornelia | 12 | 21 | 177 | 3717 | 51 | 1071 | 44 | 924 |
| Andrea | 13 | 22 | 163 | 3586 | 47 | 1034 | 43 | 946 |
| Dale | 14 | 21 | 183 | 3843 | 50 | 1050 | 47 | 987 |
| Clinton | 15 | 21 | 167 | 3507 | 38 | 798 | 21 | 441 |
| Terence | 16 | 18 | 187 | 3366 | 48 | 864 | 38 | 684 |
| Bradley | 17 | 17 | 158 | 2686 | 45 | 765 | 34 | 578 |
| Craig | 18 | 26 | 175 | 4550 | 48 | 1248 | 45 | 1170 |
| Bruce | 19 | 16 | 162 | 2592 | 46 | 736 | 36 | 576 |
| Deon | 20 | 12 | 192 | 2304 | 51 | 612 | 45 | 540 |
| Duncan | 21 | 12 | 174 | 2088 | 44 | 528 | 45 | 540 |
| Linton | 22 | 16 | 128 | 2048 | 40 | 640 | 30 | 480 |
| Grant | 23 | 21 | 156 | 3276 | 49 | 1029 | 38 | 798 |
| Chris | 24 | 20 | 165 | 3300 | 38 | 760 | 28 | 560 |
| Warren | 25 | 15 | 162 | 2430 | 53 | 795 | 41 | 615 |
| Peter | 26 | 17 | 165 | 2805 | 56 | 952 | 36 | 612 |
| Angus | 27 | 17 | 142 | 2414 | 48 | 816 | 27 | 459 |
| Leonard | 28 | 19 | 136 | 2584 | 50 | 950 | 18 | 342 |
| Raphael | 29 | 20 | 151 | 3020 | 42 | 840 | 32 | 640 |
| Philip | 30 | 17 | 160 | 2720 | 44 | 748 | 49 | 833 |
| Glen | 31 | 22 | 184 | 4048 | 54 | 1188 | 42 | 924 |
| Michael | 32 | 11 | 179 | 1969 | 42 | 462 | 42 | 462 |
| (N=32) | | $\Sigma$=609 | $\Sigma$=5318 | $\Sigma$=101769 | $\Sigma$=1494 | $\Sigma$=28567 | $\Sigma$=1226 | $\Sigma$=23512 |

(i) Correlation between teachers' ratings and pupils' scores for Section A, using Pearson's 'r'.

$$r = \frac{32 \times 101769 - (609 \times 5318)}{\sqrt{\left[(32 \times 12105 - (609)^2)\ (32 \times 895804 - (5318)^2)\right]}}$$

$$r = \frac{3256608 - 3238662}{\sqrt{\left[(387360 - 370881)\ (28665728 - 28281124)\right]}}$$

$$r = \frac{17946}{\sqrt{\left[(16479)\ (384604)\right]}}$$

$$r = \frac{17946}{\left[(128{,}37)\ (620{,}16)\right]}$$

$$r = \frac{17946}{79609{,}94}$$

$$r = \underline{0{,}225}$$

(ii) Correlation between teachers' ratings and pupils' scores for Section B, using Pearson's 'r'.

$$r = \frac{32 \times 28567 - 609 \times 1494}{\sqrt{\left[(32 \times 12105 - (609)^2)\ (32 \times 70568 - (1494)^2)\right]}}$$

$$r = \frac{914144 - 909846}{\sqrt{\left[(387360 - 370881)\ (2258176 - 2232036)\right]}}$$

$$r = \frac{4298}{\sqrt{\left[(16479)\quad(26140)\right]}}$$

$$r = \frac{4298}{\left[(128{,}37)\quad(161{,}68)\right]}$$

$$r = \frac{4298}{20754{,}861}$$

$$r = 0{,}207$$

(iii) Correlation between teachers' ratings and pupils' scores for Section C, using Pearson's 'r'.

$$r = \frac{32 \times 23512 - 609 \times 1226}{\sqrt{\left[(32 \times 12105 - (609)^2)\ (32 \times 49398 - (12260)^2)\right]}}$$

$$r = \frac{752384 - 746634}{\sqrt{\left[(387360 - 370881)\ \ (1580736 - 1503076)\right]}}$$

$$r = \frac{5750}{\sqrt{\left[(16479)\ \ (77660)\right]}}$$

$$r = \frac{5750}{\left[(128{,}37)\ \ \ (278{,}67)\right]}$$

$$r = \frac{5750}{35772{,}867}$$

$$r = \underline{0{,}160}$$

# APPENDIX L

The final test, comprising twenty items in Section A, seven in Section B, five in Section C and answer sheet.

