

PROMOTING ENVIRONMENTALLY RESPONSIBLE BEHAVIOUR:  
AN EVALUATION OF THE GLOBAL LEARNING AND  
OBSERVATIONS TO BENEFIT THE ENVIRONMENT (GLOBE)  
PROGRAMME

By

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I declare that promoting environmentally responsible behaviour: An evaluation of the Global Learning and Observations to Benefit the Environment (GLOBE) programme is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE

DATE

(Miss W J Adams)

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## **ABSTRACT**

This study aimed at determining whether participating in an environmental education programme (GLOBE) was positively reflected in participants' environmental perceptions, attitudes and level of environmentally responsible behaviour. An ecologically homogeneous sample consisting of 40 Grade 8 GLOBE participants and 40 non-GLOBE participants was selected. Pearson correlation coefficients, multiple regression analyses and t-tests were employed to compare the research groups. Results showed that GLOBE participants were more positive in their attitudes and actions toward the environment than non-GLOBE participants. GLOBE participants were however not environmentally more perceptive than non-GLOBE participants. Analysing responses of the GLOBE participants in terms of gender and place of residency was fruitless as the sample was too small to yield meaningful results. It was recommended that a more controlled and extended replication of this study, paying specific attention to initial motivations for participation/non-participation in the GLOBE programme, be considered.

# CHAPTER ONE: AIM, LITERATURE REVIEW AND PROBLEM STATEMENT

## 1.1 INTRODUCTION

The last 20 years saw a number of significant changes in perceptions about the environment and the impact of human activity on it. Suggestions that a more ecologically sound worldview is emerging, have gained tremendous credibility over especially the last 10 years (Dunlap, Van Liere, Mertig & Jones, 2000).

Much research went into how people view the environment and their role in and their interaction with the environment. Dunlap and Van Liere for example used their New Environmental Paradigm (NEP) instrument to measure the extent to which people see themselves as an integral part of rather than a separate entity to the environment. Within this new paradigm, the earth's resources are seen as limited and the ecological balance is seen as fragile and easily disrupted by human behaviour (Schultz, 2001).

Other research showed similar results and in each case, human behaviour was identified as the root cause of all environmental problems (Gigliotti, 1992; Newhouse, 1990). Maloney and Ward in Newhouse (1990, p. 26) go so far as to refer to the environmental crisis as '...a crisis of maladaptive behaviour'.

People have finally realised that the environment is a major determinant of the quality of life in any community. This led ordinary people and governments alike to realise the serious threat environmental degradation poses for earth and resulted in concerted efforts on a global scale to curb this threat (Harris & Blackwell, 1996). Despite increased international attention and governmental interventions however; most local and global

efforts are not sufficient at present. The World Wide Fund's (WWF) (2000) 'Living Planet Report', found that the state of the earth's natural ecosystems have declined by about 33% in the last 30 years, while the ecological pressure of humanity on the earth has increased by about 50% (Lotz-Sisitka, 2002; WWF, 2000). All of this led to the realisation that the current behaviour of people toward their environment needs to change, implying that people need to learn how to behave in an environmentally responsible way.

As the ultimate aim of education is to shape human behaviour (Hungerford & Volk, 1990), education and particularly environmental education was identified as a method for promoting environmentally responsible behaviour. A vision of schools leading society was envisaged. South African education experts share this vision. Various projects and initiatives such as the Environmental Education Curriculum Initiative (EECI), the Learning for Sustainable Pilot Project and the National Environmental Education Project for General Education and Training (NEEP-GET) have been launched in order to address this particular void in the South African education arena (Lotz-Sisitka, 2002).

Environmental education however is not a new concept. It has been defined in many ways by various people and has been implemented in the school syllabi of many countries for years, albeit with mixed success. There are various reasons why implementation has not met with more success; for example, there is no consensus of views regarding the nature and purpose of environmental education. It was also realised that existing environmental education programmes have to be revised and new ones developed that are more holistic and learner-centred. This is because one of the more recent definitions of environmental education sees it as '...a holistic, lifelong process of becoming aware of, appreciating, valuing and contributing to the creation and development of the kind of

environment that is healthy and sustainable' (Little, 1998, p. 103). It was also realised that environmental education programmes should not only address awareness of environmental issues, but should be geared toward changing learners perceptions and attitudes towards their environment and lead them to engage in more environmentally responsible behaviour. In order to do this, learners also need to be equipped with the necessary skills (action strategies) to address environmental problems.

### **1.1.1 Aim**

The Global Learning and Observations to Benefit the Environment (GLOBE) programme is an international science and environmental education programme that has been implemented in more than 80 countries since its inception in April 1995 (Hughes, 1998). The programme may very well replace the existing environmental education programmes in many countries as it is already integrated in the existing curricula of schools throughout the world. Many educators are also hailing GLOBE as the 'miracle' programme that will solve all the environmental education problems that exist. It is therefore imperative that the effectiveness of the programme in promoting environmentally responsible behaviour in people be evaluated. The aim of this dissertation is therefore to evaluate the effectiveness of the GLOBE programme in promoting environmentally responsible behaviour in GLOBE learners at one South African school in particular.

## **1.2 DISCUSSION OF RELEVANT TERMS**

The dominant and more traditional western viewpoint has always been a more anthropocentric one, believing that human domination over infinite natural resources leads to inevitable progress (Bell, Greene, Fisher & Baum, 2001). Most non-western cultures have been attributed as having more ecocentric viewpoints toward nature, valuing it for its own sake instead of how it supports and benefits humans. More and more people in western cultures are however adopting a more ecocentric worldview of nature and their role in it and have realised that natural resources are not infinite but are rapidly being eroded. Many are also of the opinion that people have a moral obligation to preserve and where possible restore the natural resources (Brackney & McAndrew, 2001).

The relationship a person has with his or her environment is a complex one that is influenced by a variety of factors such as that person's culture and religion (both past and present) and values. All of these factors and especially the person's dominant value orientation (for example whether that person is more economically inclined or more socially inclined), will influence that person's perceptions, attitudes and ultimately his or her behaviour towards the environment including how that person views his or her role in that environment (Bell et al., 2001; Kortenkamp & Moore, 2001).

### **1.2.1 Environment**

Definitions of the word environment are very similar in their description of what the word entails. For example, Bell et al. (2001) describe the environment as one's surroundings which include one's social environment, for example the people and groups among which we live; one's physical environment, for example the non-animal aspects of one's surroundings such as the wilderness, cities or

farmlands; the natural (non-human) and the built (human made) environment. Willers (1996, p. 24) sees the environment as '... the total complex of inter-relationships making up the physical, biological and socio-political surroundings.'

The following definition describing the environment as '...the aggregate of physical, biological and cultural conditions affecting the life of an individual human being...' (Fiedeldey, Craffert, Fiedeldey-Van Dijk, Marais, Van Staden & Willers, 1998, p. 9) seems to be the most inclusive one and will be used for the purposes of this study.

### **1.2.2 Attitudes**

Behaviour change is a complex process involving the interaction between numerous variables, including attitude. One way of changing people's behaviour therefore, is by changing their attitudes as previous research showed a relationship, albeit tenuous at times exists between attitude and behaviour.

Defining an attitude however, is problematic and there is still no consensus on a definition for it. Also, attitudes are often associated with multiple, and even contradictory values (Schultz, 2001). The concept has therefore been defined in various ways by various researchers, usually depending on their specific theoretical framework and the constructs they investigated. Plug, Meyer, Louw and Gouws (1986) for example define an attitude as a relatively stable, predominantly learnt disposition of an individual towards a specific object (for example, people, things or ideas). Fishbein and Ajzen in Thirion (1990) believe that an attitude consists of and is influenced by three components, namely the subject (a person with a specific attitude); the object (at which the attitude is directed)

and the situation (in which the subject and object interact with one another). A change in any of these components can cause the attitude to change. Eagly and Chaiken (1993) on the other hand define attitudes as psychological tendencies that are expressed by evaluating a particular entity (for example the environment) with some degree of favour or disfavour. This evaluative response may be expressed as a cognitive tendency (thoughts and ideas about an attitude object like the environment for example); as an affective tendency (positive or negative feelings towards or about the environment) or a behavioural tendency (action toward the environment) or a combination of two or all three of these psychological tendencies. An attitude only develops after a person has responded evaluatively to the attitude object and is then expressed or manifested in overt cognitive, affective or behavioural responses (Willers, 1996, p. 28).

There appears to be consensus among the various definitions of attitude regarding the following: an attitude is evaluative in nature; is learnt; is relatively lasting; is always involving an object and is predisposing the subject to act in a specific manner towards a given object (Thirion, 1990).

### **1.2.3 Environmental attitudes**

Saying that environmental attitudes refer to people's favourable or unfavourable feelings toward some feature of the physical environment or toward an issue which pertains to the physical environment (Holahan, 1982, p. 92) is one way of defining environmental attitudes.

Researchers such as Schultz (2000) believe that people's attitudes towards the environment and the type of concern they develop towards the environment, are associated with

the degree to which they view themselves as interconnected with nature.

Stern and Dietz (1994) agree and add that a person's attitude towards the environment is based on the relative importance that person places on him- or herself, other people, and the natural environment. In other words, a person's attitude towards the environment is based on his or her general set of values. They add that people with different value-orientations will ultimately have different attitudes towards, for example, the environment (Schultz, 2001).

### **1.3 DEMOGRAPHIC FACTORS THAT INFLUENCE ENVIRONMENTAL ATTITUDES**

When assessing the way people operate within the environment it is essential to look at their attitudes and their actions toward the environment. It is also important to ask if and how different segments of the population differ with regard to environmental attitudes and behaviour (Bell, et al., 2001; Scott & Willits, 1994).

Various studies have indicated that different groups of people have different attitudes toward the environment. Researchers have initially attempted to explain the difference by focusing on demographic variables such as level of education, age, gender, ethnicity, income and place of residence as possible determinants of environmental attitudes. These researchers however have never been able to establish a strong relationship between demographic variables and environmental concern (Samdahl & Robertson, 1989). Results have been inconsistent and even contradictory regarding most of these variables.



### **1.3.1 Level of education**

One of the most consistent findings in the literature suggests a link between environmental attitudes and level of education. Studies in the US and South Africa indicate that individuals with high academic achievement tend to be more environmentally concerned than those of low academic achievement (Blum, 1987; Buttel & Flinn, 1978b; Grieve & Van Staden, 1985; Reynolds, 1992; Craffert & Willers, 1994; Willers, 1996). Reynolds (1992) for example found that people with matric or post-matric qualifications showed a more caring attitude towards the environment than did people with lower qualifications. Findings by Willers (1996) support this viewpoint. According to her study, improved educational qualifications yielded a higher percentage of environmentally concerned respondents. Siemer and Knuth (2001) add that the type of education people receive also influences how they view their environment.

### **1.3.2 Age**

Researchers such as Bell and his colleagues (2001) and Fiedeldey et al. (1998) believe that age is also one of the best predictors of environmentally concerned attitudes. Fiedeldey et al. (1998) for example refer to research in the US that shows that younger adults expressed more concern for the environment than their older counterparts. Studies of Arcury and Christianson (1990) support this viewpoint and also show that age is inversely related to positive environmental attitudes as older people were found to be less concerned about the environment than younger ones. However Lyons and Breakwell's (1994) research conducted among learners between 13 and 16 years old, reveal that age is in fact positively related to environmental concern. They believe that the positive relationship may be a result of the restricted age range they used (13 - 16) and because of a

possible difference in the educational curricula of the different grades.

### **1.3.3 Gender**

Gender has shown poor consistency and poor conclusiveness as a predictor of environmental attitudes. Studies by Blum (1987) and Roth and Perez (1989) for example show no difference between the two sexes, whereas studies for example of Williams and McCrorie (1989) suggest that women are more concerned about the environment than men. Studies by Arcury and Christianson (1990) however show that men are more environmentally concerned than women. Researchers such as Schahn and Holzer (1990) offer a possible explanation. According to their findings the difference in levels of environmental concern between men and women are dependent on the specific environmental issue under consideration. Research by Scott and Willits (1994) supports this viewpoint. Their findings suggest that men may be more likely to engage in relevant political behaviour whereas women are more likely to participate in environmentally protective consumer behaviour.

Lyons and Breakwell's (1994) study among 13 - 16 year old learners revealed no sex differences in the level of environmental concern. However their study indicate a statistically significant difference in the level of self-reported environmental knowledge between boys and girls. Girls tended to report less knowledge on industrial pollution than boys. Lyons and Breakwell (1994) suggest that this may be because industrial-related topics are considered to be scientific and technological, hence girls assume that they would know

less than boys on these topics and this is reflected in the way they answered these questions.

Studies by Lindemann-Matthies (2002) however show gender to be a strong predictor of environmental perception. Participation in an environmental education programme affected girls and boys differently. A higher proportion of girls (46.6%) than boys (39.7%) in a class stated that they could identify and name more species of animals and plants in their immediate environment. This phenomenon occurred for all age groups.

