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AWARENESS IN SOME SECONDARY SCHOOL PUPILS IN
ZIMBABWE**

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A PRELIMINARY SURVEY OF ENVIRONMENTAL AWARENESS IN SOME SECONDARY SCHOOL PUPILS IN ZIMBABWE

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Abstract

For sustainable development to be effective there must be appropriate environmental education strategies which provide people with the necessary knowledge and attitudes and skills. This paper is based on exploratory research to establish the level of environmental knowledge, attitudes towards environmental issues, environmental activities and problem-solving skills of secondary school pupils in determining appropriate strategies for sustainable development. The methods used to obtain information include a questionnaire, a review of secondary sources including policy documents and the various syllabuses which contain aspects of environmental education, and interviews with officials at the Ministry of Environment and Tourism, the Ministry of Education and the Ministry of Higher Education. The questionnaire was administered to 555 Form 1 and Form 4 secondary school pupils at 8 secondary schools, 4 rural schools in Chirumanzu District, Midlands Province, and 4 urban schools in Harare. The questionnaire was designed to ascertain the knowledge, attitudes, activities and problem-solving skills of pupils as regards a wide range of environmental issues in Zimbabwe. The research attempted to identify differences, if any, between Form 1 pupils and Form 4 pupils, and between those living in a rural environment and those living in an urban environment. The results revealed that although there was a relatively high level of environmental knowledge amongst the pupils, understanding and analysis of this knowledge was considerably lower, as were skills of solving environmental problems. Environmental activities such as tree planting were quite widespread. Form 4s scored much higher than Form 1s, and generally, rural pupils did better than urban pupils. The interviews confirmed that there is no official policy on environmental education in Zimbabwe. The research concludes with a series of recommendations to enhance the status of environmental education, especially in secondary schools, in Zimbabwe, and to ensure that future generations possess the necessary knowledge, attitudes and skills to enable them to participate effectively in the sustainable development of Zimbabwe's natural resources.

Introduction

Environmental education has been defined as 'learning how to manage and improve the relationship between human society and the environment in an integrated and sustainable way', (Meadows, 1989, p.5). This is just one of the many definitions of environmental education. All definitions stress the holistic nature of the environment, encompassing socio-economic, cultural and political aspects as well as the biophysical elements. Environmental education is also regarded as human-centred, concerned with changing attitudes and values in order to develop the skills necessary to manage the environment sustainably. Environmental education is seen as a process rather than a discipline and the concept extends beyond the boundaries of formal education (Stiles, 1994). It occurs throughout life, in the passing down of indigenous environmental knowledge and cultural values from one generation to the next, in experiences gained through working, as well as from the formal education sector and other external sources such as the media and extension programmes run by government departments and non-governmental organisations.

Sustainable development can be defined as forms of economic growth and activities that do not deplete or degrade natural resources upon which present and future economic growth depends (Miller, 1994). Environmental education was recognised as being crucial for sustainable development at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. Chapter 36 of the Conference's action plan Agenda 21 states that education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues . . . and is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision making (UNCED, section 36.3, 1992)

To date, Zimbabwe does not have an official environmental education policy, despite the fact that Agenda 21 exhorted governments to implement policies on environmental education within three years. Zimbabwe has a number of environmental problems and these are escalating. According to the National Report to Rio (GOZ, 1992a), the single

biggest problem is that of land degradation resulting from human and livestock population pressures on the land. This is manifested in loss of topsoil through deforestation, erosion, and siltation of rivers. Current land use practices are causing soil losses of up to 100 tonnes/hectare/year in some parts of the country (Magadza, cited in GOZ, 1992a). This environmental problem is most critical in the rural areas where 70% of the people live and is related to historical, political and economic factors. During the colonial period, land was divided inequitably between blacks and whites which led to overpopulation of Communal Lands which are inherently infertile (Whitlow, 1988; ENDA-ZERO, 1992). Land degradation is most serious in the overpopulated Communal Lands. Here there is a direct link between environmental degradation and poverty. As environmental degradation increases so does poverty. According to the ENDA-ZERO report (1992), environmental degradation and poverty are locked in a vicious cycle that can only be broken by incorporating environmental management. It is crucial that the environmental degradation - poverty link be fully understood and that Zimbabwe develops its natural resources, at the same time maintaining environmental quality and alleviating poverty. Clearly, a policy for environmental education is urgently needed.

At present, there are various strategies for environmental education in place in Zimbabwe. These involve the inclusion of some elements of environmental issues in syllabuses of the formal educational sector, and a variety of awareness programmes in the non-formal sectors. In the formal sector, Environmental Science and Social Studies are taught at primary school, whilst topics such as management of natural resources, ecosystems, conservation, soil erosion and population studies are found in the Geography, Agriculture and Science secondary school syllabuses. At primary teachers' colleges Environmental Science is taught, whilst at secondary teachers' colleges a few environmental issues are included in the Geography, Science and Agriculture syllabuses. However, at both schools and colleges, environmental education cannot be regarded as being interdisciplinary, since there is no established cross-curricular approach. Such an approach would require careful planning, co-ordination and management (National Curriculum Council, 1990). At the University of Zimbabwe, environment related Masters programmes include the Masters in Tropical Resource Ecology in the Department of Biological Sciences, and the recently-introduced Masters in Environmental Policy and Planning in the Geography Department. Various environmental research activities are carried out, such as those by the Centre of

Applied Social Science, and the recently-established Institute of Environmental Studies. The non-formal sector includes extension services provided by government departments and parastatals, notably the Department of Natural Resources, the Department of National Parks and Wild Life Management, the Department of Agricultural, Technical and Extension Services (AGRITEX), and the Forestry Commission, and by about 150 conservation non-governmental organizations (NGOs) such as Zimbabwe National Environment Trust (ZIMNET), Action Magazine, and Environment 2000. Although the non-formal education sector is carrying out a wide range of environmental education activities, such as extension work, awareness campaigns and development of resource materials, there appears to be little co-ordination between these efforts (Stiles, 1994).