Read each item carefully. Choose the response that is closest to how you feel about the item. Having made your choice, place 1, 2, 3, 4 or 5 in the space next to the item number.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

SECTION A

1. It is the Government's responsibility to look after the environment.
2. Only people who are going to do scientific work should have to study ecology (how the environment works).
3. People make too much fuss about beautiful scenery.
4. People make too much fuss about pollution.
5. Everyone in South Africa should make some contribution towards wildlife conservation.
6. It is not my concern if someone else litters.
7. Everyone should do something towards protecting nature.
8. The conservation of various places where animals live and plants grow is essential for the survival of wildlife. It is therefore our duty to conserve these places.
9. The hyena is a useless scavenger and should be destroyed.
10. It is fun and interesting to explore rock pools at the sea.
11. I would enjoy going on a fieldtrip to learn about different animal homes.
12. I would enjoy a holiday job as assistant to a game ranger.
13. I enjoy watching TV programmes that show animals living in the wild.
14. I am concerned about how wild animals find water in times of drought.

15. People entering forestry areas should be made to leave behind their cigarettes, pipes, matches and lighters.

16. I get angry when I see other people dropping litter in the school grounds.

17. There is nothing wrong with helping ourselves to a few wild flowers when we want them.

18. I hate seeing people's names carved on trees.

19. It is every person's responsibility to point out to those damaging nature why this is wrong.

20. When the need for culling (shooting excess animals) arises, animals with the most valuable skins should be killed first.

SECTION B

1. If we want wildlife to survive we must look after the natural places where they live.

2. There are probably only 200 Siberian tigers left in the world. It is therefore important that these 200 be saved.

3. Protecting small animals is not as important as protecting large ones.

4. If you rescued a rodent which was about to be caught by an owl, you would be doing a good deed.

5. If you had the opportunity to save a springbuck from a leopard, it would be your duty to do so.

6. The spread of cities in South Africa has removed many large herds of buck. This in turn has reduced drastically the numbers of lion, leopard and cheetah that preyed on the buck. Now there are very few carcasses left for the vultures to eat. A group of people got together and by their efforts are saving these vultures from disappearing altogether. What they have done is important.

7. With a growing world population, by the time our children are at school there may be very little space left for game parks and nature reserves. If our children could see wild animals only in zoos, I would be quite happy.

SECTION C

1. I would be prepared to give at least half of my pocket money for a month towards buying land to be used as a nature reserve (a place where plants, trees, flowers and small animals can live unhindered).
2. I take an active role in at least one type of nature club.
3. I would like to help with an SPCA collection at school.
4. If on a free afternoon I had the choice of helping to take air samples to test the level of air pollution in a nearby industrial area, or to go home, I'd rather go home.
5. It is not my duty to pick up the litter that others leave lying around at picnic spots.

Answer Sheet

Pupil's name: .....

Read each item carefully. Choose the response that is closest to how you feel about the item. Having made your choice, place 1,2,3,4 or 5 in the space next to the item number.

1 = Strongly agree
2 = Agree
3 = Uncertain
4 = Disagree
5 = Strongly disagree

SECTION A

| Item | 1,2,3,4 or 5 | |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

SECTION B

| Item | 1,2,3,4 or 5 | |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

SECTION C

| Item | 1,2,3,4 or 5 | |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

# APPENDIX M

Teachers' ratings of pupils' level of environmental education on a scale of 1 to 7, according to criteria set out in Appendix A, for each of the ten schools involved.