### **1.3.4 Ethnicity**

Ethnicity, like gender showed poor consistency and poor conclusiveness as a predictor of environmental attitudes. However studies by Taylor (1989), Caron (1989) and Honnold (1981) indicate differences in attitudes towards the environment between white and Black US citizens. Bell et al. (2001) also believe that ethnic and cultural differences may influence how people view different aspects of the natural environment. Although there are limited data on ethnic differences in environmental concern in South Africa (Fiedeldey et al., 1998), studies by Van Aswegen (1992) and Craffert and Willers (1994) for example, indicate that ethnicity has been significantly related to people's views on environmental degradation. Craffert and Willers (1994) show that 93% of the white, 70% of the coloured, 67.2% of the Asian and 55.4% of the black samples regarded environmental degradation as a priority. Supporting this are findings from Willers' (1996) study, which show ethnic grouping as the single most significant and consistent predictor of environmental concern.

Most of these studies however warn against unidirectional causal interpretations and assert that other interacting factors such as socio-economic status and place of

residence be considered when interpreting differences in attitudes exhibited by different ethnic groupings.

### **1.3.5 Socio-economic status**

Lyons and Breakwell's (1994) studies show that the middle and upper classes were more concerned about the environment than lower classes. Learners from higher socio-economic backgrounds were found to be more environmentally concerned than learners from lower socio-economic backgrounds. According to them, there may be various explanations for this difference. For example, the difference may reflect differences in parenting influences, as higher-class parents are more likely to be knowledgeable and discuss these issues with their children than parents from lower social classes. The difference may also be a result of academic achievement between the two groups or reflect differences in the curricula of the schools these different social groups were likely to attend.

Taylor (1989) states that there are social, economic and psychological reasons why blacks seem to be less concerned about the environment. According to her those who form part of the lower socio-economic classes, tend to live in poorly serviced, densely populated and polluted surroundings and are less aware of polluted and overcrowded conditions than their middle and upper class counterparts. Bell et al. (2001) agree and add that socio-economically disadvantaged people do not possess the political or economic power or sufficient information (knowledge) to address these forms of environmental racism even if they are aware of the hazards they face. Since blacks tend to make up the majority of people living under these conditions, this may explain why they tend to be less environmentally concerned.

Lyons and Breakwell (1994) also assert that another variable namely level of scientific knowledge is a good discriminator between different socio-economic groups. They have concluded that it is possible that scientific knowledge raises awareness of environmental problems as well as of their possible solutions. According to them, learners who score high in the science quiz, which was an objective test of knowledge, would be more receptive to information on these issues and have thought about them and therefore have formed opinions compared to those who have lower scores.

Nevertheless research by Buttel and Flinn (1978) show a weak link between socio-economic status and environmental attitudes or concern.

#### **1.3.6 Place of residence**

Place of residence can also be seen as a predictor of environmental attitudes. Bell et al. (2001) for example found that urban and rural residents in the US view the natural environment differently. Other findings from studies in the US suggest that urban residents are more likely to be environmentally concerned than rural ones (Fiedeldey et al., 1998). Lyons and Breakwell (1994) agree that place of residence and academic achievements are related to environmental concern. They also believe that urban people are more positive in their attitudes toward the environment than rural people and that those with high academic achievement tend to be more environmentally concerned than those with low academic achievement. Willers' (1996) findings among South Africans also show that the level of education and place of residence interact in predicting environmental concern.

### **1.4 FORMING ENVIRONMENTAL ATTITUDES**

According to Newhouse (1990), there is relatively little research about how environmental attitudes are formed and changed. Most research, according to her, focused on the more tangible question of impact of specific educational programmes despite the fact that most environmental attitudes are formed as a result of life experiences and not necessarily because of specific educational programmes designed to change attitudes. Brackney and McAndrew (2001) add that one needs to understand a person's environmental worldview before one can even attempt to understand and thus influence his or her attitudes towards the environment.

Newhouse (1990) goes further and suggests that these life experiences that include initial predisposition to certain behaviour together with further activities concerning that behaviour, interrelate to form attitudes. Other forms of life experiences, such as the environment in which a person grew up in, have been found to correlate with environmental attitudes (Newhouse, 1990). Newhouse refers to Kostka's (1976) research, which found that urban Grade 6 learners in the US scored much lower on an environmental attitude assessment than did their suburban counterparts. Kostka postulates that this may be due to a vast combination of factors, for example, the influence of peers and family and the physical environment (e.g. little exposure to the natural environment).

Newhouse (1990) believes that mere exposure of a stimulus is sufficient to enhance an observer's attitude towards that object. According to her, several studies (e.g. Zajonc, 1968) found evidence of this. She also cites studies by Morgan and Gramann (1988), which support this viewpoint. They however caution that the level of exposure should be high and occur over a period of time. Another suggestion is that high levels of exposure be combined with hands-on contact with the object as this was found to promote attitudinal change.

Information is another important factor that may contribute to attitude change. Newhouse (1990) warns that the value of pure information in changing attitudes is difficult to assess as there are too many other factors involved, such as the source of the message, message content, and the characteristics of the recipients.

Authors such as Morgan and Gramann (1988 in Newhouse, 1990) and Bell et al. (2001) found that modelling is also an effective way of producing attitude change. Morgan and Gramann (1988) believe that modelling relies on associating objects with people who are respected or liked. Effective modelling according to them should meet at least three criteria:

1. Subjects must believe that the rewards observed from the model will be the same if they perform the behaviour.
2. The benefits of the behaviour must appear to outweigh the costs.
3. The model must be viewed in an emotionally positive way (In Newhouse, 1990).

However, it has also been argued (Newhouse, 1990) that modelling, despite its effectiveness in encouraging the adoption of appropriate values and attitudes, has at least three shortcomings when it comes to the complex issue of forming positive environmental attitudes. These shortcomings are:

1. Modelling stresses persuasion, not true education.
2. Modelling views the learner as an object to be manipulated rather than taught.
3. Modelling fails to provide the learner with the skills to make future decisions.

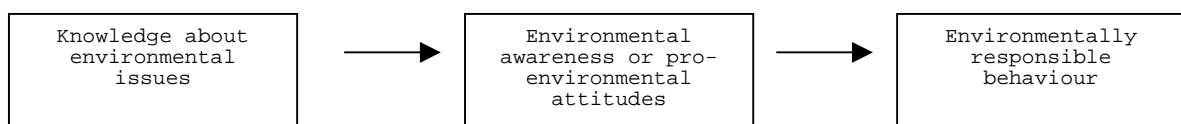
Kauchak et al. (1978 in Newhouse, 1990) therefore suggest that environmental attitudes be formed by teaching environmental issues as moral dilemmas in order for learners to analyse and draw inferences from their own

personal perspectives. Baines (1988 in Newhouse, 1990) agrees. He adds that teachers should be prepared to introduce children to controversial topics. This will give them the opportunity to assess the value of the information (data) they gather. It will also help them recognise the motivations of different interest groups and critically assess information from a variety of sources, hence allowing them to draw their own conclusions and make their own value judgements.

## 1.5 THE RELATIONSHIP BETWEEN ATTITUDE AND BEHAVIOUR

Traditionally the assumption was that increased environmental knowledge would automatically lead to environmental awareness (perceptions) that would in turn lead to pro-environmental attitudes that will be expressed as overt and responsible environmental behaviour. This simplistic and linear relationship is illustrated in Figure 1.1.

**Figure 1.1: A simplistic linear model of environmentally responsible behaviour**



Various studies on environmentally responsible behaviour have been undertaken over the past 20 years. Most of these research findings however, suggest that attitudes do not necessarily influence or lead to overt behavioural changes. For example, a positive attitude towards the environment will not necessarily mean that an individual will buy environmentally friendly products or recycle these products (Bell et al., 2001). Wicker (1969) in fact found a weak relationship between attitude and behaviour (in Baron & Byrne, 1987). Although attitudes may not



cause behaviour, they may have important causal effects on behaviour. The question is therefore when and how attitudes will have causal effects on behaviour.

Attitudes are theoretical constructs and are not accessible through direct observation (Fishbein & Ajzen, 1975 in Dillon & Gayford, 1997). They must be inferred from measurable responses such as direct observation of behaviour. Since this is often difficult to achieve, responses such as statements of intentions are frequently used as they are considered to be more reliable predictors of behaviour. However, an individual's behavioural intentions are influenced by factors such as his or her attitude, social norms and perceptions of personal control over a given situation. This is the basis of a psychometric model developed by Ajzen and Fishbein (1980 in Dillon & Gayford, 1997) in their theory of reasoned action and in Dillon and Gayford's (1997) subsequent theory of planned behaviour.

According to Dillon and Gayford (1997), Ajzen and Fishbein's theory of reasoned action provides a theoretical framework within which the relationship between attitude and behaviour can be studied. In their theory they distinguish between beliefs, attitudes, intentions, and behaviour. Beliefs involve knowledge or opinions concerning the attitude object; attitudes involve emotions and evaluations with respect to that object; intentions refer to the behavioural aims; and behaviour involves the actual action itself (Dillon & Gayford, 1997).

Fishbein and Ajzen (in Dillon & Gayford, 1997) postulated a specific pattern of effective relations among the four components. In their view, for instance, actual behaviour is, first, a function of behavioural intentions, and second, a function of attitudes that, in turn, is affected by knowledge. A critical assumption in their theory is that knowledge and attitudes influence actual

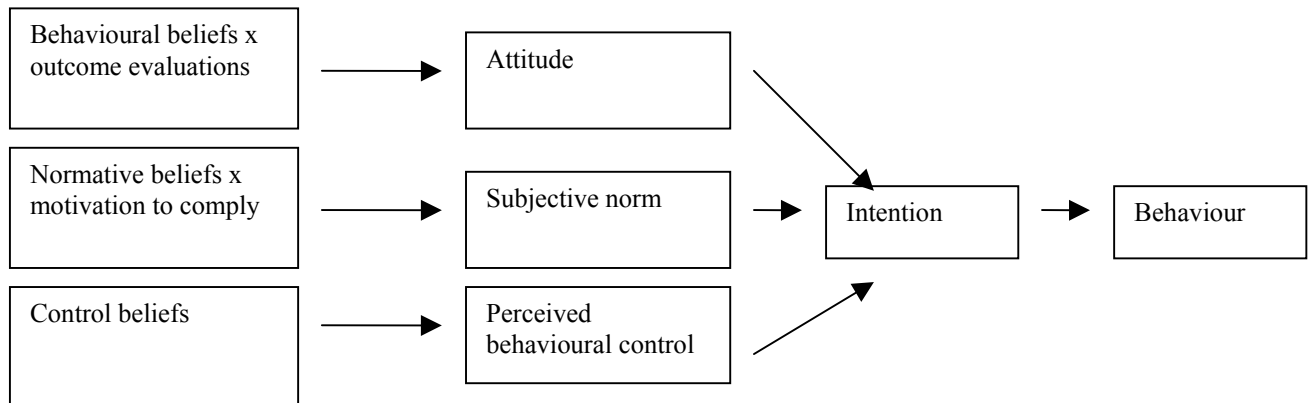
behaviour only through behavioural intentions. According to them, behavioural intentions are the best predictors of actual behaviour. In line with this theory at least four environmentally related dimensions could be distinguished: knowledge and opinions concerning the environment; attitude towards the environment; willingness to make personal sacrifices in favour of the environment (behavioural intention) and environmentally responsible behaviour (Dillon & Gayford, 1997). They also stress that knowledge affects actual behaviour only through attitude and behavioural intentions.

According to Dillon and Gayford (1997), the principle of Ajzen and Fishbein's theory is that it integrates attitude, subjective norm and perceived behavioural control. Dillon and Gayford (1997) furthermore believe that these variables exert powerful influences on behavioural intentions. They have therefore adapted Ajzen and Fishbein's theory and described the variables in the following way:

1. An attitude is an individual's beliefs about the outcomes of the behaviour (known as the 'behavioural belief'), combined with the value placed on those outcomes (known as the 'outcome evaluation').
2. A subjective norm is the individual's perception of the social pressure to perform or not to perform a particular behaviour based on his or her beliefs (known as 'normative beliefs') about the wishes of peer group, family and important others and his or her 'motivations to comply' with this pressure.
3. Just as beliefs concerning consequences of behaviour underlie an individual's attitudes and normative beliefs underlie his or her subjective norms, so beliefs about resources and opportunities (known as 'control beliefs') underlie an individual's perceived 'behavioural control'. Perceived behavioural control is thus the degree of control that an individual thinks he or she has over his or her actions. This perception reflects past

experience as well as an anticipation of impediments and obstacles (Dillon & Gayford, 1997).