The research problem

For the formulation of effective policy, there must be substantial research and information available to inform policy-makers. Therefore, before an environmental education policy and a consequent action plan can be formulated, adequate information about the present situation and future needs of the country is required. Research is essential in order to avoid adopting imported environmental education policies designed to meet the particular needs of other countries which would not necessarily suit the conditions and needs of Zimbabwe and its people. Although there has been some research on environmental education in Zimbabwe, such as by Mono (1993), Mutimba (1993), Kuiper (1994), and Stiles (1994), there is a need for more research, especially in the non-formal sector, secondary schools and teacher education.

Aims and objectives

The present research focuses on secondary schools. The broad aim of this research is to find out the present situation amongst secondary school pupils regarding their knowledge of and attitudes towards environmental issues, their participation in environmental protection activities, and their skills in solving environmental problems. This will provide an indication of the adequacy of the present strategies in equipping secondary school pupils with the necessary knowledge and skills and in fostering the development of attitudes required to achieve sustainable development in Zimbabwe.

The specific objectives of the research are to:

- a) find out the level of knowledge that secondary school pupils have about major environmental issues in Zimbabwe, notably erosion, river siltation, uses of indigenous plants, and who is responsible for preserving wildlife;
- b) determine attitudes of secondary school pupils towards poverty, responsibility for land conservation, the utilization of wild life, and environmental problems;
- c) assess the skills of secondary school pupils in solving environmental problems;
- d) find out about tree planting and other environmental activities carried out by secondary school children;
- e) determine if there are any differences between pupils living in rural and urban areas, Form 1 pupils and Form 4 pupils, as regards their environmental knowledge, attitudes, problem-solving skills and environmental activities; and
- f) make recommendations from the results of the baseline study on environmental education in secondary schools which can assist in the formulation of a policy and action plans for environmental education in Zimbabwe.

Methodology

Data collection techniques used were: a review of secondary sources, a questionnaire administered to pupils, and interviews. The questionnaire constituted the major part of the research method.

Data collection

A detailed study of secondary sources was done. These included documents such as Zimbabwe's National Conservation Strategy (GOZ, 1987), the National Report to the UNCED (GOZ, 1992a), the Report on the National Response to the UNCED Rio Earth Summit (GOZ, 1993a), and the Second Five Year National Development Plan 1991 - 1995 (GOZ, 1991). The secondary school syllabuses which contain elements of environmental education namely Geography, Science and Agriculture, were reviewed and the relevant aspects were identified. Their aims and objectives and suggested teaching methods were scrutinized, together with recent past examination papers for Zimbabwe Junior Certificate (ZJC) and O Level in these subjects, where questions pertaining to the environment were identified.

A questionnaire was administered to 555 Form 1 and Form 4 secondary school pupils at eight schools. Four schools were selected using random number tables, within Harare: George Stark, Mount Pleasant, Mukai and Ellis Robins. Four rural schools were

similarly selected randomly in Chirumanzu District, Midlands Province approximately 200 km south of Harare. These were: Siyahokwe, Chamakanda, Chizou and Holy Cross.

The questionnaire was designed to assess the knowledge, attitudes, problem-solving skills and activities of secondary school pupils regarding a wide range of environmental issues and problems existing in Zimbabwe.

The questionnaire contained a variety of questions. There were thirty statements on a wide range of environmental topics with which the pupils had to strongly agree, agree, disagree, strongly disagree, or to state that they were not sure. There was a visual impact question where the pupils were asked to respond to an oblique photograph of a degraded landscape, giving suggestions as to possible causes for the degradation and possible solutions. This was followed by a series of questions about tree planting activities at home and at school, including how many trees the pupils had planted during the past twelve months, and the reason why they had planted the trees. There was also a set of questions to determine indigenous technical knowledge of the respondents by asking them the uses of various natural products. A decision-making exercise on the possible uses of wildlife was included. This was followed by a case study of air pollution in Harare where the pupils were asked to think of causes and possible solutions to a specific environmental problem, namely, excessive exhaust emissions from buses. They were further given a choice of three of the most serious environmental problems in Zimbabwe from a list of eight, followed by a series of questions about the pupils' environmental activities. Finally, there was a question on where the pupils' learnt most about the environment.

The emphasis of the questionnaire was on rural problems since the most critical environmental problem in Zimbabwe, namely, land degradation due to soil erosion, deforestation, overgrazing, and the siltation of rivers and dams, occurs in rural areas (Marongwe and Milne, 1993; ENDA-ZERO, 1992; GOZ, 1992a). However, some environmental problems more prevalent in urban areas, such as air pollution, were also included.

A pre-testing of the questionnaire was carried out with eleven pupils, from Form 1 and Form 4, at Harare High School, in Mbare, Harare. From the results, appropriate modifications were made to the questionnaire, as well as to practical arrangements for administration of the questionnaire.

Officials at the Curriculum Development Unit of the Ministry of Education and in the Ministry of

Environment and Tourism were invited to comment on the questionnaire and further modifications were made.

The questionnaires were administered personally between 10th February and 2nd March, 1995. An introduction, including explanation and instructions, was given and the questionnaire took between 1 to 1.5 hours to complete.

Interviews were carried out with 15 heads of departments of Science, Geography, and Agriculture, and government officials, including an assistant secretary in the Ministry of Environment and Tourism, the Chief Education Officer for Policy and Planning in the Ministry of Education, and the Deputy Director for Teacher Education in the Ministry of Higher Education.

Analysis of questionnaire data

The questionnaires were coded for analysis using SPSS. Coding of the question on examples of uses of plants involved extensive consultation with local herbalists and reference books (Drummond, 1981; Drummond, 1984; and Gelfand, *et al.*, 1985), to verify that the examples given by the pupils were correct. Frequencies, percentages, and cross tabulations for the variables were obtained to establish main trends, differences and similarities.