APPENDIX M

SCHOOL 1

| | PUPILS' NAMES | TEACHERS' RATINGS | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | |
| 1 | Alberto | 4 | 4 | 6 | 3 | 3 | 5 | 25 |
| 2 | Roger | 3 | 4 | 4 | 2 | 2 | 3 | 18 |
| 3 | Michael | 5 | 6 | 6 | 2 | 4 | 3 | 26 |
| 4 | Peter | 4 | 2 | 2 | 5 | 3 | 3 | 19 |
| 5 | Mark | 5 | 5 | 6 | 6 | 4 | 6 | 32 |
| 6 | Paulo | 4 | 3 | 3 | 6 | 4 | 4 | 24 |
| 7 | Carlos | 3 | 3 | 3 | 5 | 4 | 3 | 21 |
| 8 | Byron | 2 | 4 | 4 | 1 | 2 | 2 | 15 |
| 9 | Mario | 6 | 4 | 4 | 7 | 6 | 6 | 33 |
| 10 | Mario | 3 | 3 | 3 | 5 | 4 | 3 | 21 |
| 11 | Antonio | 5 | 4 | 4 | 3 | 4 | 6 | 26 |
| 12 | Benjamin | 3 | 3 | 3 | 2 | 2 | 3 | 16 |
| 13 | Matthew | 4 | 2 | 2 | 5 | 3 | 6 | 22 |
| 14 | Michael | 3 | 3 | 3 | 1 | 1 | 2 | 13 |
| 15 | Jonathan | 4 | 4 | 4 | 3 | 4 | 3 | 22 |
| 16 | Alito | 5 | 2 | 2 | 7 | 6 | 3 | 25 |
| 17 | Alan | 5 | 2 | 3 | 5 | 4 | 3 | 22 |
| 18 | Donovan | 3 | 4 | 3 | 2 | 2 | 2 | 16 |
| 19 | Charles | 3 | 4 | 4 | 3 | 3 | 6 | 23 |
| 20 | Costas | 3 | 2 | 2 | 2 | 4 | 4 | 17 |
| 21 | Matt | 5 | 2 | 4 | 3 | 3 | 2 | 19 |
| 22 | Victor | 5 | 2 | 2 | 2 | 2 | 2 | 15 |
| 23 | Paul | 5 | 2 | 2 | 4 | 4 | 2 | 19 |
| 24 | Joao | 6 | 5 | 5 | 3 | 4 | 4 | 27 |
| 25 | Robert | 7 | 5 | 5 | 4 | 3 | 3 | 27 |
| 26 | Prodromos | 4 | 4 | 4 | 2 | 3 | 2 | 19 |
| 27 | Ian | 3 | 4 | 4 | 2 | 5 | 3 | 21 |
| 28 | Kevin | 7 | 6 | 6 | 7 | 6 | 6 | 38 |
| 29 | Andrew | 6 | 4 | 4 | 3 | 2 | 3 | 22 |
| 30 | Glen | 6 | 3 | 3 | 3 | 2 | 3 | 20 |

N = 30

APPENDIX M

SCHOOL 2

| PUPILS' NAMES | TEACHERS' RATINGS | | | | TOTAL |
|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | |
| 1 Shirley | 6 | 4 | 4 | 3 | 17 |
| 2 Margarlda | 5 | 3 | 4 | 7 | 19 |
| 3 Ana Maria | 4 | 2 | 4 | 5 | 15 |
| 4 Mandy | 6 | 6 | 5 | 5 | 22 |
| 5 Paulina | 5 | 1 | 7 | 6 | 19 |
| 6 Yvonne | 3 | 2 | 3 | 3 | 11 |
| 7 Paula | 5 | 6 | 5 | 3 | 19 |
| 8 Berta | 4 | 1 | 3 | 3 | 11 |
| 9 Corete | 3 | 3 | 3 | 4 | 13 |
| 10 Paula | 4 | 5 | 3 | 3 | 15 |
| 11 Elizabeth | 2 | 2 | 1 | 1 | 6 |
| 12 Paraskevi (Vivi) | 3 | 3 | 3 | 5 | 14 |
| 13 Silvana | 4 | 2 | 3 | 4 | 13 |
| 14 Helena P. | 6 | 3 | 3 | 5 | 17 |
| 15 Carol | 5 | 4 | 3 | 4 | 16 |
| 16 Maria | 6 | 7 | 3 | 5 | 21 |
| 17 Renata | 5 | 3 | 3 | 4 | 15 |
| 18 Maria | 6 | 6 | 3 | 4 | 19 |
| 19 Zelia M. | 4 | 6 | 3 | 1 | 14 |
| 20 Maria M. | 4 | 4 | 3 | 1 | 12 |
| 21 Maria | 6 | 3 | 4 | 7 | 20 |
| 22 Angelina | 6 | 7 | 6 | 5 | 24 |
| 23 Elisa | 5 | 3 | 3 | 4 | 15 |
| 24 Susana | 4 | 6 | 3 | 4 | 17 |
| 25 Isabel | 5 | 7 | 3 | 4 | 19 |
| 26 Selene | 3 | 1 | 1 | 1 | 6 |
| 27 Rosamaria | 6 | 2 | 3 | 4 | 15 |
| 28 Theresa | 4 | 1 | 1 | 2 | 8 |
| 29 Gabriel | 6 | 3 | 4 | 5 | 19 |
| 30 Manuella | 2 | 4 | 3 | 5 | 14 |