**Figure 1.2: Dillon and Gayford's (1997) model of planned behaviour**



(Dillon & Gayford, 1997, p. 285)

The model has been used in a wide range of contexts for investigating human behaviour in a variety of social groups and cultures (Dillon & Gayford, 1997). Questions focused on personal intentions rather than the way respondents felt those in society expected them to respond. Dillon and Gayford (1997) reiterate that the model has been applied in a wide variety of contexts and research evidence supports the view that statements of behavioural intentions are strong indicators of personal behaviour. People's beliefs and value systems influence these behavioural intentions. As Ajzen (1988 in Dillon & Gayford, 1997, p. 288) has observed '...in the final analysis, a person's behaviour is explained by

considering his or her beliefs. Since people's beliefs represent the information (be it correct or incorrect) they have about themselves and about the world around them, it follows that their behaviour is ultimately determined by this information.'

This model allowed comparison between three different kinds of normative influence: family, close friends and those considered experts. Responses in relation to the normative influences of family and close friends often showed a broader distribution, indicating that these influences are often fairly weak. There was generally a tendency for more strongly held positive views relating to normative beliefs based on the opinions of experts. The responses relating to personal control over a given situation also showed fewer strong positive responses, suggesting that many respondents felt that their personal control over many of the issues were limited (Dillon & Gayford, 1997).

The results of the study conducted by Dillon and Gayford (1997) showed that within the broad range of questions relating to different aspects of environmental issues, most of the respondents gave positive responses. The most consistent positive distributions across the different elements of the model were those concerning the recycling of glass. A possible explanation may be that in areas where the issue appears to be most straightforward, where there is reasonable information available and individuals are able to exercise more control over both their behaviour and its outcomes, they tend to make supportive statements about environmentally responsible intentions (Dillon & Gayford, 1997).

The results show among other things, the composite importance of the influences of attitudes, subjective norms and perceived control of behavioural intention, with attitudes appearing to be the most consistently

associated with behavioural intentions (Dillon & Gayford, 1997).

From the above, one can infer that people sometimes give careful and deliberate thought to their attitudes and the implications of those attitudes on their behaviour. The best predictor of how a person will act in a given situation, is the strength of his or her intention with respect to the situation (Dillon & Gayford, 1997). For example, a person may have an intention to engage in certain behaviour, and not necessarily be driven by an attitude.

The following factors may play a role. The person's attitude towards the behaviour in question, for example a very shy person may be too timid to participate in an anti-cruelty to animals demonstration. The second factor known as subjective norms refers to the person's belief about how others will evaluate the proposed behaviour. If the person believes others, especially significant others will view the proposed action and hence him- or herself in a very positive light, it may strengthen his or her intention to engage in that particular action or behaviour. The person thus has a vested interest in performing that particular behaviour (Baron & Byrne, 1987). The ease or difficulty with which a person perceives a proposed behaviour, will also impact on whether the person will actually engage in that overt behaviour or not. For example, a person may support the notion of recycling but view the act of engaging in recycling as time consuming and inconvenient and hence refrain from doing so. The perceived consequences of behaviour therefore influence intentions, which in turn strongly influence or predict actual behaviour.

Other less obvious factors are also related to attitude strength. One is direct experience. Attitudes formed by direct experience tend to be stronger and to predict behaviour better than other attitudes (Baron & Byrne,

1987; Bell et al., 2001). Attitude accessibility, which refers to how readily an attitude comes to mind, is another factor that may play a role in how attitudes affect behaviour. It stands to reason that strong attitudes come readily to mind and therefore exert more influence on behaviour than weaker attitudes. Direct experience and vested interest also make the attitude accessible, and are therefore two factors that increase the effect an attitude has on behaviour (Baron & Byrne, 1987). Another factor that may strengthen the attitude-behaviour relationship, is the amount of information or knowledge that is available. According to Eagly and Chaiken (1993) the less information an individual possesses about an attitude object, the more unstable the attitude will be.

Although Wicker (1969) found a weak relationship between attitude and behaviour, other studies show that attitude can in fact predict behaviour under some conditions (Willers, 1996). Bright and Tarrant (2002) believe that strongly held attitudes are more likely to predict related behaviour than weakly held attitudes. Some studies confirmed this as they showed that the relationship between general attitudes (for example, attitudes about religious or political issues) and behaviour tend to be weak whereas the relationship between specific, narrow and precise attitudes (referred to as attitude specificity) and behaviour tend to be quite strong (Baron & Byrne, 1987). According to Newhouse (1990), the more relevant or important an object is to one personally, the more predictable will the behaviour of the person towards that object be.

The careful consideration of the pros and cons of engaging in a certain behaviour or not however, is not always an option. There are situations that require immediate action and do not allow for careful deliberation or reflection. In these situations, the person's attitude, coupled with his or her perception of

appropriate behaviour (social norms) and previous experience, will influence immediate behaviour or reaction on that person's part.

One can thus postulate that attitudes are related to behaviour. When these attitudes are strong and important, are acquired through direct experience, influence the person's self-interest and are accessible, they can have stronger effects on behaviour.

#### **1.5.1 Attitude theory and environmental education programmes**

There are several potential advantages of applying the theories of reasoned action and planned behaviour to learners and their views on the environment and hence hold important implications for future environmental education programmes. They provide a mechanism for relating cognitive elements of environmental education to the more subjective, affective elements. Consequently, it helps to meet the criticism that it is not simply through knowledge and understanding of issues and principles that changes in attitudes and behaviour may be brought about. Using this model allow us to focus on more subtle, and probably more relevant aspects of cognition, such as peoples' beliefs about the outcomes of particular kinds of behaviour and the degree of personal control they understand they have over situations as well as their own behavioural intentions in relation to particular environmental issues (Bell et al., 2001; Dillon & Gayford, 1997).

Furthermore, the way that Dillon and Gayford's (1997) study was applied here placed the emphasis firmly on the individual and his or her personal intentions, rather than on what was considered to be what those in society at large ought to do. Again all of these have important implications for teaching and learning in environmental

education. Another important feature of the use of this model is that it focuses attention away from simply concentrating on attitudes as the most important affective aspect in relation to the environment and directs attention to behaviours or at least the stated intentions to behave in a particular way (Dillon & Gayford, 1997).

A particular factor that has received little attention from environmental educators is that of the perceptions of control that individuals feel that they have over behaviours relating to particular environmental issues. This fits in with research (e.g. Hines, Hungerford, & Tomera, 1986/87; Hungerford & Volk, 1990) that indicate that locus of control plays a role in determining whether someone will be more likely to engage in environmentally responsible behaviour or not.

## **1.6 ENVIRONMENTALLY RESPONSIBLE BEHAVIOUR**

Various studies on environmentally responsible behaviour have been undertaken over the past 20 years. Some of these studies showed that the process is more complex than the one illustrated in figure 1.1 (p.15) and that prediction of environmentally responsible behaviour depends on various factors that interact (Bell et al., 2001; Hungerford & Volk, 1990). Research focused mainly on identifying the demographic and personality characteristics of those most likely to engage in environmentally responsible behaviour (e.g. Hines et al., 1986/7) and on the effects of behavioural interventions on environmental behaviour. The most enduring avenue of research in this area, however has been to examine how cognitive and psychosocial variables influence environmental behaviour.



Variables studied have included the influence of perceived costs and benefits of the behaviour (e.g. De Young, 1990); inconvenience of performing the behaviour (e.g. Humphrey, Bord, Hammond & Mann, 1977); barriers and facilitating conditions to performing the behaviour (e.g. Derksen & Gartrell, 1993); knowledge or difficulty of the behaviour (e.g. De Young, 1989); perceived effectiveness or control required to perform the behaviour (e.g. Hines et al., 1986/87); attitudes toward the behaviour (e.g. Hines et al., 1986/87) and social influences on the individual performing the behaviour (in Taylor & Todd, 1995).

Taylor and Todd (1995) believe that people generally seem to be sensitive to environmental issues, and may have a positive attitude toward environmental programmes. Yet, despite these positive attitudes, participation in environmental programmes such as waste management programmes for example, varies widely (Bell et al., 2001). Little is known about how an individual's beliefs and attitudes are related to behaviour. Hopper and Nielsen (1991) suggest that this is because the literature lacks an integrated theoretically based model to understand the relationships between environmental beliefs, attitudes and behaviour. Schultz (2000) concurs. He adds that this may be because most of the research on environmental issues has been based on traditional social psychological theories of attitudes, resulting in most of the research on environmental concerns, motives and behaviours, being fragmented and hence difficult to integrate into an organised theory.

#### **1.6.1 The Hines Model of Responsible Environmental Behaviour**

In 1986-87 some researchers including Hines, published an important meta-analysis of behaviour research literature (Hungerford & Volk, 1990, p. 9). These researchers analysed 128 studies, which assessed variables in

association with responsible environmental behaviour and which reported empirical data on this relationship.

This analysis resulted in the emergence of a model of responsible environmental behaviour allowing Hines and his colleagues to make certain inferences. According to them, factors such as an intention to act, prior knowledge of the problem at hand, and a desire to act are more likely to lead to actual action on the part of an individual. A person's desire to act is influenced by a host of personality factors such as his or her locus of control, attitude toward the environment and toward taking action as well as situational factors such as age, gender and level of education (Hungerford & Volk, 1990).

Newhouse (1990) sees locus of control as a person's perception of his or her ability to bring about change through his or her behaviour. It is very unlikely that someone with an external locus of control for example may try to bring about change because that person attributes change to chance or to powerful others such as God, parents, the government, etc. A person with an internal locus of control for example, will be more willing to become actively involved as such a person may believe his or her action can make a difference (Fiedeldey et al., 1998; Hungerford & Volk, 1990). Newhouse (1990) goes on to suggest that parents and teachers are capable of promoting an internal locus of control in children by giving them a say in matters that will affect them and by encouraging them to make their own decisions and to critically evaluate the opinions of others.

## **1.7 RELATIONSHIP BETWEEN ENVIRONMENTAL ATTITUDES AND ENVIRONMENTAL BEHAVIOUR**

To reiterate, the underlying assumption has been that people who are knowledgeable about the environment have

positive attitudes toward the environment and manifest these positive attitudes in environmentally responsible behaviour (Kuhlemeier, Van den Berg & Lagerweij, 1999). Research has already shown that this assumption is untrue. For example, research by Dunlap (1991) in Scott and Willits (1994) indicates that despite the growing concern among US citizens of the need to protect the environment, few have adopted a more environmentally responsible lifestyle.

Dunlap goes further and offers a few reasons to explain this discrepancy. He suggests that public concern for the environment may decrease because of the increase in governmental attention to environmental issues, as people tend to believe that the government will now take care of and deal with the problems. Secondly, people tend to see institutions and big companies as the culprits, not individuals; hence they fail to change their ways. Thirdly, people may be willing to change some aspects of their lives (e.g. recycle household waste), but not others (e.g. using public transport instead of driving). Dunlap also feels that people may not have sufficient information about how to act in ways that are more environmentally responsible. He believes that those who are more environmentally aware are more likely to engage in environmentally responsible behaviour if there is strong leadership in regard to environmental protection, emphasising the urgency for people to change their lifestyles (Scott & Willits, 1994).

Scott and Willits (1994) offer the following explanation for the discrepancy. According to them all the media coverage of environmental problems and issues resulted in people learning the language of environmentalism, without developing a simultaneous behavioural commitment. They add that people may simply be unaware of how their personal behaviour impacts on the environment. In other words, people may simply lack the necessary information

on what specific actions they can engage in to become more environmentally responsible.

It is now also believed that environmental knowledge does not necessarily lead to positive environmental attitudes that are manifested in overt and responsible behaviour toward the environment. The following findings support this statement. Kuhlemeier et al. (1999) found that attitudes and behaviour of learners who are knowledgeable about environmental issues do not differ from those learners who do not possess that environmental knowledge. This led them to conclude that environmental knowledge does not necessarily lead to pro-environmental attitudes or a willingness to engage in environmentally responsible behaviour, especially not when this requires making sacrifices on their part or inconveniencing them. However, a willingness to make sacrifices (a behavioural intention) is more likely to lead to environmentally responsible behaviour than an environmental attitude on its own. One can therefore say that a more positive environmental attitude and greater willingness to make sacrifices are more likely to lead to more environmentally responsible behaviour.

Kuhlemeier et al. (1999) however found that the behavioural intention 'willingness to make a sacrifice' combined with a positive environmental attitude did not necessarily lead to more environmentally responsible behaviour on the part of people (in their case, Dutch high school learners). This raised the question of why these learners did not put their behavioural intentions into practice more often. They offer a possible explanation for this. According to them, learners may not have sufficient knowledge of the consequences of their behaviour on the environment. They suggest that environmental education be used to provide learners with knowledge of and skills in using environmental strategies. It is particularly important that the link between environmental problems and learners' personal

lifestyles be stressed. It is also important to raise the awareness of learners to the environmental choices they face as for example residents, consumers, garbage producers and travellers (Kuhlemeier et al., 1999).

The different studies showed that people were unaware of the impact of their own individual lifestyles on the environment. People also felt that they did not possess the necessary knowledge (information) or skills to make a tangible difference in their environments.