Review of secondary sources

A wide range of environmental issues, with emphasis on those most crucial to Zimbabwe, are adequately covered in the Agriculture, Geography and Science syllabuses.

Agriculture, although not done at all schools, contains considerable information about the environment and also has a practical component. In the ZJC Agriculture syllabus, three out of nine aims are directly related to natural resource conservation (GOZ, 1989). The syllabus includes topics on biological pest control, grazing systems, conservation of soil, water development and its conservation, land tenure systems, problems associated with stream bank cultivation and legislation pertaining to it, deforestation, and the value of trees. Included in the last topic is a tree planting project involving management skills and practical activities. The ZJC examination covers a wide range of environmental issues, but the questions are mainly factual recall. The O level Agriculture syllabus (5035) has only one aim, out of a list of ten, which is directly concerned with environmental issues, namely, that it aims 'to develop positive attitudes towards the country's natural resources so as to conserve and use them wisely' (University of Cambridge, 1994a, p.2). Other aims

seek to promote rural development and to develop problem-solving abilities of the pupils. The syllabus covers physical environmental influences, general principles of land use, population growth, soil erosion, forestry, pasture management and intermediate technology. Besides the core syllabus, four options on farming specializations are offered, of which the pupils, with guidance from the teachers, choose one. This allows for practical activities related to the environmental conditions of a particular area. There is assessment of the pupils' practical work, including demonstration of their initiative and ability to cope with problems. The theory examination consists predominantly of factual recall questions, and not many pertain to environmental issues.

The ZJC Geography syllabus aims, amongst other things, to provide knowledge and understanding of some of the major issues which arise from a person's relationship with the environment. The syllabus is designed to encourage pupils to 'respect the environment and use resources wisely' (GOZ, 1986, p.1). The syllabus covers the physical environment, population studies, uses and conservation of water, soil erosion and its conservation, land use, and sources of renewable and non-renewable energy. Although the majority of questions in the examination require mere factual recall, those few dealing with environmental issues tend to be the more challenging ones, requiring skills of analysis, synthesis and evaluation. Among the seven aims of the O level Geography syllabus (2248) is the encouragement of 'an appreciation and sensitive awareness of the environment on a local, national and world scale' (University of Cambridge, 1991, p.2). Its assessment objectives include the understanding of environmental inter-relationships and interaction, decision-making skills, judgement and evaluation of environmental problems. Environmental topics in the syllabus include desertification, people and ecosystems, exploitation and conservation of natural resources and population studies. Paper 2 of the Geography O level examination normally contains a wide variety of challenging questions on environmental issues, often requiring problem-solving skills.

The ZJC Science syllabus has been revised recently. It now contains the unit Resources and the Environment (GOZ, 1993b). Prior to this, no environmental issues were included, although there was adequate coverage of the biophysical elements of the environment. At O level, a new Combined Science syllabus (5129) has recently been introduced. One of its aims is to stimulate interest in and care for the environment (University of Cambridge, 1996). The syllabus contains a topic on air pollutants, and a

section on the effects of man on the ecosystem with regard to agriculture and pollution. Observation of past examination papers reveal that there are few questions about the environment and those which do appear are mainly factual, dealing with aspects of the physical environment, rather than environmental issues.

The Geography syllabus contains more environmental issues than any of the other secondary school syllabuses, and it also attempts to link the issues with the concept of sustainable development. Although the Science syllabus covers the biophysical aspects of the environment, a holistic approach to environmental issues is not included.

Although Zimbabwe's Second Five Year National Development Plan 1991-1995 (GOZ, 1991) reaffirms the Government's aim to maintain a correct balance between development and environment, and to implement action plans aimed at the utilization of the country's natural resources in an equitable, productive and sustainable manner, inclusion of environmental education into school curricula is not mentioned as a strategy to achieve this. The National Report to Rio (GOZ, 1992a) does acknowledge the need for a variety of awareness campaigns geared towards the creation of a new awareness of the environment by its users, but it makes no reference to the introduction of environmental education as a cross-curricular or inter-disciplinary subject in schools. Instead, science is highlighted as the focus for environmental issues. However, the Report on the National Response Conference to Rio (GOZ, 1993a) is more explicit in the promotion of environmental education being essential in achieving sustainable development. It not only recommends the development of environmental education in schools but in teacher education colleges as well. In fact, in the report, the Confederation of Zimbabwe Industries supports the development of an environmental curriculum at the tertiary level of education.

Table 1: The numbers of respondents by form and type of school

Form	Type of school		Total
	Rural	Urban	
1	140	147	287
4	144	124	268
Total	284	271	555

Results of the questionnaire

The numbers of Form 1s and Form 4s, and the numbers of rural and urban pupils are shown in Table 1. The presentation of the questionnaire results is divided into sections on knowledge, attitudes, problem solving skills and environmental activities in Zimbabwe.

Environmental knowledge

Two aspects of environmental knowledge were examined, one which would be expected to have been gained primarily from school since it appears in various syllabuses (Table 2) and the other which does not appear in any syllabus and can be presumed to have been gained at home, from families and the community and is an example of indigenous technical knowledge (Table 3).

Table 2 shows the percentages of respondents who agreed or strongly agreed with various statements about what can cause, and what can help prevent, soil erosion and river siltation. Those who did not agree, either disagreed, or strongly disagreed, were not sure, or did not respond constitute the difference. A high proportion of pupils agreed that deforestation and heavy rainfall can cause soil erosion, the scores for all respondents being 80% and 75% respectively. However, reduction of soil erosion by minimizing the amount of bare ground, was less known. Rural pupils had higher scores than urban pupils on all issues. Form 4s had higher scores than Form 1s. Only a little over half of the urban respondents agreed that stream bank cultivation contributes to river siltation, compared with 71% of the rural pupils.