N = 30

APPENDIX M

SCHOOL 3

| PUPILS' NAMES | TEACHERS' RATINGS | | | | | TOTAL |
|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | |
| 1 Jason | 6 | 7 | 6 | 5 | 6 | 30 |
| 2 Craig A. | 4 | 5 | 5 | 4 | 3 | 21 |
| 3 Bradley S. | 5 | 4 | 4 | 5 | 3 | 21 |
| 4 Miron | 4 | 6 | 5 | 4 | 4 | 23 |
| 5 Filipe L.F. | 5 | 4 | 6 | 4 | 4 | 23 |
| 6 Lashner T. | 7 | 5 | 6 | 5 | 5 | 28 |
| 7 Marco P. | 5 | 5 | 6 | 4 | 3 | 23 |
| 8 Richard C.H. | 3 | 7 | 4 | 4 | 4 | 22 |
| 9 Shane B. | 3 | 6 | 3 | 4 | 3 | 19 |
| 10 Sean N. | 5 | 6 | 5 | 6 | 4 | 26 |
| 11 Sean M. | 2 | 6 | 2 | 4 | 4 | 18 |
| 12 Charles J. | 7 | 6 | 6 | 5 | 6 | 30 |
| 13 Craig A. | 5 | 5 | 4 | 4 | 4 | 22 |
| 14 Jean | 3 | 4 | 4 | 4 | 5 | 20 |
| 15 Maria M. | 2 | 3 | 3 | 3 | 1 | 12 |
| 16 Michele B. | 5 | 5 | 6 | 6 | 4 | 26 |
| 17 Jenny D. | 4 | 4 | 4 | 5 | 4 | 21 |
| 18 Loren | 4 | 3 | 4 | 3 | 3 | 17 |
| 19 Cristina | 5 | 6 | 4 | 4 | 6 | 25 |
| 20 Lana | 7 | 7 | 6 | 5 | 6 | 31 |
| 21 Teresa M. | 6 | 4 | 4 | 5 | 3 | 22 |
| 22 Nerina J. | 6 | 7 | 6 | 5 | 5 | 29 |
| 23 Merle | 4 | 6 | 4 | 4 | 4 | 22 |
| 24 Eleni | 4 | 4 | 5 | 4 | 4 | 21 |
| 25 Liza | 2 | 4 | 4 | 4 | 3 | 17 |
| 26 Karen | 3 | 4 | 5 | 4 | 5 | 21 |
| 27 Belinda L. | 3 | 4 | 4 | 4 | 3 | 18 |
| 28 Leigh V. | 5 | 4 | 6 | 4 | 6 | 25 |
| 29 Michelle E. | 4 | 4 | 6 | 4 | 4 | 22 |
| 30 Ursula D. | 4 | 6 | 6 | 4 | 4 | 24 |
| 31 Melinda | 4 | 4 | 5 | 4 | 4 | 21 |
| 32 Riva | 6 | 6 | 4 | 5 | 5 | 26 |
| 33 Sonya | 6 | 7 | 6 | 4 | 3 | 26 |
| 34 Cindy | 4 | 5 | 4 | 4 | 4 | 21 |
| 35 Kim | 4 | 5 | 5 | 4 | 5 | 23 |
| 36 Maria | 4 | 5 | 4 | 5 | 4 | 22 |

N = 36

APPENDIX M

SCHOOL 5

| PUPILS' NAMES | TEACHERS' RATINGS | | | | | TOTAL |
|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | |
| 1 Alexis | 4 | 5 | 4 | 2 | 3 | 18 |
| 2 Helen | 4 | 3 | 3 | 6 | 5 | 21 |
| 3 Isabel | 2 | 3 | 3 | 4 | 3 | 15 |
| 4 Penelope | 4 | 3 | 3 | 6 | 6 | 22 |
| 5 Belinda | 7 | 7 | 5 | 5 | 6 | 30 |
| 6 Lorella | 3 | 3 | 3 | 2 | 3 | 14 |
| 7 Dale | 4 | 3 | 2 | 1 | 5 | 15 |
| 8 Diane | 5 | 6 | 3 | 3 | 3 | 20 |
| 9 Helen | 5 | 6 | 5 | 4 | 3 | 23 |
| 10 Julie | 6 | 3 | 5 | 1 | 4 | 19 |
| 11 Colleen | 6 | 7 | 5 | 4 | 4 | 26 |
| 12 Samantha | 4 | 2 | 5 | 3 | 3 | 17 |
| 13 Bronwyn | 3 | 7 | 4 | 3 | 3 | 20 |
| 14 Monika | 5 | 3 | 3 | 3 | 3 | 17 |
| 15 Samantha | 4 | 3 | 2 | 3 | 5 | 17 |
| 16 Mandi | 5 | 3 | 3 | 3 | 3 | 17 |
| 17 Kerry | 5 | 7 | 5 | 7 | 3 | 27 |
| 18 Nicolette | 5 | 6 | 5 | 6 | 3 | 25 |
| 19 Vanessa | 4 | 3 | 3 | 5 | 3 | 18 |
| 20 Juliet | 4 | 2 | 2 | 2 | 3 | 13 |
| 21 Carrie | 6 | 4 | 2 | 4 | 3 | 19 |
| 22 Katia | 3 | 3 | 4 | 2 | 3 | 15 |
| 23 Tracey | 6 | 7 | 6 | 7 | 6 | 32 |