Vaske and Kobrin (2001) believe that place attachment facilitates the development of environmentally responsible behaviour. They operationalise place attachment as place dependence which refers to a functional attachment to a specific place and place identity which refers to an emotional attachment to that specific place. According to them a person will engage in environmentally responsible behaviour towards a place (natural setting) if they have emotionally meaningful ties to that place. Environmental education (EE) programmes should therefore be designed in such a way that they help learners form an emotional attachment to their immediate environment and the broader or global environment.

Much of the preceding research is based on data that is over 15 years old. It is imperative to update this data to ascertain whether these findings are still applicable as such information is crucial when designing new environmental education programmes (Scott & Willits, 1994).

## **1.8 ENVIRONMENTAL EDUCATION**

According to Hungerford and Volk (1990) the ultimate aim of education is to shape human behaviour. Educational

systems have therefore been established on a global scale to develop citizens who will behave in desirable ways. Environmental education (EE) has been identified as an educational method for promoting environmentally responsible behaviour in learners and has subsequently been implemented in the curricula of schools throughout the world.

The last 10 years especially saw the scope of environmental education expanding with an increasing emphasis on the role of education in responding to wide-ranging, complex environmental issues and risks. Chapter 36 of Agenda 21 recognises the central role education plays in shaping value orientations and social actions, hence it sees environmental education as a socially transformative and continuous learning process that is based on respect for all life (Lotz-Sisitka, 2002, p. 100).

Guidelines for effective EE programmes that may lead to behavioural changes on the part of learners have also been defined by the 1977 Tbilisi Intergovernmental Conference on EE. These guidelines promote the following:

- **Awareness:** - to help learners acquire an awareness and sensitivity to the total (natural and build) environment and its related problems;
- **Sensitivity:** - to help learners gain a variety of experiences in, and acquire a basic understanding of the environment and its related problems;
- **Attitudes:** - to help learners acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection;
- **Skills:** - to help learners acquire skills for identifying and solving environmental problems;
- **Participation:** - to provide learners with an opportunity to be actively involved at all levels in

working toward the resolution of environmental problems (Hungerford & Volk, 1990, pp. 8-9).

These guidelines allow us to define an environmentally responsible person as someone who has an awareness, sensitivity, understanding and concern for the environment and its problems as well as the motivation for active involvement, combined with the necessary skills to identify and solve environmental problems and who actively engages in working toward a resolution of environmental problems at all levels (Hungerford & Volk, 1990, p. 9).

Teaching environmentally responsible behaviour therefore goes beyond basic education in its traditional sense and involves the teaching of knowledge about environmental issues, the promotion of pro-environmental attitudes and the teaching of the necessary skills for positive action in society (Hungerford & Volk, 1990).

Despite the guidelines, however, the success rate of EE programmes varied. Even programmes that were seen as successful were not far-reaching or widespread enough. One reason for this is that EE does not form part of the formal curricula of most schools and where it is applied, it is usually in the form of an extra-curricular activity. Teachers also have not received adequate training for teaching EE and for incorporating EE instruction across subject areas (Disinger, 2001; Hungerford, 2002). These are serious shortcomings as an interdisciplinary approach to teaching and learning is required in order to produce an environmentally responsible citizenry (Paul & Volk, 2002).

Another reason is that previous models of EE were based on the assumption that knowledge about the environment and environmental problems will lead to environmental awareness and pro-environmental attitudes, which in turn will lead to environmentally responsible behaviour.

Various behavioural studies showed that it is a more complex process and that prediction of environmentally responsible behaviour depends on various factors that interact (Hungerford & Volk, 1990). According to research done by scientists such as Hines et al. (1986/87), factors such as an intention to act, prior knowledge of the problem at hand, and a desire to act are more likely to lead to actual action on the part of an individual. A person's desire to act is influenced by a host of personality factors such as his or her locus of control, attitude toward the environment and toward taking action as well as situational factors such as age, gender and level of education (Hungerford & Volk, 1990). A person with an internal locus of control for example, will be more willing to become actively involved as such a person may believe his or her action can make a difference (Fiedeldey et al., 1998; Hungerford & Volk, 1990).

Most EE programmes, however, do not take these factors into consideration and are still designed to provide knowledge (information) about the environment and increase environmental awareness. Too few incorporate a serious attempt to promote pro-environmental attitudes, and develop or increase the behavioural intentions of learners toward environmentally responsible behaviour (Hungerford & Volk, 1990).

This lack of emphasis on objectives that focus on helping learners actually solve environmental problems and develop problem-solving skills, is contrary to the guidelines as stipulated at the Tbilisi Intergovernmental Conference in 1977 and needs to be rectified (Hungerford & Volk, 1990).

It is imperative that EE programmes move beyond the mere knowledge production and awareness raising and include ways of increasing the intention and desire of learners to act in environmentally responsible ways as well as equip them with the necessary skills and problem-solving



abilities to actively engage in environmentally responsible behaviour (Hungerford & Volk, 1990). A new model of instruction is therefore needed.

## **1.9 THE GLOBAL LEARNING AND OBSERVATIONS TO BENEFIT THE ENVIRONMENT PROGRAMME**

The Global Learning and Observations to Benefit the Environment (GLOBE) programme is an environmental education and science programme that had its inception on 22 April 1995. It is a US-based programme that has been implemented in more than 80 countries (Hughes, 1998). GLOBE goals encompass the guidelines identified at the Tbilisi conference held in 1977 and are as follows:

- Enriching learners' understanding and awareness of both the local and global environment.
- Promoting problem-solving and practical hands-on skills.
- Improving learner achievement in science, mathematics and technology.
- Facilitating global communication, co-operation and information exchange between learners, teachers, scientists and communities.
- Encouraging local projects and initiatives on environmental issues (Hughes, 1998).

GLOBE encourages learners between 5-18 years old to undertake scientific measurements and environmental observations and engage in environmental projects in their communities. Learners then submit their GLOBE data to the international GLOBE data server where the information is accessed by anyone with Internet connectivity and is actually being used by scientists for research purposes. GLOBE is based on the premise that learners will, due to their GLOBE activities, become more environmentally aware and their understanding of their environment as well as their problem-solving skills will

increase. This should then lead to their behaving in more environmentally responsible ways.

This GLOBE vision seems to fit the vision Janse van Rensburg has of the role of environmental education in South Africa. She describes environmental education as a 'responsive process of change' involving the development of the capacity to 'collaboratively develop capabilities, for example, tools, resources and action competencies, to deal with and encourage change in local contexts' (Lotz-Sisitka, 2002, p. 101).

This also ties in well with Emmons' (1997) model of positive environmental action. Emmons believes that a model of environmentally responsible behaviour should focus on the integration of multiple learner-learning areas (which she defines as environmental concepts, environmental attitudes and sensitivity, action skills and procedures, and empowerment and ownership) and their combined effect on positive environmental behaviour. She also suggests that learning preferably occurs in a non-formal experiential setting (Emmons, 1997). Schultz (2000) agrees. He adds that such learning for example, a class trip to a nature reserve would reduce a learner's perceived separation between self and nature, which would in turn lead to an increased concern for the environment. From this one may infer that such an increased concern for the environment may be a positive step towards engaging in environmentally responsible behaviour on the part of that learner. Several researchers found an association among environmental sensitivity and involvement in outdoor activities with significant others as well as among environmental sensitivity and environmentally responsible behaviour - confirming these authors beliefs (Siemer & Knuth, 2001).

Emmons (1997) views positive environmental behaviour as a deliberate strategy that involves decisions, planning, implementation and reflection by an individual or group.

The action or behaviour is also intended to achieve a specific positive environmental outcome, either small or large. This behavioural response will be self-determined and will involve the human capacity for deciding how to behave (Deci, 1980 in Emmons, 1997, p. 35). This sort of behaviour requires foresight and planning and is designed to serve a specific purpose based on the individual's decisions. This behaviour is also voluntary and non-automatic and is both a process and a product.

This ties in well with the environmental oriented outcomes that the Environmental Education Curriculum Initiative (EECI) identified for South African learners. They include the ability to make sound judgements about the management and utilisation of resources and the ability to address social and environmental issues in order to promote development and social justice (Lotz-Sisitka, 2002, p. 108).

Kuhlemeier, et al. (1999) add that it is particularly important that the link between environmental problems and learners' personal lifestyles be stressed. It is also important to raise the awareness of learners to the environmental choices they face as for example residents, consumers, garbage producers and travellers.

Despite the sterling work that many South African education experts and organisations such as EECI and the National Environmental Education Project (NEEP) did in terms of defining environmental education and its role in the South African school context, very little of this environmental education curriculum development has made its way into South African classrooms (Lotz-Sisitka, 2002, p. 108).

These reasons, coupled with the fact that before GLOBE, relatively few countries have made a commitment to EE programmes that involve learners throughout their schooling and that utilise a carefully constructed,

research-based scope and sequence (Hungerford & Volk, 1990), make it imperative that the effectiveness of the programme be evaluated. If found to be effective in promoting environmentally responsible behaviour, the programme may be integrated in the existing curricula of schools on a global scale and particularly other South African schools.

## **1.10 PROBLEM STATEMENT**

Given the above review, the question arises whether participation in the GLOBE programme can be positively related to pro-environmental perceptions, attitudes and environmentally responsible behaviour?

The research aims at determining whether participating in the GLOBE programme is positively reflected in the perceptions, awareness, attitudes and level of environmentally responsible behaviour in learners participating in the programme. This gives rise to the following hypothesis:

- GLOBE learners are more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than non-GLOBE learners.

Concluding from the literature review, a number of secondary demographic hypotheses can also be formulated. For example, research findings (Arcury & Christianson, 1993; Williams & McCorie, 1989) suggest that females are more concerned about the environment than males, hence the hypothesis:

- Female GLOBE learners are more positive in their perceptions of, their attitude toward and their environmentally directed behaviour than male GLOBE learners.

Also, various research studies (Jones & Dunlap, 1992 in Fiedeldey et al., 1998; Samdahl & Robertson, 1989) suggest that place of residence influence people's attitudes toward their environment leading to the following hypothesis:

- GLOBE learners who reside in urban areas are more positive in their perceptions of, their attitude toward and their environmentally directed behaviour than GLOBE learners who reside in rural areas.

Studies, for example Taylor (1989) show that middle and upper social groups are more concerned about the environment than their lower socio-economic counterparts. Research by Lyons and Breakwell (1994) support these findings as their own research show that learners from higher socio-economic backgrounds were more environmentally concerned than learners from lower socio-economic backgrounds hence the hypothesis that:

- GLOBE learners from a higher socio-economic background (i.e. middle class) are more positive in their perceptions of, their attitude toward and their environmentally directed behaviour than GLOBE learners from a lower socio-economic background (i.e. working class).

## **CHAPTER TWO: RESEARCH DESIGN AND METHODOLOGY**

### **2.1 RESEARCH DESIGN**

This research project, which is essentially a pilot study, hence exploratory in nature, only made use of quantitative methods in the pursuit of answers. Circumstances (time and financial constraints) did not allow for a comprehensive and in-depth exploration of all the issues involved. Hence the research study can be typified as a cross-sectional correlational field survey design with no pre-test. The samples, from which statistical inferences was drawn, were randomly selected from two accessible populations (i.e. the entire grade 8 GLOBE and non-GLOBE groups) that were as homogeneous as possible. This increased the comparability of the research groups (Huysamen, 1994).

### **2.2 DATA-GATHERING INSTRUMENT**

In designing the questionnaire, the researcher was heavily guided by the South African version of the PAGEC<sup>1</sup> questionnaire (Fiedeldey et al., 1998). Where necessary, questions were rephrased for suitable use on a South African high school learner sample. A number of other questions that address the broad aims of the study were added.

The data-gathering instrument was composed of a questionnaire consisting of 9 structured and 5 unstructured or open-ended questions (see Appendix B). Four of these open questions dealt with demographic information such as age, grade, ethnic group and home language and therefore only required specific answers. The other unstructured question requested respondents to

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<sup>1</sup> Perception and Assessment of Global Environmental Change<sup>1</sup>

identify environmental problems and rate them according to seriousness.

The questionnaire was divided into two parts. The first part (Questions 1 to 7) aimed at obtaining some indication of the respondents' environmental perceptions, attitudes and environmentally directed behaviour. The second part of the questionnaire (Questions 8 to 14) measured demographic details of the respondents. Simple statistical analyses such as frequency descriptions, Pearson correlation coefficients, multiple regression analysis and t-tests were used to test the hypotheses as described in Chapter one. From this inferences were drawn.

### **2.3 DATA-GATHERING PROCEDURE**

This research study can be typified as a cross-sectional correlational field survey design with no pre-test. The researcher was restricted to one school only because of financial and time constraints. This resulted in an accessible population that was as homogeneous as possible, thus increasing the comparability of the research groups.

During May 2001 data was gathered from Grade 8 learners at Groot Brakrivier Secondary School. To enhance the effectiveness and valid completion of the questionnaire, teachers were requested to go through the questions one by one with the learners before completion in order to ensure that learners would understand what was required of them. Teachers were also requested to make it very clear to learners that there were no right or wrong answers and that the researcher was only interested in their viewpoints. It was furthermore imperative that they answer every question, and the absolute confidentiality of each answer sheet was stressed (Huysamen, 1994).