Plants have many uses, and knowledge of five of these uses was investigated in the questionnaire. The percentages of pupils who gave a correct example of one plant which can be used for each of the listed items are shown in Table 3.

The results were rather varied depending on the specified use. However, an overall average of 51% correct answers was obtained. For each use, the rural pupils scored considerably higher than the urban pupils. Plants used to cure colds and flu were most widely known, whilst plants whose parts were used as chewing gum, were least widely known. More than one half of Form 1s knew plants which could be used for curing colds and cleaning teeth, while almost one half knew plants which could cure stomach aches. Form 4s' knowledge of plant uses was higher than that of Form 1s', the biggest difference being knowledge of plants whose bark can be used for string. The smallest difference between the Forms was knowledge of plants which can be used to cure stomach ache, whereas

Table 2: Percentages of respondents who agreed or strongly agreed with various factual statements about the causes of soil erosion and river siltation

Statement	Type of school		Form		All respondents
	Rural	Urban	1	4	
Deforestation causes soil erosion	88.4	71.3	69.7	91.0	80.0
Heavy rainfall causes soil erosion	80.3	70.1	70.4	80.6	75.3
Practices such as mixed cropping and inter-cropping which minimize the amount of ground left bare help to reduce soil erosion	67.3	47.6	50.5	65.3	57.7
Soil erosion contributes to river siltation	81.3	77.9	70.4	89.6	79.6
Stream bank cultivation contributes towards river siltation	70.8	54.6	47.7	79.1	62.8
Gold panning is harmful because it causes river siltation	59.9	50.6	44.9	66.4	55.3

knowledge of this use of plants exhibited the biggest difference in score between rural and urban pupils. Generally, the differences between scores for rural and urban pupils was greater than between Form 1s and Form 4s.

There were more differences in the scores for Form 4s and Form 1s for knowledge about erosion and siltation than for the various uses of plants. The difference in the score for agreement that deforestation causes soil erosion was 21%, and that for stream bank cultivation contributing to river siltation being 31%, whilst the average difference between Form 1s and Form 4s for knowledge of uses of indigenous plants was only 14%. This may indicate that knowledge about the latter is gained at an early age outside the school. Generally there were not many differences between responses from boys and girls. For example, 80% of boys and 82% of girls agreed that deforestation caused soil erosion, and 52% of boys and 53% of girls

gave correct answers for plants which can be used for string.

Attitudes towards environmental issues

Pupils' attitudes towards a variety of environmental issues were mixed. Table 4 shows the pupils' attitudes towards some possible causes of poverty. The percentages are for those who agreed or strongly agreed with each statement. The remainder said they either disagreed or strongly disagreed with each statement, or were not sure or gave no response.

The statement that poverty is caused by overpopulation had the highest agreement than any of the other causes listed, and the level of agreement between rural and urban pupils was similar. However, one quarter of all respondents either disagreed or strongly disagreed with this statement. The least proportion of pupils agreed that poverty was caused by the present unfavourable world economic situation, urban pupils agreeing more than rural pupils, and

Table 3: Percentage of correct responses to knowledge of uses of plants

Use	Type of school		Form		All respondents
	Rural	Urban	1	4	
String	48.2	28.4	28.6	49.3	38.6
Curing flu/cold	81.0	59.4	62.0	79.5	70.5
Curing stomach ache	70.1	31.7	47.7	55.2	51.4
Cleaning teeth	77.1	41.7	53.0	67.2	59.8
Chewing gum	39.4	24.7	26.8	38.1	32.3
Average	63.2	28.8	43.6	57.9	50.5

Table 4: Percentages of the respondents who agreed or strongly agreed with various statements about the cause of poverty.

Statement	Type of school		Form		All respondents
	Rural	Urban	1	4	
Overpopulation is a major cause of poverty.	56.7	57.9	47.4	68.0	57.3
Poverty is caused by laziness.	52.8	37.3	50.1	40.0	45.2
Poverty is a result of colonization and former policies of unequal land distribution.	39.4	44.3	37.6	42.2	41.8
Poverty is a result of farming on infertile or unsuitable land.	41.9	34.7	40.4	36.2	38.3
Poverty is caused by the present unfavourable world economic situation.	32.0	37.7	28.3	41.8	34.8

Form 4s agreeing more than Form 1s to this statement. More rural than urban pupils agreed that poverty is caused by laziness. However, more urban than rural pupils agreed that poverty was caused by unequal land distribution during colonial times.

Attitudes towards responsibility for conservation of land were more diverse, as shown in Table 5. Two-fifths of the respondents agreed with the statement that agricultural land is better conserved when it is privately owned than when it is communally owned, but about quarter disagreed with this statement. Just over two-fifths of the respondents thought that government should be responsible for reclaiming gullies, although 28% disagreed with the statement. There was more of a consensus on the need for miners and gold panners to rehabilitate their sites after closing down their operations. The agreement was higher among rural pupils.

There was more consensus on how wildlife should be used. Table 6 shows which strategies the pupils stated they would choose to utilize wildlife if they had a farm on which there were large wild animals. Almost half of the respondents thought that the best way to utilize wildlife on a farm would be to have tourists pay to view and photograph the animals, but very few thought that it would be a good idea to make arrangements for hunters to pay to kill the animals. More urban than rural pupils thought that the animals should be left alone and preserved, and more Form 1s than Form 4s saw the animals as a nuisance, or something to be left alone and preserved, without a commercial value.

With regard to their attitudes towards the importance of waste recycling, the pupils were split. Just over 40% thought that aluminium beverage cans

should be banned in Zimbabwe if they cannot be recycled. However, 36% disagreed with this. More rural pupils agreed with the banning and more urban pupils disagreed with it.