N = 23

# APPENDIX M

## SCHOOL 6

| PUPILS' NAMES | TEACHERS' RATINGS | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | |
| 1 Yvonne | 3 | 2 | 3 | 3 | 3 | 3 | 17 |
| 2 Kaliope | 7 | 4 | 7 | 6 | 4 | 7 | 35 |
| 3 Karen | 5 | 4 | 4 | 5 | 4 | 3 | 25 |
| 4 Paula | 6 | 2 | 4 | 3 | 3 | 3 | 21 |
| 5 Juliet | 3 | 1 | 3 | 3 | 2 | 2 | 14 |
| 6 Maria | 5 | 2 | 5 | 6 | 3 | 3 | 24 |
| 7 Rene | 5 | 2 | 4 | 3 | 3 | 3 | 20 |
| 8 Bolinka | 4 | 3 | 3 | 4 | 3 | 3 | 20 |
| 9 Andrea | 7 | 4 | 7 | 7 | 6 | 7 | 38 |
| 10 Lenka | 5 | 3 | 3 | 6 | 4 | 4 | 25 |
| 11 Jane | 4 | 3 | 6 | 6 | 3 | 3 | 25 |
| 12 Karen | 6 | 3 | 3 | 6 | 3 | 5 | 26 |
| 13 Elsa Maria | 3 | 2 | 5 | 4 | 3 | 3 | 20 |
| 14 Sarah | 3 | 2 | 4 | 4 | 3 | 3 | 19 |
| 15 Theodosia | 6 | 2 | 6 | 5 | 3 | 3 | 25 |
| 16 Carla | 5 | 1 | 6 | 5 | 4 | 3 | 24 |
| 17 Sandra | 5 | 4 | 6 | 3 | 3 | 3 | 24 |
| 18 Pasqualina | 4 | 4 | 3 | 3 | 3 | 3 | 20 |
| 19 Tanya | 4 | 1 | 7 | 3 | 1 | 4 | 20 |
| 20 Paula | 6 | 3 | 6 | 3 | 3 | 5 | 26 |
| 21 Jacqueline | 5 | 2 | 5 | 3 | 4 | 3 | 22 |
| 22 Karen | 2 | 2 | 1 | 3 | 3 | 3 | 14 |
| 23 Sonett | 2 | 4 | 6 | 3 | 2 | 7 | 24 |
| 24 Maria | 6 | 2 | 6 | 5 | 4 | 6 | 29 |
| 25 Vania | 7 | 5 | 7 | 6 | 6 | 7 | 38 |
| 26 Deolinda | 2 | 3 | 2 | 3 | 3 | 3 | 16 |
| 27 Jacky | 4 | 1 | 6 | 2 | 3 | 3 | 19 |
| 28 Kirsty | 1 | 3 | 2 | 3 | 3 | 3 | 15 |