There are various limitations with regard to this research study. For example it was impossible for the researcher to meet with the fieldworkers in person. She therefore corresponded with them via e-mail and included a detailed letter of instruction (Appendix A) with the questionnaire, requesting the teachers to scrutinise the questionnaire and should they discover any unclear or ambiguous statements to contact her immediately. She further requested them to first trial the questionnaire by asking one GLOBE and one non-GLOBE learner to complete the questionnaire and fax their responses to her. The returned questionnaires showed that respondents understood what was expected from them.

It was clear from the completed questionnaires received that learners clearly understood what was required from them, except with the answering of Question 12, where learners were required to indicate the profession (present or past) of their parents. Some of the learners perfectly understood the question and indicated the profession of their parent(s), whereas others would indicate the company or factory where the parent worked instead of saying what position the parent filled in that company or factory. A number of learners have also completely misunderstood the question and instead of indicating a profession or even a place of work, have rather ticked the box, indicating yes they have a father or mother. The hypothesis testing for possible differences between GLOBE learners from different socio-economic backgrounds had thus to be discarded because of insufficient information.

Language could have posed a problem, as the questionnaire was in English only and the learners at this school are predominantly Afrikaans speaking. Translating the questionnaires in Afrikaans and then having to back translate the data would have been both time consuming and expensive and the researcher decided against that.



The May 2001 data-gathering process was a second attempt. The first data gathering process occurred during September 2000. After this data was collected using a similar procedure, the fieldworkers mailed the completed questionnaires to the researcher. The questionnaires were in two A3 envelopes, but unfortunately only one envelope reached the researcher and the whole process had to be repeated. Since the researcher only received the envelope in November 2000, it was decided to only repeat the process in the following year as it was year-end and the teachers had other priorities such as the impending examinations.

The following year the fieldworkers decided to gather the data in May and to personally deliver the completed questionnaires to the researcher, as they had to be in Pretoria, Gauteng for a GLOBE workshop, which occurred in June 2001. In this way, they ensured that the second batch of questionnaires reached their destination safely.

## **2.4 SAMPLE REALISATION AND COMPOSITION**

A simple random sampling procedure was employed to ensure that enough respondents were available in each of the two research groups to allow meaningful descriptive and inferential analyses of the data. The sample consisted of 80 respondents, 40 GLOBE and 40 non-GLOBE learners. These formed the two criterion groups of this study. The GLOBE respondents were learners who participated in an extra-curricular environmental education and science programme called the Global Learning and Observations to Benefit the Environment (GLOBE) programme whereas the non-GLOBE learners were those who did not participate in this programme.

The researcher was restricted to one school only because of financial and time constraints. Also, by using one

school only, the accessible population was kept as homogeneous as possible, which was likely to increase the comparability of the research groups. The Groot Brakrivier Secondary School was selected because the school has proved to be very co-operative in past endeavours and the teachers were quite willing to participate.

During May 2001 data was gathered from learners at the Groot Brakrivier Secondary School in Groot Brakrivier in the Western Cape. This Afrikaans medium school is situated in the predominantly coloured part of town and serves mainly coloured learners. Groot Brakrivier Secondary School was one of the first schools in South Africa to participate in the GLOBE programme and two teachers from the school Mr Mark Brettenny and Mr Godfrey Felix were trained as GLOBE teachers in 1997 and as GLOBE trainers in 1999. These teachers agreed to act as fieldworkers.

To reiterate, the brief to the fieldworkers was to randomly select respondents who were similar in age and grade and to try and maintain a gender balance. The fieldworkers decided on using Grade 8 learners as mostly lower grades are participating in this extra-curricular programme.

The 200 Grade 8 learners who formed the accessible population were firstly divided into GLOBE and non-GLOBE groups. Forty learners were respectively selected for each operationalised level of the primary classification variable. This was done randomly.

Respondents were divided into GLOBE and non-GLOBE respondents and a new variable 'participation in the GLOBE programme<sup>2</sup> was created using program steps in the SAS computer package (Appendix C). Respondents who participated in the GLOBE programme were assigned to the

GLOBE group and those who did not to the non-GLOBE group. The new variable, 'participation in the GLOBE programme', was assigned a value of one (1) using a nominal scale. This means that the value was only used to group

The respondents into mutually exclusive groups that do not have any magnitude relationship to one another (McCall, 1990, p. 440). The response rate at which questionnaires were returned was 55% for GLOBE and 45% for non-GLOBE respondents. This contributed to a gender composition that was unbalanced within each group. The gender composition between groups was more balanced, for example, 56% of all respondents were female and 44% were male.

In order to control for the extraneous variables, age and grade, it was decided to only select Grade 8 respondents from the age of 13 to 15. This resulted in a response rate of 48% (n = 22) GLOBE and 52% (n = 24) non-GLOBE respondents.

A gender composition of 50% (n = 23) males and females (n = 23) respectively ensued. The gender composition within the GLOBE group however remained unbalanced, for example 68% (n = 15) of GLOBE respondents were female and 32% (n = 7) male.

Seventy-two percent (n = 33) of respondents reside in a rural area while the remaining 28% (n = 13) reside in a semi-urban area. Almost the complete opposite is true for the GLOBE group, as 73% (n = 16) of GLOBE respondents live in a semi-urban area and 27% (n = 6) in a rural area. All of the respondents have indicated Afrikaans as their home language.

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<sup>2</sup> This variable is referred to as 'GLOBE' in the statistical procedures used to test the hypothesis

## **2.5 OPERATIONALISATION AND CODING OF THE CLASSIFICATION VARIABLES**

The responses to all the questions were statistically analysed using the Statistical Analysis System (SAS) software package. Before this process could commence however, the data (responses to the said questions) were captured, using a text editor.

Using the measurements in the questionnaire, composite variables were defined in order to obtain an indication of the nature and extent of this sample group's environmental perceptions/awareness, their environmental attitudes as well as their environmentally directed behaviour.

Questions 4, 5 and 7 were closed or structured questions that required either a yes or no response. The responses to these questions were changed to a dichotomous format where the 'yes' which may be construed as an environmentally oriented response was assigned the value of one (1), and the 'no' response, which is not perceived to be environmentally oriented the value of zero (0). These values were defined on an ordinal level of measurement, indicating some order of relative if not absolute magnitude. For example, a 'yes' response to Question 4, 'Have you done anything to help solve environmental problems?' was converted to a value of one (1) and a 'no' response to said question a zero (0) value.

Question 3 was also a closed or structured question, which requested respondents to choose between two given options namely government or the individual. This was in response to the question, 'Who is more responsible to

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(Appendix C).

protect the environment?'. The responses to this question were also converted to dichotomous variables and the response, 'the individual', which is deemed more environmentally oriented, was assigned a value of one (1), whereas the response, 'government', which seems a less environmentally oriented response, a value of zero (0). Again, these values were defined on an ordinal level of measurement.

Question 8 expected respondents to indicate their gender by ticking the appropriate box (see Appendix B). Since this was also a closed or structured question, it was also converted to a dichotomous format. A new variable, 'gender'<sup>3</sup> was created using program steps in the SAS computer package. The new variable 'gender' was assigned a value of one (1), and 'male' a value of zero (0), using a nominal scale.

### **2.5.1 Environmental perception**

Environmental perception is based on the scope and nature of the information obtained. Question 2 in the questionnaire was used to get an indication of the composition of sources providing environmental information to the respondents (Dillon & Gayford, 1997).

It was decided to convert the responses to Question 2 (see Appendix B) into a dichotomous variable as well. This was to determine whether respondents used or perceived the stated sources of information as sources of environmental information or not. Respondents also had to indicate how much environmental information they had received from a range of sources including the radio, TV news and TV environmental programmes. They had to indicate the amount of information they received from these sources using the categories 'none', which was

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<sup>3</sup> This variable is referred to as 'female' in the statistical procedures in order to distinguish between the sexes.

assigned the value of zero (0); 'a little', which was assigned the value of one (1); 'some', which was assigned the value of two (2); or 'a great deal', which was assigned the value of three (3). An ordinal scale was therefore used to measure the items.

In order to create a dichotomous variable where the aim was only to distinguish between whether sources of information were used or not, responses ranging from 'a little' (1) to 'a great deal' (3) were reclassified and assigned the new value of one (1) whereas responses of 'none' (0) remained zero.

A new variable namely 'environmental information' (referred to as 'info' in the statistical procedures) was then created combining all the possible sources of environmental information as mentioned above. Appendix C shows the program steps that were employed to accomplish this procedure.

This was done because literature (for example Ajzen, 1988 in Dillon & Gayford, 1997) shows that people's behaviour is explained by their beliefs, which represents the information (be it correct or incorrect) they have about themselves and the world around them.

**Table 2.1: Sources of environmental information for the total sample group**

<b>Sources of environmental information</b>				
<b>No</b>	<b>Source</b>	<b>Yes n (%)*</b>	<b>No n (%)*</b>	<b>Rank</b>
1	TV environmental programmes <sup>4</sup>	45 (98)	1 (2)	1
2	TV news <sup>5</sup>	43 (98)	1 (2)	2.5
3	Books	43 (96)	2 (4)	2.5
4	Talking with others	42 (95)	2 (5)	4
5	Newspapers	39 (87)	6 (13)	5
6	General magazines	38 (86)	6 (14)	6
7	Speciality magazines	35 (81)	8 (19)	7
8	Radio	32 (74)	11 (26)	8
9	Other sources	31 (72)	12 (28)	9

<sup>4</sup> The percentages of 97.83 and 2.17 were rounded off to 98% and 2% respectively.

<sup>5</sup> The percentages of 97.73 and 2.27 were rounded off to 98% and 2% respectively.

<b>Total</b>	<b>407</b>	<b>n = 348 (86)</b>
<b>n = 59 (14)</b>		

\* No response to a source of information was regarded as missing data. In these cases n does not add up to 46.

From Table 2.1 it is clear that the research group as a whole mostly viewed all the stated sources of information as information about the environment. Almost every respondent (n = 45; 98%) identified TV environmental programmes as a source of environmental information. The vast majority of respondents (n = 43; 98%) also identified TV news as a source of environmental information. The radio and other sources of information were perceived as the least likely stated sources of information about the environment, yet still scored very high, for example most respondents (n = 32; 74%) identified the radio as a source of environmental information.

In addition to the above range of sources that were generally used, a fairly large number of respondents (n = 31; 72%) also reported making use of other sources of information. While the question did not require further elaboration, the existence of a wide range of sources providing environmentally relevant information to this sample group was noted. It seems that follow-up studies should consider obtaining more detail on the nature, scope and quality of the sources of environmental information used by respondents.

### **2.5.2 Environmental attitudes**

A broad indication of environmental concerns expressed by the respondents was obtained from question 1 (Dillon & Gayford, 1997; Kuhlemeier et al., 1999) (see Appendix B). It was an open-ended question that had two components. Firstly it allowed respondents to list environmental



problems as identified by them. Sixteen categories of environmental problems were created (Table 2.2, p. 46) encompassing all the problems as identified by the respondents. A nominal scale was used to assign values to these categories. The values therefore have no numerical value and were only used to classify the items into discrete or mutually exclusive groups that do not have any magnitude relationship to one another (McCall, 1990, p. 440).

**Table 2.2: Environmental problems as identified by respondents**

No	Categories of environmental problems	Category	Frequency of responses	Percentage *	Rank order
1.	Infectious diseases	Social and environmental	26	19,25	1
2.	Violence	Social	21	15,55	2
3.	Pollution	Environmental	19	14,07	3
4.	Waste	Environmental	11	8,15	4.5
5.	Alcohol and drug abuse	Social	11	8,15	4.5
6.	Littering	Environmental	10	7,40	6
7.	Animal extinction	Environmental	8	5,92	7
8.	Depletion of marine resources	Environmental	7	5,18	8
9.	Water pollution	Environmental	5	3,70	9.5
10.	Unemployment	Social	5	3,70	9.5

11.	Veldfires	Environmental	3	2,22	11
12.	Teen pregnancies	Social	2	1,48	13.5
13.	Poverty	Social	2	1,48	13.5
14.	Deforestation	Environmental	2	1,48	13.5
15.	Sewage	Social and environmental	2	1,48	13.5
16.	Air pollution	Environmental	1	0,74	16
<b>Total</b>			<b>n = 135</b>		

\* Due to rounding, the total may not add up to 100.

This was an open-ended question and respondents could list as many environmental problems as they wanted. The responses ranged between one and four environmental problems. This therefore resulted in certain categories, for example 'infectious diseases' (Category 1) appearing more frequently than other categories, for example, 'deforestation' (Category 14). The problems as identified by the respondents also covered a wide range of social issues.

The 16 categories of environmental problems as identified by respondents were then grouped under three new categories called 'social problems', which was assigned the value one (1), 'environmentally-related problems', which was assigned the value two (2) and 'environmental problems', which was assigned the value three (3). The scale that was used to assign values to these categories is an ordinal scale, so the numbers indicate some relative order of environmental relatedness.