Tourism was generally thought to be economically good for Zimbabwe, with 78% of all respondents agreeing. However, attitudes about controlling the number of tourists in order to protect the environment were more varied. While 52% agreed with the need to control the numbers of tourists, 34% disagreed. Most disagreement came from the rural pupils, and Form 4s.

Pupils were asked to choose what they thought were the three most serious environmental problems in Zimbabwe today. The frequencies for the three choices were amalgamated and shown as percentages in Table 7. The highest score was for deforestation, followed by air pollution. Loss of top soil due to erosion, and river siltation scored much lower, and responses from both the rural and urban pupils were similar. The three lowest overall scores were for unsightly mine dumps and quarry excavations, water pollution and gully erosion. Differences between rural and urban pupils tended to be greater than between Form 1 and Form 4, with the notable exception of loss of top soil. More Form 1s than Form 4s regarded loss of top soil as one of the three most serious environmental problems. More urban and Form 1 pupils regarded rhino poaching as a more serious problem than did rural and Form 4 pupils.

Problem-solving skills

The pupils' problem-solving skills were assessed by two exercises. The first required recognition of a degraded landscape, possible causes for the degradation, and suggestions for the rehabilitation of

Table 5: Pupils' response to statements about responsibility for conservation of land (in percentages)

Statement	Response	Type of school		All respondents
		Rural	Urban	
Users of land should be responsible for conserving their land	Agree and strongly agree	81.4	74.7	78.1
	Not sure	7.5	13.8	10.6
	Disagree and strongly disagree	11.1	11.5	11.3
	Total	100	100	100
The Government should be responsible for reclaiming gullies.	Agree and strongly agree	49.8	38.0	44.0
	Not Sure	23.7	31.9	27.7
	Disagree and strongly disagree	26.5	30.1	28.3
	Total	100	100	100
Agricultural land is better conserved when it is privately owned rather than communally owned.	Agree and strongly agree	49.2	44.2	41.2
	Not sure	23.8	26.8	30.9
	Disagree and strongly disagree	27.0	29.0	27.9
	Total	100	100	100
Miners and gold panners should rehabilitate the site when they have finished their operations.	Agree and strongly agree	76.8	63.2	70.2
	Not sure	10.9	20.8	15.7
	Disagree and strongly disagree	12.3	16.0	14.1
	Total	100	100	100

the land. Only 54% of the pupils recognized the landscape in the photograph as being degraded. More rural, (58%), than urban, (48%), and more Form 4, (75%), than Form 1s, (34%), recognized it as a degraded landscape. However, less than a half of those who recognized the landscape as being degraded could give two possible causes that would be termed appropriate or acceptable, such as deforestation, overgrazing, or overcultivation, while two thirds could give one cause. More pupils thought it could be rehabilitated than not, most of them giving a sensible example of possible rehabilitation, such as, by planting trees. Recognition of the problem, causes and solution were slightly better among rural pupils than urban pupils and much higher for Form 4s than for Form 1s.

The second problem-solving exercise dealt with the issues of air pollution from bus exhaust emissions, in Harare (Table 8). Many pupils found the problem hard to grapple with, in some cases completely misinterpreting the problem. Table 8 shows the various responses to possible causes or reasons for the problem and possible solutions. Only 4 pupils could give three good reasons why the buses cause pollution, and only 2 pupils could give three good possible solutions or regulations which could be initiated by the government

to deal with the problem of too much smoke and fumes from buses. No pupils could give three possible solutions which could be implemented by the bus owners. However, about a third of respondents gave at least one cause or solution, indicating an attempt to deal with the problem, but between 61% and 75% had no idea of possible causes or solutions.

There is a great difference between Form 1s and Form 4s as regards ability to solve problems, Form 1s having a much lower ability. The rural pupils did slightly better than urban pupils in suggesting solutions to the problem. The results show that generally the problem involving land degradation was easier to handle than that of air pollution.

In all the responses to the two problem solving exercises boys displayed more ability than girls in suggesting possible causes and solutions to the problems. Almost 47% of boys compared with 35% of girls gave appropriate suggestions for rehabilitation of the degraded landscape. Only 21% of girls compared with 36% of boys could suggest at least one sensible reason for the possible cause of excessive exhaust emissions from buses. On solutions to this problem boys scored 51% for possible solutions from the

Table 6: Respondents choices for uses of wildlife on a farm (in percentages)

	Type of school		Form		All respondents
	Rural	Urban	1	4	
Kill the wild animals periodically for meat for the family.	8.1	8.2	9.1	7.1	8.1
Kill them straight away to prevent them from destroying crops.	5.3	4.4	8.4	11.1	4.9
Ranch them instead of cattle and then sell them periodically for their meat hides.	16.5	14.0	13.6	17.2	15.3
Make arrangements with a tourist company for tourists to pay to come and look at and photograph the animals.	51.8	43.5	41.8	54.1	47.7
Leave them alone because they are nice to look at and need to be preserved.	10.9	19.9	19.1	11.1	15.3
Make arrangements with a tourist company for hunters to pay to kill the animals.	5.3	7.0	4.9	7.5	6.2
No responses	2.1	3.0	3.1	1.9	2.5
Total	100	100	100	100	100

the vehicle owners and 48% for government solutions, compared with 33% and 32% respectively for girls.

Environmental activities

Tree planting activities at home and at school were examined, as well as general environment orientated activities carried out at school. The proportion of pupils who had planted trees at home and at school in the previous twelve months is shown in Table 9.