N = 28

APPENDIX M

SCHOOL 7

| PUPILS' NAMES | TEACHERS' RATINGS | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | |
| 1 Mark | 3 | 6 | 4 | 4 | 4 | 6 | 27 |
| 2 Charles | 3 | 5 | 3 | 6 | 6 | 7 | 30 |
| 3 Anthony | 5 | 4 | 3 | 3 | 4 | 6 | 25 |
| 4 Nicholas | 3 | 5 | 5 | 4 | 3 | 6 | 26 |
| 5 Carl | 2 | 2 | 3 | 2 | 2 | 4 | 15 |
| 6 Mohammed | 2 | 2 | 2 | 2 | 2 | 5 | 15 |
| 7 Carl | 3 | 5 | 3 | 1 | 3 | 4 | 19 |
| 8 Nicholas | 3 | 6 | 5 | 1 | 1 | 7 | 23 |
| 9 Glen | 5 | 2 | 2 | 2 | 6 | 6 | 23 |
| 10 Simon | 2 | 4 | 2 | 2 | 2 | 3 | 15 |
| 11 Mahesh | 3 | 2 | 3 | 2 | 2 | 4 | 16 |
| 12 Curtis | 2 | 2 | 3 | 1 | 3 | 3 | 14 |
| 13 Benjamin | 3 | 3 | 3 | 3 | 5 | 6 | 23 |
| 14 Clive | 3 | 2 | 3 | 3 | 5 | 5 | 21 |
| 15 Kurt | 2 | 2 | 6 | 3 | 3 | 5 | 21 |
| 16 Andre | 3 | 4 | 5 | 6 | 5 | 5 | 28 |
| 17 Peter | 3 | 2 | 3 | 2 | 3 | 5 | 18 |
| 18 Brian | 3 | 4 | 6 | 3 | 2 | 3 | 21 |
| 19 Lorenzo | 3 | 3 | 3 | 3 | 2 | 4 | 18 |
| 20 Anthony | 3 | 2 | 3 | 3 | 2 | 3 | 16 |
| 21 Thomas | 2 | 2 | 3 | 2 | 3 | 3 | 15 |
| 22 Roland | 3 | 4 | 3 | 3 | 4 | 4 | 21 |
| 23 Brian | 4 | 7 | 4 | 5 | 5 | 6 | 31 |
| 24 Roderick | 4 | 6 | 6 | 4 | 7 | 7 | 34 |
| 25 Fabio | 4 | 3 | 2 | 4 | 4 | 5 | 22 |
| 26 Richard | 3 | 2 | 3 | 5 | 1 | 5 | 19 |
| 27 Lorenzo | 3 | 2 | 3 | 4 | 3 | 4 | 19 |
| 28 Edric | 5 | 6 | 5 | 5 | 3 | 7 | 31 |
| 29 Mark | 4 | 3 | 3 | 5 | 5 | 5 | 25 |

N = 29

# APPENDIX M

## SCHOOL 8

| PUPILS' NAMES | TEACHERS' RATINGS | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | |
| 1 Quintin | 3 | 4 | 4 | 4 | 4 | 3 | 22 |
| 2 David | 3 | 3 | 3 | 4 | 2 | 3 | 18 |
| 3 Peter | 2 | 3 | 3 | 4 | 2 | 3 | 17 |
| 4 Jonathan | 6 | 7 | 6 | 7 | 6 | 4 | 36 |
| 5 Chad | 2 | 3 | 2 | 4 | 4 | 3 | 18 |
| 6 Charles | 1 | 4 | 4 | 2 | 1 | 3 | 15 |
| 7 Michelle | 3 | 5 | 6 | 4 | 4 | 4 | 26 |
| 8 Linda | 2 | 5 | 3 | 2 | 2 | 3 | 17 |
| 9 Rosalinda | 3 | 3 | 3 | 4 | 2 | 3 | 18 |
| 10 Delilah | 3 | 2 | 4 | 5 | 3 | 4 | 21 |
| 11 Laura | 3 | 2 | 3 | 2 | 3 | 3 | 16 |
| 12 Marijana | 3 | 2 | 3 | 5 | 3 | 4 | 20 |
| 13 Jacqueline | 1 | 2 | 3 | 2 | 2 | 3 | 13 |
| 14 Samantha | 3 | 4 | 4 | 4 | 4 | 4 | 23 |
| 15 Vanessa | 2 | 3 | 3 | 2 | 3 | 3 | 16 |
| 16 Lorella | 2 | 3 | 3 | 4 | 2 | 5 | 19 |
| 17 Jenny | 5 | 6 | 4 | 4 | 5 | 4 | 28 |
| 18 Adrianne | 5 | 5 | 4 | 3 | 4 | 3 | 24 |
| 19 Mandy | 4 | 5 | 4 | 4 | 5 | 5 | 27 |
| 20 Lori | 3 | 6 | 4 | 3 | 5 | 4 | 25 |
| 21 Kim | 3 | 5 | 5 | 7 | 4 | 5 | 29 |
| 22 Nicole | 5 | 6 | 4 | 5 | 5 | 4 | 29 |
| 23 Andrea | 6 | 6 | 5 | 5 | 6 | 4 | 32 |
| 24 Linda | 3 | 3 | 4 | 3 | 3 | 3 | 19 |