Categories 2, 5, 10, 12 and 13 were grouped under 'social problems', categories 1 and 15 were grouped under 'environmentally-related problems' (social and environmental) and categories 3, 4, 6, 7, 8, 9, 11, 14

and 16 were grouped under 'environmental problems'. This procedure was repeated for each of the four environmental problems as identified by respondents. If a respondent had, for example, identified the three problems deforestation, drug and alcohol abuse and sewage as environmental problems, then deforestation would be regrouped under 'environmental problems', drug and alcohol abuse under 'social problems' and sewage under 'environmentally-related problems'. The frequency of responses for each of these new categories was 5 (31.3%) for social problems, 2 (12.5%) for environmentally-related problems and 9 (56,2%) for environmental problems.

Social problems, for example violence (n = 21; 15.55%) refer to problems that occur in the human environment for example problems in interpersonal, community, cultural, economic or political environments (Fiedeldey et al., 1998) whereas environmentally-related (social and environmental) problems such as infectious diseases (n = 26; 19.25%) refer to problems that have both a social and environmental impact where one usually leads to or influence the other. Environmental problems such as pollution (n = 19, 14.07%) on the other hand refer to problems that occur in the natural or physical environment for example the depletion or extinction of natural resources such as fauna and flora which inevitably leads to fragile ecosystems which ultimately threaten the biodiversity on earth.

The social and environmentally-related categories received the highest response rate for example, an environmentally-related problem namely infectious diseases (n = 26; 19.25%) received the highest response rate whereas an environmental problem namely air pollution received the lowest response rate (n = 1; 0.74%). This showed that the socio-economic conditions and built environment that these respondents have to live

in was of greater concern to them than the physical or natural environment. This is not surprising as their community is mostly a working class rural community where poverty, violence, drug and alcohol abuse as well as infectious diseases; particularly HIV/AIDS and tuberculosis (TB) are rife. Almost every respondent who identified infectious diseases as a potential environmental problem, mentioned AIDS and TB illustrating the point.

Despite this, most of the problems identified were in fact environmental problems showing that these respondents are capable of identifying environmental problems. The environmental problem that received the highest response rate is pollution (n = 19; 14.07%). It is interesting to note that although respondents in both sample groups identified pollution as an environmental problem, only respondents in the GLOBE sample group distinguished between different types of pollution, for example water pollution (n = 5; 3.70%) and air pollution (n = 1; 0.74%).

Secondly the respondents had to classify the identified environmental problems as 'not very serious' (1); 'somewhat serious' (2) or 'very serious' (3). An ordinal level of measurement was used to assign numbers to these categories, and again the numbers therefore indicate some order of relative magnitude.

The first option, 'not very serious', with hindsight, was not a good option and should have read, not serious at all. As it is, it is very similar to the second option, 'somewhat serious'. It was therefore decided to combine the two categories into a single one, namely 'not serious'. The component of the question that deals with the seriousness of the environmental problem as perceived by the respondent was then converted into a dichotomous category where 'not serious' was assigned the value zero (0) and 'very serious' the value one (1).

For the purposes of this analysis the new categories of 'social problems' and 'environmentally-related problems' were discarded. A new category called 'environmental attitudes' (referred to as 'overall' in the statistical analysis procedures) was then created, incorporating all responses falling under the new category 'environmental problems', and which had also been identified as very serious problems. This index of the respondents' environmental concerns is likely to give some indication of a more extended attitudinal approach toward the environment (Fiedeldey et al., 1998).

### 2.5.3 Environmentally responsible behaviour

Structured self reports on actively expressing environmentally responsible behaviour was obtained from the responses to Question 6 (see Appendix B). Respondents were presented with a list of environmentally oriented or environmentally responsible behaviours and were required to indicate to what extent they adhered to those behaviours. Options ranged from 'never'; which was assigned the value of zero (0); 'sometimes', which was assigned the value of one (1); 'usually', which was assigned the value of two (2) to 'always', which was assigned the value of three (3).<sup>6</sup>

**Table 2.3: The total sample group's adherence to environmentally responsible behaviours**

<b>Environmentally responsible behaviour</b>	<b>Yes (%)</b>	<b>No (%)</b>	<b>Rank</b>
Turn off the lights when leaving an empty room	45 (98)	1 (2)	1
Recycle newspapers, bottles and or cans	42 (91)	4 (9)	2
Brush teeth with water	38 (83)	8 (17)	3

<sup>6</sup> In the case of '*brush your teeth with the water running*', the inverse was true, and therefore this behaviour variable was re-coded, using the formula  $N = 3 - O$  (where 'N' denotes the new value and 'O' the original value).

running			
Re-use bottles and jars	25 (54)	21 (46)	4
Bring own shopping bags for shopping	8 (17)	38 (83)	5
Total n = 230	158 (69)	72 (31)	

These responses were also converted to dichotomous variables and the options, 'sometimes' (1); 'usually' (2) and 'always' (3) were combined and assigned a new value, one (1), as they represented what was considered environmentally responsible behaviour whereas 'never' retained the value zero (0) as such responses did not depict environmentally responsible behaviour. For one of the behaviours presented, 'brush your teeth with the water running', an elicited response such as never however indicated an environmentally responsible behaviour and was assigned the value one (1) whereas the new, combined category in this case was assigned the value zero (0).

From Table 2.3 it was clear that the vast majority of the research group respondents indicated that they adhered to most of the stated environmentally responsible behaviours. Almost all of the respondents (n = 45; 98%) regularly turned off the lights burning unnecessarily. A vast majority of respondents (n = 42; 91%) were also engaged in waste management activities such as recycling newspapers, bottles and or cans. Most of them (n = 38; 83%) also refrained from brushing their teeth with the water running. A little over half of the research group respondents (n = 25; 54%) also re-used bottles and jars. The vast majority of the research group respondents (n = 38; 83%) however did not take their own bags when they went shopping. This is the only environmentally directed behaviour that few respondents engaged in.

## **CHAPTER THREE: DATA ANALYSIS AND RESULTS**

### **3.1 INTRODUCTION**

This chapter will report on the analysis, major findings and results of the study. Inferential analytical methods such as the correlation and regression techniques referred to in Chapter two were used to test the first hypothesis presented in Chapter one. Bivariate analytical methods such as t-tests were used to test the second and third hypotheses also referred to in Chapter one. A synthesis was then drawn from the data obtained.

The fourth hypothesis could not be analysed as too many of the respondents either failed to answer Question 12, which dealt with the professions or past professions of parents or only wrote the name of the company or factory where the parent worked, instead of the parent's profession. The fact that respondents were Afrikaans speaking might have resulted in them not understanding what this particular question required from them.

### **3.2 CORRELATION ANALYSES**

Pearson correlation coefficients using the SAS software package were calculated to establish whether a linear association existed between the criterion variable 'participation in the GLOBE programme' and measurements of the classification variables 'environmental information', 'environmental attitudes' and 'environmentally responsible behaviour'. This was done to test the first hypothesis stating that:

- GLOBE learners are more positive in their attitudes toward, their perceptions of and their environmentally directed behaviour than non-GLOBE learners.

The level of significance ( $\alpha$ ) at which the  $H_0$  would be rejected or not rejected was 0.05 (5%). What this means is that the calculated p-value would be compared to the  $\alpha$  of 0.05 and if it was smaller or equal to the  $\alpha$ , the  $H_0$  would be rejected as it means that there was only a 5% or lesser chance that the coefficients were not significant, indicating a linear association between the compared variables (UNISA, 1997, p. 101). If the p-value was however greater than  $\alpha$ , the  $H_0$  would not be rejected, indicating that there was no relationship or association between the compared variables.

Pearson correlation coefficients were calculated to establish the association if any between the measurements of 'participation in the GLOBE programme', 'responsibility to protect the environment'<sup>7</sup>, 'solving environmental problems yourself' and 'own actions to solve environmental problems'. This was also done to test the part of the hypothesis that deals with perceptions and attitudes. These variables were derived from Question 3, which requested respondents to indicate who is more responsible for protecting the environment, the individual or government; Question 4, which requested respondents to indicate whether there are some things they can do themselves to solve environmental problems, and Question 5 which requested respondents to indicate whether they have done anything to help solve environmental problems. No relationship could be established between the variable 'participation in the GLOBE programme' and these other variables as the levels of significance were too low. The intercorrelations were all lower than 0.29 with  $p > 0.05$ . This means that respondents participating in the GLOBE programme did not differ from respondents not participating in the programme with regard to their views on government and individual responsibility to protect the environment,

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<sup>7</sup> This variable is indicated as 'resp\_pro' in the statistical procedures employed to test the hypotheses.



personal actions than can be taken to solve environmental problems and active contributions to solving environmental problems. These variables have therefore been discarded from further comparisons.

Creating a Pearson correlation coefficient for the variables 'participation in the GLOBE programme' and 'environmental attitudes', using the CORR procedure, showed a p-value (0.0004) that was notably smaller than the alpha of 0.05. What this showed is that the  $H_0$  had to be rejected at the 5% level of significance. One may conclude therefore that there was a significant linear association ( $r = 0.50$ ;  $p < 0.05$ ) between the variable 'participation in the GLOBE programme' and this investigation's measurement of 'environmental attitudes'. One may further infer from this that participating in the GLOBE programme was significantly associated with a positive attitudinal directedness towards the environment. Participation in the GLOBE programme can therefore be described as a good general indicator of pro-environmental attitudes.

The correlation coefficient for the comparison between 'participation in the GLOBE programme' and the measurement of 'environmental information' ( $r = 0.06$ ) however, yielded a p-value of 0.7 that was greater than the alpha of 0.05 and the  $H_0$  could therefore not be rejected at the 5% level of significance. What this means is that there was no linear association between participating in the GLOBE programme and environmental perception. As such, no difference existed between the criterion groups with regard to the sources of environmental information used by the respondents.

This finding is significant in that it indicates that access to sources of environmental information does not necessarily result in people adopting environmentally sound perceptions or becoming environmentally concerned citizens. One therefore needs to find that which

distinguish between those who are environmentally aware and or concerned and those who are not, elsewhere.

A Pearson correlation coefficient, using the CORR procedure of the SAS software package was used to compare the variable 'participation in the GLOBE programme' with the variables 'environmentally responsible behaviour' and 'club membership'. This was done in order to test whether GLOBE participants generally tended to engage in more environmentally oriented and environmentally responsible behaviour than non-GLOBE participants for the purpose of assessing the second part of the hypothesis.

Correlating the variable 'participation in the GLOBE programme' with 'environmentally responsible behaviour' and 'club membership' yielded coefficients ( $r = 0.58$ ;  $p < 0.05$ ) and ( $0.91$ ;  $p < 0.05$ ) respectively. What this showed was that the  $H_0$  had to be rejected at the 5% level of significance in both cases. One may therefore conclude that there was a significant linear association between participating in the GLOBE programme and environmentally responsible behaviour and club membership respectively. One may therefore infer that GLOBE participants tended to engage in more positive or environmentally oriented and environmentally responsible behaviour than non-GLOBE learners.

In summary, the correlational analyses yielded the following results. GLOBE respondents were able to identify more environmental problems than non-GLOBE respondents and to a greater extent appreciated the seriousness that these identified environmental problems pose for the environment. Despite this, a significant association could not be established between the variables 'participation in the GLOBE programme' and 'environmental information'. One should also take into account that some other variables used in an attempt to assess a relationship between participating in the GLOBE programme and pro-environmental perceptions (as well as

environmental attitudes) yielded insignificant correlations. One may infer from this that GLOBE respondents did not necessarily have access to more or better sources of environmental information than non-participants. Despite this they were still able to better appreciate the fact that the earth faces serious environmental problems.

In addition, the analyses tended to support the conclusion that GLOBE participants were more positive in their attitudes towards the environment and tended to engage in more environmentally oriented actions and behaviours than their non-GLOBE counterparts and the second part of the hypothesis has therefore been verified.

The aim of this research study as stipulated in Chapter one, was to determine whether participating in the GLOBE programme could be related to positive environmental perceptions, environmental attitudes and level of environmentally responsible behaviour. From the above-mentioned findings it would appear that the answer to this question is a qualified yes, given the inability to establish an association between participation in the GLOBE programme and access to environmental information along with a few other attitudinal and behavioural indicators.

It should also be noted that the measurement of the 'participation in the GLOBE programme' variable has a built-in bias and one cannot say with absolute certainty that it is in fact their participation in the GLOBE programme that has resulted in GLOBE participants exhibiting more positive attitudes and actions towards the environment than non-GLOBE participants. It may be that they had joined the programme precisely because they are more positive in their attitudes and actions towards the environment than those who had chosen not to join the programme. It is therefore imperative to analyse the

mutual interaction of the 'participation in the GLOBE programme' variable and the respective classification variables.