More trees were planted at home than at school, especially in urban areas. Rural pupils planted more trees both at home and at school than urban pupils. This difference is especially marked with trees planted at school, where more than twice as many rural pupils than urban pupils had planted trees. Slightly more Form 1s than Form 4s planted trees at school. However there was a large difference between rural and urban Form 1s. Just over 80% of rural Form 1s, compared

Table 7: Percentage score for issues which were regarded by the respondents as the three most serious environmental problems in Zimbabwe

Environmental problem	Type of school		Form		All respondents
	Rural	Urban	1	4	
Deforestation	23.6	17.7	15.5	26.2	20.7
Air pollution	17.8	18.0	18.3	17.4	17.9
Loss of top soil through erosion	13.1	13.8	15.2	11.6	13.4
Rhino poaching	11.9	14.2	14.5	11.3	13.0
River siltation	10.6	11.7	10.8	11.4	11.1
Gully erosion	11.5	4.7	8.1	8.2	8.2
Water pollution	6.0	8.6	7.3	7.2	7.3
Unsanitary mine dumps, quarry excavations	4.8	7.0	5.8	4.8	5.9
No response	0.7	4.3	4.5	1.9	2.5
TOTAL	100	100	100	100	100

Table 8: Respondents suggestions of reasons and solutions for air pollution caused by buses in Harare (in percentages).

	Type of school		Form		All respondents
	Rural	Urban	1	4	
Reasons which could be given by bus company owners for buses producing too much smoke :					
3 sensible reasons	0.7	1.0	0.0	1.5	0.7
1 or 2 sensible reasons	27.8	27.0	11.0	45.1	27.2
no sensible reasons	69.7	64.0	83.0	50.4	67.0
no response	1.8	9.0	7.0	3.0	5.1
Total	100	100	100	100	100
Solutions of bus company owner to solve the problem of too much smoke from the buses:					
3 sensible reasons	0.0	0.0	0.0	0.0	0.0
1 or 2 sensible reasons	40.1	38.0	22.0	22.3	39.3
no sensible reasons	55.3	48.0	66.0	65.9	51.9
no response	4.6	13.0	12.0	11.8	8.8
Total	100	100	100	100	100
Solutions of Government for solving the problem of excessive smoke from buses:					
3 sensible reasons	0.4	0.4	0.0	0.7	0.4
1 or 2 sensible reasons	38.7	29.9	15.7	54.5	34.4
no sensible reasons	51.8	47.6	63.4	35.1	49.7
no response	9.1	22.2	20.9	9.70	15.5
Total	100	100	100	100	100

with 43% of urban Form 1s, planted trees at school. Just over two-thirds of pupils who planted trees at home also agreed with the statement that planting more trees is a solution for deforestation.

Table 9: Percentage of the respondents who planted trees at home and at school

Respondents	Trees planted	
	At Home	At School
Rural	83.1	77.5
Urban	79.7	31.0
Form 4	82.1	52.6
Form 1	80.8	56.8
All	81.4	54.8

Reasons given for planting trees are shown in Table 10. Overall, prevention of soil erosion was given as the main reason for planting trees, even though 29 of the pupils who gave this reason only planted one tree over a twelve month period. Of the 36% who gave the reason as preventing erosion for planting trees at home, 32% agreed with the statement that

deforestation causes soil erosion. There is a relatively higher score for rural pupils planting trees at school because they were told to do so.

Three of the four rural schools had orchards, but none of the urban schools had any. For trees planted at home, the main reasons given, apart from preventing soil erosion, were for firewood and fruits by rural pupils, and shade and their aesthetic value by urban pupils.

Nearly half the pupils thought that they learnt most about the environment from Geography lessons (Table 11). Science and Agriculture scored much lower.

Results of the interviews

Of the fifteen heads of department interviewed in the schools where the pupils' questionnaire was administered, only one-third of the heads appreciated environment education as being a holistic concept. The interviews also revealed that there was very little co-operation or liaison between departments within the

The advantages and disadvantages of using tooth brushes made from twigs could be discussed in Biology lessons. Another advantage of encouraging indigenous technical knowledge is that if children grew up respecting and valuing natural resources, such as indigenous plants in this case, they are more likely to conserve them. This has already been proven in the case of wildlife where, if animals have an economic value, they are better conserved (Martin, 1993).

Attitudes towards poverty illustrate that although this problem is widespread, its causes are not fully understood. More pupils thought that overpopulation causes poverty, rather than by farming on infertile land, or as a result of former unequal land distribution, or the unfavourable world economic situation. It is obvious that having to share a fixed amount of resources with more people results in less for everyone; however, factors determining the 'fixed amount' are more complicated and require analysis. Historical and economic causes of poverty could be unfamiliar and too divorced from everyday life. Many people hold the belief that poverty is caused by laziness, the virtue of being hardworking is held in great esteem. However, even though one might work very hard, if the land is inherently infertile and in a drought prone region, poverty is likely to remain. The relatively high response for laziness being a cause of poverty, especially of the rural pupils may reflect a fatalistic rather than an analytical approach to poverty.

There appears to be a certain amount of ambivalence in attitudes towards conservation and ownership of land. Although most agreed that users should be responsible for conserving land, less than half thought that land is better conserved if it is privately owned rather than communally owned. This view could be due to failure to understand the differences between use-rights and ownership. Attitudes towards responsibility for gully reclamation reflect a tendency to depend on the government rather than self-reliance in solving environmental problems.

Attitudes towards wildlife reflect national trends of giving wildlife a commercial value in order to conserve it better as well as enabling development. This concept is embodied in the Parks and Wild Life Act of 1975, the 1982 amendment to this Act, and the Wildlife Policy of 1992 (Environmental Consultants, 1992; GOZ, 1992b). The successes of the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) have been widely published (Martin, 1993; Taylor, 1993). However, it is unlikely that the pupils' attitudes towards wildlife was influenced by CAMPFIRE because, firstly, no pupil in the questionnaire, nor teachers in the interviews, mentioned CAMPFIRE. Secondly, the responses to

the strategy of arranging for hunters to pay to kill the animals is low, whereas CAMPFIRE permits the controlled hunting of selected animals in order to maximize income from wildlife. However, the pupils could have read about it before, or heard about the concept without the name of CAMPFIRE. Generally, rural pupils had a more utilitarian view towards wildlife than urban pupils who might have visited recreational parks and viewed wildlife in or near Harare.