N = 24

APPENDIX M

SCHOOL 9

| PUPILS' NAMES | TEACHERS' RATINGS $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | TOTAL |
|---|---|---|---|---|---|---|
| 1 Alan | 3 | | 3 | 3 | 5 | 14 |
| 2 Willy | 4 | | 2 | 4 | 4 | 14 |
| 3 Robert | 4 | | 4 | 4 | 3 | 15 |
| 4 Ben | 2 | | 3 | 3 | 3 | 11 |
| 5 Howard | 4 | | 2 | 3 | 3 | 12 |
| 6 Harry | 5 | | 4 | 3 | 3 | 15 |
| 7 Mark | 2 | | 3 | 5 | 2 | 12 |
| 8 Kevin | 5 | | 3 | 6 | 3 | 17 |
| 9 Mike | 3 | | 3 | 6 | 4 | 16 |
| 10 Ralph | 5 | | 3 | 3 | 4 | 15 |
| 11 Greg | 2 | | 3 | 4 | 5 | 14 |
| 12 Hugo | 2 | | 2 | 6 | 2 | 12 |
| 13 Graham | 2 | | 4 | 4 | 3 | 13 |
| 14 Douglas | 4 | | 3 | 5 | 5 | 17 |
| 15 Ken | 3 | | 2 | 4 | 4 | 13 |
| 16 Steve | 4 | | 3 | 4 | 4 | 15 |
| 17 Bradley | 5 | | 3 | 4 | 4 | 16 |
| 18 Mike | 2 | | 2 | 3 | 4 | 11 |
| 19 Sean | 5 | | 3 | 3 | 3 | 14 |
| 20 Andrew | 3 | | 3 | 3 | 4 | 13 |
| 21 John | 4 | | 4 | 3 | 4 | 15 |
| 22 Ray | 4 | | 3 | 3 | 3 | 13 |
| 23 Henry | 2 | | 2 | 4 | 5 | 13 |
| 24 Brian | 6 | | 4 | 4 | 5 | 19 |
| 25 Juan | 2 | | 3 | 3 | 4 | 12 |
| 26 James | 5 | | 3 | 3 | 5 | 16 |
| 27 Neil | 2 | | 2 | 3 | 3 | 10 |
| 28 Colin | 5 | | 3 | 3 | 5 | 16 |
| 29 Peter | 5 | | 3 | 3 | 4 | 15 |
| 30 Frank | 4 | | 2 | 3 | 5 | 14 |
| 31 Deon | 4 | | 3 | 4 | 3 | 14 |
| 32 Roy | 4 | | 3 | 3 | 3 | 13 |
| 33 Arnold | 1 | | 2 | 3 | 3 | 9 |

(All pupils were given '3' or '4'. Ratings discarded).

N = 33

APPENDIX M

SCHOOL 10

| | PUPILS' NAMES | TEACHERS' RATINGS $T_1$ | $T_2$ | $T_3$ | $T_4$ | TOTAL |
|---|---|---|---|---|---|---|
| 1 | Dennis | 3 | 2 | 2 | 3 | 10 |
| 2 | Laurie | 5 | 6 | 6 | 5 | 22 |
| 3 | Colin | 5 | 4 | 4 | 4 | 17 |
| 4 | Samantha | 5 | 5 | 4 | 3 | 17 |
| 5 | Sean | 4 | 4 | 4 | 3 | 15 |
| 6 | Tim | 4 | 4 | 4 | 3 | 15 |
| 7 | Craig | 5 | 4 | 4 | 4 | 17 |
| 8 | Norman | 5 | 5 | 5 | 4 | 19 |
| 9 | Jenny | 5 | 5 | 3 | 5 | 18 |
| 10 | Priscilla | 4 | 4 | 4 | 3 | 15 |
| 11 | Ben | 4 | 5 | 4 | 2 | 15 |
| 12 | Dalene | 2 | 2 | 2 | 1 | 7 |
| 13 | Juan | 3 | 6 | 2 | 2 | 13 |
| 14 | Leigh | 5 | 5 | 4 | 4 | 18 |
| 15 | Reg | 4 | 4 | 5 | 4 | 17 |
| 16 | Marc | 4 | 5 | 5 | 4 | 18 |
| 17 | Eric | 6 | 6 | 6 | 5 | 23 |
| 18 | Teunis | 5 | 5 | 4 | 3 | 17 |
| 19 | Damron | 4 | 5 | 5 | 4 | 18 |
| 20 | Laura | 4 | 4 | 3 | 3 | 14 |
| 21 | Nancy | 4 | 4 | 4 | 4 | 16 |
| 22 | Graham | 4 | 5 | 5 | 3 | 17 |
| 23 | Julie | 3 | 2 | 2 | 2 | 9 |
| 24 | Ricky | 6 | 4 | 3 | 3 | 16 |
| 25 | Ronel | 4 | 5 | 4 | 4 | 17 |
| 26 | Anton | 3 | 3 | 2 | 2 | 10 |
| 27 | Allan | 4 | 5 | 5 | 4 | 18 |
| 28 | Desiree | 4 | 7 | 6 | 3 | 20 |

N = 28

# APPENDIX N

Data for :

(i) five highest scorers in Section A of the final test and teachers' ratings for those five pupils

(ii) five highest scorers according to teachers' ratings and scores in Section A for those five pupils

for each of the ten schools involved.