### **3.3 MULTIPLE REGRESSION ANALYSIS**

Three multiple linear regression models containing the variable 'participation in the GLOBE programme', along with the variables 'environmentally responsible behaviour', 'environmental information' and 'environmental attitudes' were therefore respectively developed. The purpose was to test for a unique relationship between the different dependent variables after the effect of 'participation in the GLOBE programme' was separated from the other variables in the model. Using the REG procedure of the SAS software program, a multiple regression analysis was created in order to establish if there were indeed any association amongst these variables.

From the individual regression coefficients in the model with 'environmental attitudes' as the dependent variable, it appeared that the p-value of each coefficient was greater than the alpha of 0.05 and the  $H_0$  could therefore not be rejected. No linear relationship was found between 'environmental attitudes' and 'participation in the GLOBE programme' ( $t = 0.92$ ;  $p = 0.37$ ;  $df = 1$ ) or between 'environmental attitudes' and 'environmentally responsible behaviour' ( $t = 1.63$ ;  $p = 0.11$ ;  $df = 1$ ) or between 'environmental attitudes' and 'environmental information' ( $t = -0.18$ ;  $p = 0.85$ ,  $df = 1$ ) after the effect of the 'participation in the GLOBE programme' had been separated from these other variables. Despite this, the p-value of 0.04 and F-value of 3.19 of the model itself was smaller than alpha at the 5% level of significance indicating a linear relationship between the 'environmental attitudes' variable and these other

variables as a group. It must also be taken into account that the model succeeded in explaining only 17% of the variation in the dependent variable, 'environmental attitudes'.

The model where the variable 'environmental information' was defined as the dependent variable was itself insignificant as the p-value of 0.985 and  $F = 0.05$  was far greater than the alpha at the 5% level of significance, confirming that there was no linear relationship between the variable 'environmental information' and the three other variables as a group.

From the individual regression coefficients of the model with 'environmentally responsible behaviour' defined as the dependent variable, it appears that 'participation in the GLOBE programme' was a significant predictor of expressing environmentally responsible behaviour, indicated by a p-value of 0.0008 and an F-value of 8.84 that was significantly smaller than the alpha of 0.05. What this showed was that the  $H_0$  had to be rejected at the 5% level of significance. The regression coefficients ( $t = 1.63$ ;  $p = 0.11$  and  $t = 0.12$ ;  $p = 0.9$ ) (0.11 and 0.9) for the variables 'environmental attitudes' and 'environmental information' were both greater than the alpha of 0.05 thus indicating that neither variable was significant nor had a unique relationship with the dependent variable 'environmentally responsible behaviour'. From this one may infer that GLOBE participants were significantly more likely to engage in environmentally oriented and environmentally responsible behaviour than non-GLOBE participants.

The model as a whole was also significant, indicating that there was a strong linear association between 'environmentally responsible behaviour' and the independent variables 'environmental attitudes' and 'environmental information' as  $F = 8.84$ ;  $p = 0.0003$ . The p-value (0.0003) was significantly smaller than the alpha

of 0.05. The model itself explained 42% of the variation in the dependent variable, 'environmentally responsible behaviour'. GLOBE respondents were therefore more positive in their behaviour toward the environment than non-GLOBE respondents.

Results from the multiple regression analyses confirmed that GLOBE learners were more positive in their attitudes and their behaviour toward the environment than non-GLOBE learners. These results also confirm that there was no difference between GLOBE and non-GLOBE respondents with regard to environmental perceptions, thus verifying two aspects of hypothesis one.

### **3.4 BIVARIATE ANALYSES OF RESPONDENTS WHO PARTICIPATED IN THE GLOBE PROGRAMME**

It was decided to use single bivariate t-tests for independent and unequal groups to compare the GLOBE respondents in terms of gender and place of residence in order to either verify or reject the hypotheses, which state that:

- Female GLOBE learners are more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than male GLOBE learners;
- GLOBE learners who reside in urban areas are more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than GLOBE learners who reside in rural areas.

The variables used to assess the above hypotheses were converted into a dichotomous format. These variables are 'gender' which indicate the gender of respondents and 'residence', which indicate the place of residence of the respondents. The gender and place of residence variables were respectively compared to the measures of

perceptions, attitudes and environmentally responsible behaviours.

The critical t-value of 1.96, which is equivalent to the 5% level of significance, was selected as criterion for rejecting the  $H_0$ . What this means is that the calculated t-value would be compared to the alpha of 1.96 and if found to be smaller than the alpha, the  $H_0$  would not be rejected as the difference between the means could be ascribed to chance (i.e. coincidence). If the t-value was, however, equal to or greater than alpha, the  $H_0$  would be rejected, indicating that any difference between the two groups would be systematic (i.e. real) i.e.:

$$\begin{aligned} \bullet H_0: & \bullet_{\text{GLOBE}} = \bullet_{\text{non-GLOBE}} \\ \bullet H_1: & \bullet_{\text{GLOBE}} > \bullet_{\text{non-GLOBE}} \end{aligned}$$

With regard to the 'environmental information' variable, the 'female' mean ( $\bar{x} = 8.33$ ) seems to be greater than the 'male' mean ( $\bar{x} = 7.83$ ). The opposite is apparently true for the 'environmentally responsible behaviour' and 'environmental attitudes' variables as the 'male' mean in both cases were greater than the 'female' mean (Table 3.1). The question is therefore whether these differences were so small that they could be ascribed to coincidence rather than genuine differences.

**Table 3.1: Statistical comparison of gender with the composite classification variables**

Variables	Gender	n	Mean	t-values	df	95% confidence interval of the difference *	
						Lower	Upper
Environmental information	Female	12	8.33	.86	16	-.73	1.73
	Male	6	7.83	.75	7,3	-1.06	2.06
Environmentally responsible behaviour	Female	22	6.14	-1.43	28	-1.49	.26
	Male	8	6.75	-1.44	12,5	-1.54	.31
Environmental attitudes	Female	17	.94	-.59	21	-.27	.15
	Male	6	1.00	-1.00	16,0	-.18	0.07

\* Assuming equal variances

The t-value in each case was smaller than 1.96 and the  $H_0$  could not be rejected. What this means is that the differences were so small, they could be ascribed to chance rather than any real differences. The 95% confidence intervals also included the value zero, meaning that the difference was not significant. It should be taken into account that the small and differing sample sizes may have contributed to the lack of obtaining significant differences between the groups.

In order to ensure that differences in sample sizes did not unduly affect the analysis, Levene's test for the equality of variances was performed and no significant differences were obtained (see Table 3.2).



**Table 3.2: Independent sample test for the equalities of variances of male and female responses**

Gender Male/female		Levene's test for equality of variance	
		F	Sig.
Environmental information	Equal variance assumed	2.395	.141
Environmentally responsible behaviour	Equal variance assumed	.083	.776
Environmental attitudes	Equal variance assumed	1.558	.226

**Table 3.3: Statistical comparison of place of residence with the composite classification variables**

Variables	Place of residence	n	Mean	t-values	Df	95% Confidence Interval of the difference *	
						Lower	Upper
Environmental information	Rural	3	7.67	-.82	16	-2.16	.96
	Semi-urban	15	8.27	-.65	2,4	-3.98	2.78
Environmentally responsible behaviour	Rural	8	6.63	1.02	28	-.45	1.34
	Semi-urban	22	6.18	1.11	14,9	-.41	1.30
Environmental attitudes	Rural	7	1.00	.65	21	-.14	.26
	Semi-urban	16	.94	1.00	15,0	-0.07	.20

\* Assuming equal variances

The results for the 'place of residence' variable mirrored that of the 'gender' variable, for example, the 'rural' mean ( $\bar{X} = 7.67$ ) was only slightly smaller than the 'semi-urban' mean ( $\bar{X} = 8.27$ ). Again apparently, the opposite was true for the 'environmentally responsible behaviour' and 'environmental attitudes' variables as the 'rural' mean in both cases were greater than the 'semi-urban' mean. One is faced with the same question of whether these differences were too small, or big enough to be significant and therefore genuine.

The  $H_0$  was not rejected as the t-value in each case was smaller than 1.96. The small differences could therefore again be ascribed to chance rather than any real differences between the two groups as confirmed by the 95% confidence intervals, which again included the value zero (meaning that the difference was not significant).

Again, in order to ensure that differences in sample sizes did not unduly affect the analysis, Levene's test for the equality of variances was performed and no significant differences were obtained (see Table 3.4).

**Table 3.4: Independent sample test for the equalities of variances of rural and semi-urban responses**

Place of residence Rural/semi-urban		Levene's test for equality of variance	
		F	Sig.
Environmental information	Equal variance assumed	.340	.568
Environmentally responsible behaviour	Equal variance assumed	.070	.794
Environmental attitudes	Equal variance assumed	1.957	.176

No real differences could be detected between GLOBE males and females or between GLOBE respondents who resided in

semi-urban and those in rural areas. The hypothesis that states that female GLOBE respondents are more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than male GLOBE respondents could therefore not be confirmed. The same goes for the hypothesis that states that GLOBE respondents who reside in semi-urban areas are more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than those who reside in rural areas.

### **3.5 CONCLUSION**

A qualification of the first hypothesis was obtained. GLOBE learners were indeed more positive in their attitudes and their behaviour toward the environment than non-GLOBE learners. They were however not more positive in their perceptions of the environment than their non-GLOBE counterparts.

Neither of the second or third hypotheses could be verified. One may therefore state that female GLOBE learners were not proved to be more positive in their perceptions of, their attitudes toward or their environmentally directed behaviour than their male counterparts. One may further state that GLOBE learners who resided in (semi-) urban areas were not found to differ in their use of sources of environmental information or to be more concerned in their attitudes and their behaviour toward the environment than those who lived in rural areas.

## **CHAPTER FOUR: CONCLUSION**

### **4.1 INTRODUCTION**

The main objective of this study was to determine whether participating in the Global Learning and Observations to Benefit the Environment (GLOBE) programme was positively reflected in broad indicators of environmental perceptions, attitudes and behaviour of those who participated in the programme. This was done by comparing participants of the programme with non-participants. These respondents were socio-culturally strongly homogeneous, for example respondents in both sample groups were Grade 8 learners from one particular high school and were between the ages of 13 - 15 years old. Other objectives included determining whether the GLOBE sample group differed in terms of gender, place of residency and socio-economic backgrounds.

### **4.2 TESTING THE HYPOTHESES**

The first hypothesis stated that GLOBE learners were more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than non-GLOBE learners.

The second hypothesis stated that female GLOBE learners were more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than male GLOBE learners.

The third hypothesis stated that GLOBE learners who resided in urban areas were more positive in their perception of, their attitudes toward and their environmentally directed behaviour than GLOBE learners who resided in rural areas.

The fourth hypothesis stated that GLOBE learners from a higher socio-economic background (i.e. middle class) were more positive in their perceptions of, their attitudes toward and their environmentally directed behaviour than GLOBE learners from a lower socio-economic background (i.e. working class). This hypothesis was not tested due to insufficient information.

In order to either verify or reject the above hypotheses, the author tested for each of these attributes separately.

#### **4.2.1 Environmental perceptions**

Determining whether the GLOBE sample group exhibited more positive perceptions towards the environment was a complex exercise. A person's behaviour is ultimately explained by considering his or her beliefs and since people's beliefs represent the information (be it correct or incorrect) they have about themselves and the world around them, it follows that their behaviour is ultimately determined by this information, aldus Ajzen (1988 in Dillon & Gayford, 1997). The variable 'environmental information' was operationalised by recoding and comparing the sources of environmental information used by the respondents. It was argued that the source of gaining information forms an essential link in the process of environmental perception (Bell et. al., 2001) and its measurement is likely to be a good indicator of possible group differences in perceiving the environment.

Results from the Pearson correlation coefficients and multiple regression analyses show that GLOBE respondents were not more positive in their perceptions of the environment than non-GLOBE respondents and this part of the stated hypothesis was rejected.

What does this mean for the GLOBE programme as an environmental education programme geared to develop an environmentally responsible citizenry? Literature shows that despite the fact that peoples' beliefs and knowledge influence their perceptions toward the environment, positive environmental perceptions do not necessary result in positive environmental attitudes or positive actions toward the environment. The relationship or linkages are more complex and are influenced by a variety or other factors such as a person's behavioural intentions, locus of control, willingness to make a sacrifice and the emotional attachment a person has with a place (Dillon & Gayford, 1997; Kuhlemeier et. al, 1999; Newhouse, 1990; Vaske & Kobrin, 2001). This result therefore does not imply that the GLOBE programme has failed in its attempt to develop a responsible citizenry. One still has to determine how the learners fared with regard to the other two attributes and in particular their actual behaviour towards the environment.

Whereas all the respondents were equally exposed to environmental information, some decided to participate in the GLOBE programme whilst others decided not to participate in the programme. The motivation for this decision to participate in an environmental education programme will form an important key in understanding the processes of environmental attitude and behaviour formation and change. It will also provide some greater insight into the sentiments and life worlds of people freely choosing to partake in the GLOBE programme.