Results from the identification of the three most serious environmental problems in Zimbabwe coincide with the Ministry of Environment and Tourism's national survey (Marongwe and Milne, 1993) in that deforestation rated the highest. Deforestation is a contributing factor towards loss of top soil. Infertility, due to loss of top soil, and rivers drying up due to siltation are the real problems.

It appears that more than mere exposure to a problem is required in order to increase the pupils ability to solve environmental problems. This is illustrated by rural pupils tackling the problem of air pollution from vehicle exhaust emissions better than pupils in urban areas where there are more buses and air pollution. Not only is national legislation on, and monitoring of, air pollution weak, there is little publicity of the problem (Moyo *et al.*, 1993). However, despite the low pupil ability to recognize the causes of and suggest solutions to air pollution, the score for air pollution being one of the three most important environmental problems is high, especially for urban pupils. This highlights the fact that for environmental problems, although generally well known in an abstract way, their implications are not fully understood. In fact, the problem of air pollution was misunderstood by approximately a third of the pupils, especially Form 1s, as they associated the production of excessive smoke with smoking cigarettes on the bus.

Only half of the pupils actually recognised the land in the photograph as being degraded, and less than a quarter could suggest possible causes and solutions to the problem. The results indicate that the lack of ability of the pupils to tackle environmental problems needs to be seriously addressed. Two factors compounding this problem could be inappropriate teaching methods, and inhibitions arising from indigenous culture. None of the heads of departments in the selected schools mentioned problem solving activities as a teaching strategy appropriate for environmental education. Generally, the predominant teaching method in schools in Zimbabwe is 'chalk and talk' and rote learning (Lewin *et al.*, 1991; Kuiper, 1994). According to Meadows (1989), environmental

Table 11: Where the respondents thought that they learnt most about the environment (in percentages).

	Type of school		Form		All respondents
	Rural	Urban	1	4	
Secondary school Geography	50.0	43.9	41.1	53.4	47.0
Secondary school Agriculture	20.1	11.4	23.3	10.1	15.9
Primary school	4.2	12.2	9.1	7.1	8.1
Secondary school Science	7.4	8.5	9.1	6.7	7.9
TV, videos, films	4.6	10.7	5.9	9.3	7.6
Leisure reading	7.4	4.1	7.7	3.7	5.8
Home	2.1	1.5	1.7	1.9	1.8
Field trips	0.7	2.6	1.0	2.2	1.6
Radio	0.7	0.7	0.3	1.1	0.7
Did not know	1.1	0.4	0.3	1.1	0.7
Other (unspecified)	0.4	0.4	0.3	0.4	0.4
No response	1.3	3.6	2.2	3.0	2.5
Total	100	100	100	100	100

education is fundamentally education in problem solving. The idea of cramming as much knowledge in order to pass examinations is common amongst pupils, teachers and parents. Other activities, including asking questions, discussion and practical work, are sometimes regarded as a waste of time. In fact, some parents of pupils at one of the rural schools expressed dissatisfaction that too much emphasis was put on tree planting activities at the school. They felt that they had sent their children to school to obtain the necessary O levels, not to plant trees.

Culturally, Zimbabwean children are not encouraged to participate in problem-solving activities. According to Shumba, (1995) it is virtually inappropriate for children to query knowledge or decisions of adults and the teacher being an adult figure is therefore considered to know everything. Also, problem-solving in traditional culture may involve absolute solutions obtained from revelation, dreaming or divination (Shumba, 1995). The fact that girls did worse than boys in all aspects of the problem-solving exercise could also be related to the cultural role of females in Zimbabwean society. Shumba (1995) states that teachers noted that females are treated as minors in society and thus carry an inferiority complex into the classroom. On the other hand, males are expected to take part in decision-making in both the family and the community whilst females have a more passive role.

Tree planting activities appear to be much higher at home than at school. Tree planting activities at school depend on how much land is available, whether or not Agriculture is taught, and the involvement of the Forestry Commission which promotes tree planting.

The Forestry Commission appears to be more active in the rural schools, and in fact was cited by both staff and pupils as the only organization visiting schools to talk about environmental issues. The overwhelming reason given for planting trees being to prevent erosion is commendable but invites more research to be done on why people really plant trees. It is possible that different results for reasons for planting trees at home might have been obtained if the question was open-ended, rather than having a predetermined response. Although planting trees to prevent erosion will certainly be advantageous in the long-term, more short-term practical reasons for planting trees such as for fuelwood, fruits, and construction poles are more applicable and comprise practical sustainable development activities. Trees are a resource to be utilized economically for development if, at the same time, other trees are planted to replace those cut, thereby maintaining sustainability and environmental quality. Pupils must be able to relate positive resource use with the advantages of development.

The fact that overall almost 80% of the pupils thought that they learnt most about the environment from school, whether from primary school or secondary Geography, Agriculture or Science, indicates that school is an important vehicle in developing environmental awareness. Television has a potential role in imparting environmental information but its role in Zimbabwe at the moment is limited by the low number of families having televisions. In the USA and the UK, the role of television in environmental education is much greater (MacLeod, 1990; Lyons and Breakwell, 1994).

Limitations of the study

The results obtained in the research are by no means definitive. Rather, the investigations have laid the foundations for more detailed national studies to determine the status of environmental awareness in Zimbabwe. The small sample of eight schools may not fully represent the national situation. Further research in other areas, particularly those in the badly degraded overpopulated Regions IV and V, or in areas where CAMPFIRE occurs might reveal different results. The sample of Harare schools does not include high fee-paying private schools where the pupils' experiences and exposure to environmental issues might have produced different results. Analysis of the impact of environmental education at A level would be worthwhile as, although the target population is very small, their future influence in society might be significant.