APPENDIX N

SCHOOL 1

| 5 HIGHEST SCORERS IN SECTION A | | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|---|
| 1 | Robert | 93 | 27 |
| 2 | Kevin | 93 | 38 |
| 3 | Ian | 85 | 21 |
| 4 | Donovan | 84 | 16 |
| 5 | Matthew | 84 | 22 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|---|
| 1 | Kevin | 38 | 93 |
| 2 | Mario | 33 | 75 |
| 3 | Mark | 32 | 77 |
| 4 | Joao | 27 | 79 |
| 5 | Robert | 27 | 93 |

SCHOOL 2

| 5 HIGHEST SCORERS IN SECTION A | | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|---|
| 1 | Paulina | 93 | 19 |
| 2 | Margarlda | 89 | 19 |
| 3 | Maria | 86 | 20 |
| 4 | Rosamaria | 86 | 15 |
| 5 | Gabriel | 83 | 19 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|---|
| 1 | Angelina | 24 | 69 |
| 2 | Mandy | 22 | 61 |
| 3 | Mariana | 21 | 75 |
| 4 | Maria | 20 | 86 |
| 5 | Margarlda | 19 | 89 |

APPENDIX N

SCHOOL 3

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Charles | 90 | 30 |
| 2 Nerina | 90 | 29 |
| 3 Liza | 90 | 17 |
| 4 Karen | 88 | 21 |
| 5 Michelle | 88 | 24 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Lana | 31 | 84 |
| 2 Jason | 30 | 85 |
| 3 Charles | 30 | 90 |
| 4 Nerina | 29 | 90 |
| 5 Lashner | 28 | 87 |

SCHOOL 5

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Carrie | 98 | 19 |
| 2 Kerry | 97 | 27 |
| 3 Samantha | 95 | 17 |
| 4 Dale | 93 | 15 |
| 5 Nicolette | 92 | 25 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Belinda | 30 | 77 |
| 2 Kerry | 27 | 97 |
| 3 Colleen | 26 | 80 |
| 4 Nicolette | 25 | 92 |
| 5 Helen | 23 | 77 |

APPENDIX N

SCHOOL 6

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Deolinda | 91 | 16 |
| 2 Tanya | 84 | 20 |
| 3 Paula | 83 | 26 |
| 4 Lenka | 81 | 25 |
| 5 Maria | 80 | 24 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Andrea | 38 | 80 |
| 2 Elsa | 38 | 78 |
| 3 Kaliope | 35 | 73 |
| 4 Mary | 29 | 56 |
| 5 Karen | 26 | 73 |

SCHOOL 7

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Rod | 94 | 34 |
| 2 Lorenzo | 89 | 19 |
| 3 Nicolas | 88 | 23 |
| 4 Kurt | 88 | 21 |
| 5 Tony | 88 | 16 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Rod | 34 | 94 |
| 2 Brian | 31 | 79 |
| 3 Edric | 31 | 74 |
| 4 Charles | 30 | 80 |
| 5 Andre | 28 | 84 |

APPENDIX N

SCHOOL 8

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Jonathan | 93 | 36 |
| 2 Peter | 85 | 17 |
| 3 Marijana | 84 | 20 |
| 4 Michelle | 81 | 26 |
| 5 Charles | 79 | 15 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Jonathan | 36 | 93 |
| 2 Andrea | 32 | 24 |
| 3 Kim | 29 | 79 |
| 4 Nicole | 29 | 78 |
| 5 Jenny | 28 | 72 |

SCHOOL 9

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Kevin | 87 | 17 |
| 2 Colin | 85 | 16 |
| 3 Henry | 84 | 13 |
| 4 Brian | 84 | 19 |
| 5 Douglas | 83 | 17 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Brian | 19 | 84 |
| 2 Kevin | 17 | 87 |
| 3 Douglas | 17 | 83 |
| 4 Mike | 16 | 69 |
| 5 Bradley | 16 | 61 |

APPENDIX N

SCHOOL 10

| 5 HIGHEST SCORERS IN SECTION A | SCORE FOR SECTION A | SCORE ON TEACHERS' RATINGS |
|---|---|---|
| 1 Laurie | 96 | 22 |
| 2 Ricky | 92 | 16 |
| 3 Samantha | 90 | 17 |
| 4 Jenny | 88 | 18 |
| 5 Eric | 87 | 23 |

| 5 HIGHEST SCORERS ON TEACHERS' RATINGS | SCORE ON RATINGS | SCORE FOR SECTION A |
|---|---|---|
| 1 Eric | 23 | 87 |
| 2 Laurie | 22 | 96 |
| 3 Desiree | 20 | 81 |
| 4 Norman | 19 | 85 |
| 5 Jenny | 18 | 88 |