#### **4.2.2 Environmental attitudes**

Previous studies indicate that positive attitudes toward the environment do not necessarily lead to environmentally responsible behaviour. Researchers such as Wicker (1969 in Baron & Byrne, 1987) found a weak relationship between attitudes and behaviour. Although

there is not a direct or linear relationship between attitude and behaviour, i.e. attitudes do not cause behaviour; they may have important causal effects on behaviour. Behavioural change is a complex process involving the interaction between numerous variables of which attitude is only one attribute. An attitude itself is a complex attribute which is difficult to define and may involve multiple and even contradictory values (Bright & Tarrant, 2002; Dillon & Gayford, 1997; Schultz, 2001). Suffice to say however, attitudes, especially strong specific and narrowly defined attitudes that have been acquired through direct experience, that influence the person's self-interest and are accessible, have a strong effect on behaviour. For this reason, a general indication of the variable 'environmental attitudes' was obtained by recoding the respondents' identification and ratings of serious environmental problems. The measurement of environmental concern is generally regarded as an integrated component of broader attitudinal dispositions (Willers & Van Staden, 1998).

The correlations and multiple regression analyses that were obtained analysing the criterion groups' environmental concerns, showed that respondents in the GLOBE sample group were indeed more concerned in their attitudes towards the environment than their non-GLOBE counterparts. Although not sufficient on its own, this is already a step in the right direction for the GLOBE programme in its aim of developing an environmentally responsible citizenry.

#### **4.2.3 Environmentally responsible behaviour**

Literature by researchers such as Kuhlemeier et al. (1999), shows that despite the positive environmental perceptions and attitudes experienced by many people, most of them would not necessarily engage in environmentally responsible behaviour. Various reasons

are given for why an obviously environmentally concerned person won't extend the concern and feelings to actual behaviour. In some cases it is because people do not realise the consequences of their actions on the environment, in other cases it is because people feel helpless to make a difference (they have external loci of control) or sometimes people are just unwilling to make the necessary sacrifices and thus inconvenience themselves or spending more money (Bell et. al., 2001).

Other factors play a role in whether pro-environmental perceptions and attitudes would be manifested as pro-environmental behaviour. Factors such as behavioural intentions, willingness to make a sacrifice, place attachment, a strong internal locus of control and strong and accessible attitudes combined are more likely to lead to environmentally responsible behaviour on the part of people (Kortenkamp & Moore, 2001; Kuhlemeier et al., 1999). Previous research (for example, Kuhlemeier et al., 1999) on responsible behaviour have tended to focus on the stated responses of respondents in terms of their behavioural intentions, their willingness to make sacrifices and so forth, this research went beyond testing stated intentions, but tested for actual behaviour on the part of respondents. This was done by combining all responses dealing with adherence to specific examples of environmentally responsible behaviour into a variable called 'environmentally responsible behaviour' which was then used to test the part of the hypotheses dealing with actual actions toward the environment.

The results obtained from the correlations and multiple regression analyses showed that GLOBE learners were significantly more environmentally active than non-GLOBE learners. GLOBE learners were found to engage in environmentally responsible behaviour significantly more so than non-GLOBE learners. It therefore appears that the GLOBE programme in the very least has succeeded in



supporting the development and expression of environmentally responsible behaviour. Whether these respondents will over time still be engaging in environmentally responsible behaviour would only be determined by longitudinal follow-up studies.

It is not possible to prove that the GLOBE environmental education programme has resulted in more positive environmentally directed attitudes and increased environmentally responsible behaviour. This is however a limitation of the ex post facto nature of the research design. Given that the GLOBE participants expressed a greater measure of environmentally responsible behaviour than those who did not participate in the GLOBE programme strengthens the conclusion that at the very least, the GLOBE programme provides a structured avenue for those with environmentally concerned attitudinal dispositions to give greater behavioural expression thereof.

#### **4.2.4 Biographic comparisons of participants in the GLOBE programme**

The results obtained by the bivariate t-tests were not conclusive when comparing the GLOBE sample in terms of gender and place of residency respectively with regard to the measurements of environmental perception, attitudes and behaviour. The GLOBE sample group was perhaps too small to yield meaningful results. However, from the results of this study, preliminary indications are that the environmental directness of the participants in the GLOBE programme is not related to gender or to their place of residence.

### **4.3 CONCLUSION**

The aim of this research project was to evaluate the effectiveness of the GLOBE programme in promoting environmentally responsible behaviour in GLOBE learners

in one South African school in particular. One may say that the GLOBE programme was proved to be supportive of not only promoting environmentally concerned attitudes but also environmentally responsible behaviour in GLOBE learners at Groot Brakrivier Secondary School.

The findings from this particular research project will hopefully be a contribution to psychological knowledge in terms of the determinants of pro-environmental perceptions, attitudes and especially behaviour of South African learners. It might also be used to support policy in terms of environmental education in South Africa, especially with regard to the outcomes-based education syllabus. Hopefully this study, which is basically a pilot phase, will lead to a more in-depth and fully scaled study in future. It is recommended that a qualitative component be included in a follow-up study since it will strengthen the validity and interpretive value of the dataset.

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## **APPENDICES:**

### **Appendix A: Letter of instruction to fieldworkers**

#### **LETTER OF INSTRUCTION:**

Dear Teacher,

I would really appreciate it if you could find 40 learners who participate in the GLOBE programme and 40 learners who do not participate in the programme to complete the included questionnaire.

I would also appreciate it if you as teachers would go through every question and contact me if you do not understand anything.

I have also included two extra questionnaires. Could you please see to it that two learners (one GLOBE and one non-GLOBE learner) complete it beforehand and fax it through to me in order for me to ascertain whether learners understand what is expected of them or not.

Completing the questionnaire would take approximately 40 minutes. Would it be possible to have learners complete the questionnaire at the same time and possibly in the same venue, as it is important that they receive the same instructions with regard to completing it?

The questions are straightforward and I doubt if your learners will have a problem understanding what is expected of them. I would like you to stress again that there are no right or wrong answers and that I am interested in the viewpoints of learners. It is however important that they answer every question as completely as possible. Do ensure learners of the confidentiality of their responses.

Thanking you again for your willingness to participate in  
this study.

Yours sincerely

Whynie J. Adams

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2. Here are some sources of information about the environment. How much information do you get from:

	None	A little	Some	A great deal
The radio				
TV news				
TV environmental programmes				
Talking with others				
Newspaper				
Books				
General magazines				
Speciality magazines				
Other				

3. Who is more responsible to protect the environment?

Government	The individual
------------	----------------

4. In general, are there some things you can do yourself to help solve environmental problems?

Yes	No
-----	----

5. Have you done anything to help solve environmental problems?

Yes	No
-----	----

6. Here are some ways that people behave every day and some don't. Do you do these or not?

	Never	Sometimes	Usually	Always
Turn off the lights when you leave an empty room				
Brush your teeth with the water running				
Re-use bottles and jars				
Bring your own bags for shopping				
Have newspapers, bottles and/ cans recycled				

7. Have you ever belonged to or do you belong to an environmental or green club or any similar organisation?

Yes	No
-----	----

**General questions:**

8. Please indicate your gender by ticking the appropriate box

Male
Female

9. Ethnic group: -----  
-----

10. Home language: -----  
-----

11. Type of residential area. Tick the appropriate box

Rural	
Semi-urban	
Urban	

12. Professions or past professions of parents

Father	
Mother	

13. How old are you? -----  
-----

14. Your present grade? -----  
-----

**THANK YOU VERY MUCH FOR YOUR PARTICIPATION.**

## Appendix C: Statistical Analysis System (SAS) program steps employed to convert existing variables and to create new variables

```
*options replace ps=48 ls=132;
options replace ps=58 ls=80;

filename ddin 'c:\Whynie\Globe.txt';

data master;
infile ddin lrecl=79 pad;

input(globe  )(@1 1.)
      (env_pr  )(@3 1.)
      (radio  )(@5 1.)
      (tv_news )(@7 1.)
      (tv_env  )(@9 1.)
      (talk_oth) (@11 1.)
      (newspapr) (@13 1.)
      (books  )(@15 1.)
      (gen_mags) (@17 1.)
      (spec_mag) (@19 1.)
      (oth_srce) (@21 1.)
      (need_pro) (@23 1.)
      (resp_pro) (@25 1.)
      (solv_prb) (@27 1.)
      (own_acts) (@29 1.)
      (infl_gov) (@31 1.)
      (lght_off) (@33 1.)
      (brush_th) (@35 1.)
      (re_use_b) (@37 1.)
      (shp_bags) (@39 1.)
      (recycle ) (@41 1.)
      (female  ) (@43 1.)
      (res_area) (@45 1.)
      (ee_sch1 ) (@47 1.)
      (ee_sch2 ) (@49 1.)
      (club_mem) (@51 1.)
      (club_cnt) (@53 1.)
      (env_prb1) (@55 2.)
      (env_ser1) (@58 1.)
      (env_prb2) (@60 2.)
      (env_ser2) (@63 1.)
      (env_prb3) (@65 2.)
      (env_ser3) (@68 1.)
      (env_prb4) (@70 2.)
      (env_ser4) (@73 1.)
      (age     ) (@75 2.)
      (grade  ) (@78 2.);

*****;
*if globe = 1;
*****;

brush_th = 3 - brush_th;
rural = 1 - res_area;
```

```

if age > 15 then delete;
if grade ^= 8 then delete;

    if 1 <= env_ser1 <= 2 then serious1 = 0;
    if env_ser1 = 3 then serious1 = 1;
    if 1 <= env_ser2 <= 2 then serious2 = 0;
    if env_ser2 = 3 then serious2 = 1;
    if 1 <= env_ser3 <= 2 then serious3 = 0;
    if env_ser3 = 3 then serious3 = 1;
    if 1 <= env_ser4 <= 2 then serious4 = 0;
    if env_ser4 = 3 then serious4 = 1;

serious = serious1 + serious2 + serious3 + serious4;

if env_prb1 = 1 or env_prb1 = 2 or env_prb1 = 3 or env_prb1 = 7 or
    env_prb1 = 8 or env_prb1 = 16 or env_prb1 = 17 or env_prb1 = 20 or
    env_prb1 = 21 then env_pr1 = 0;
if 4 <= env_prb1 <= 6 or 9 <= env_prb1 <= 15 or 18 <= env_prb1 <= 19
then env_pr1 = 1;
if env_prb2 = 1 or env_prb2 = 2 or env_prb2 = 3 or env_prb2 = 7 or
    env_prb2 = 8 or env_prb2 = 16 or env_prb2 = 17 or env_prb2 = 20 or
    env_prb2 = 21 then env_pr2 = 0;
if 4 <= env_prb2 <= 6 or 9 <= env_prb2 <= 15 or 18 <= env_prb2 <= 19
then env_pr2 = 1;
if env_prb3 = 1 or env_prb3 = 2 or env_prb3 = 3 or env_prb3 = 7 or
    env_prb3 = 8 or env_prb3 = 16 or env_prb3 = 17 or env_prb3 = 20 or
    env_prb3 = 21 then env_pr3 = 0;
if 4 <= env_prb3 <= 6 or 9 <= env_prb3 <= 15 or 18 <= env_prb3 <= 19
then env_pr3 = 1;
if env_prb4 = 1 or env_prb4 = 2 or env_prb4 = 3 or env_prb4 = 7 or
    env_prb4 = 8 or env_prb4 = 16 or env_prb4 = 17 or env_prb4 = 20 or
    env_prb4 = 21 then env_pr4 = 0;
if 4 <= env_prb4 <= 6 or 9 <= env_prb4 <= 15 or 18 <= env_prb4 <= 19
then env_pr4 = 1;

env_prob = env_pr1 + env_pr2 + env_pr3 + env_pr4;

env_pr01 = env_prb1 * serious1;
env_pr02 = env_prb2 * serious2;
env_pr03 = env_prb3 * serious3;
env_pr04 = env_prb4 * serious4;

array e_p {8} env_prb1-env_prb4 env_ser1-env_ser4;

temp = 0;
do i = 1 to 8;
    if e_p{i} > . then temp = temp + 1;
end;

if temp > 0 then overall = 0;
if (env_pr1 = 1 and serious1 = 1) or (env_pr2 = 1 and serious2 = 1) or
    (env_pr3 = 1 and serious3 = 1) or (env_pr4 = 1 and serious4 = 1)
then overall = 1;

array beh{5} lght_off brush_th re_use_b shp_bags recycle;

do i = 1 to 5;
    if 1 <= beh{i} <= 3 then beh{i} = 1;
end;

```



```
actions = solv_prb + own_acts + lght_off + brush_th + re_use_b +  
shp_bags + recycle +  
    club_mem;  
  
array inf {9} radio tv_news tv_env talk_oth newspaper books gen_mags  
spec_mag oth_srce;  
  
do i = 1 to 9;  
    if 1 <= inf{i} <= 3 then inf{i} = 1;  
end;  
  
info = radio + tv_news + tv_env + talk_oth + newspaper + books +  
gen_mags + spec_mag + oth_srce;
```