Summary of the research findings

The results of the questionnaire revealed that the pupils had considerable environmental knowledge, gained from the school syllabuses and from the local environment. Generally, Form 4s were more knowledgeable than Form 1s, reflecting the acquisition of knowledge during secondary school years, and rural pupils were more environmentally aware than the urban pupils, possibly due to their more immediate contact with and dependence on their environment, but also given the emphasis of the questionnaire on rural environmental issues. Generally, deeper insights and understanding of the causes of environmental problems were lacking. The pupils were generally weak at problem-solving. Nonetheless, these skills are crucial if environmental education is to be successful in helping to achieve sustainable development. Obviously, more time is needed for the acquisition of problem-solving skills at school. The authoritarian cultural background of the pupils described by Shumba (1995) predisposes the pupils, especially girls, to have difficulties in making decisions and solving problems for themselves. The pupils, especially those at rural schools, were quite active as regards such environmental activities as tree planting. This is encouraging, but more effort is needed on the part of the teachers to explain *why* trees should be planted, and their value as a natural resource which is to be used sustainably. The fact that rural pupils generally scored better than urban pupils requires more research to determine the reasons for this or whether it is due to rural pupils interacting with and being more dependent on land than urban pupils.

There is no doubt, from this research, that Geography as a subject is the vanguard of environmental education in Zimbabwean secondary schools. This is confirmed not only by the syllabus content and the examination questions, but by the pupils' responses in the questionnaire. The overwhelming response for pupils thinking that they learnt most about the environment from school highlights the potential role of school in environmental education. At present the amount of co-ordination between subjects as regard environmental issues, at secondary level, is negligible. An official cross-curricular approach to environmental education would improve this. From the interviews, it appears that there is also little liaison between the Ministry of Environment and Tourism and the two education ministries.

That there is considerable knowledge about uses of local plants, even among Form 1s and urban pupils, indicates the potential to tap and develop more of this indigenous knowledge, and include it in the school curriculum. This would also help to cement closer links between school and the community.

The content of environmental issues in the various relevant syllabuses is adequate, as is the level of environmental knowledge of the factual recall-type among the pupils, as shown by the questionnaire results. However, this is not matched by the pupils' ability to comprehend and apply this knowledge, especially concerning solving problems. This implies that the problem lies more with the teaching methods rather than the content of the syllabuses. Not enough time is spent on pupil-centred activities. It is therefore questionable whether the present state of environmental education in Zimbabwean secondary schools is adequate to equip the pupils, as adult citizens and decision-makers of tomorrow, with the necessary skills, and to develop correct attitudes, to enable them to contribute to the sustainable development of the country. More research is needed in order to determine if the present findings are typical of all secondary schools throughout Zimbabwe.

Recommendations

In the context of this research the following recommendations are suggested:

- a) More research to establish the present state, and future needs for environmental education in Zimbabwe, at the national level.
- b) The formulation of government policy on environmental education, either to be a component of the proposed new environment legislation in the Ministry of Environment and Tourism, or to be

incorporated into the new education policy planned in the Ministry of Education, or both.

- c) The introduction of environmental education at all teacher training colleges as a service subject taken by all student teachers. This will ensure that all new teachers, irrespective of their main teaching subjects, will have the necessary knowledge and interest, as well as the skills, to teach about environmental issues.
- d) Regular in-service workshops on environmental education for practising teachers at district and provincial level. It is necessary to update and inform teachers on local and global environmental issues, on a regular basis. Such workshops would also create enthusiasm for the subject and provide a forum for exchange of ideas and experiences.
- e) Co-ordination of teaching across different subjects to identify cross-curricular environmental themes. This can be facilitated by official guidelines provided by the Ministry of Education.
- f) Formulation of specific environmental education programmes for each school, by each school. This will help to maximize the effectiveness of environmental education in each school and the community.
- g) More emphasis on pupil-centred teaching strategies to enable pupils to apply their knowledge. This can be encouraged by the introduction of more problem-solving, evaluation and judgement type questions, projects and practical work as part of assessment, especially in subjects containing aspects of environmental education.
- h) The creation of more time for environmental education at secondary schools, possibly by the formation of extra-curricular clubs.
- i) The encouragement of more involvement by NGOs, government departments and parastatals in environmental activities in schools. Teachers should take more initiative in the utilization of the facilities and resources offered by the various NGOs, government departments and parastatals. Joint projects can be set up.
- j) Improvement of links between schools and the local communities to optimize contributions of local technical knowledge, and the identification of particular environmental problems and needs of the community, to the schools, and encourage pupil involvement in community based environmental activities. This could be implemented by community involvement in formulation of the schools environmental education programmes.

This exploratory research has attempted to examine the knowledge, awareness, problem-solving skills and activities of some secondary school pupils, as regards environmental issues. It has tried to relate these to the context of the school curriculum, and to the wider environmental problems being experienced in Zimbabwe today. Weaknesses, especially as regards understanding and problem-solving skills, have been identified. Further research is necessary to establish if these are national trends.

If the whole population is to become environmentally aware, develop more positive attitudes towards the environment, and have the capacity and opportunity to develop by managing the country's natural resources in a sustainable manner, then more environmental education is needed at all levels, especially at secondary school as these are regarded as the formative years.

For sustainable development to succeed there must be broad-based participation in development projects involving the grassroots from the beginning. However, empowerment without enablement is useless. Environmental education can provide the necessary enablement where everybody is capable of making informed, correct decisions which incorporate environmental factors with development objectives. It can also provide the necessary knowledge, attitudes and skills which enable people to use and manage their natural resources, at the same time maintaining environmental quality in such a way as to provide for future generations. Without adequate environmental education at all levels, resources will continue to be used unsustainably, environmental problems will worsen and poverty will increase.

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