

Environmental and Sustainability Literacy among Students at a Selected Institution of Higher Learning in Zimbabwe

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Abstract

The study was carried to assess students' environmental and sustainability literacy at a selected institution of higher learning in Zimbabwe. A descriptive cross-sectional design was used. The questionnaire used was validated, and the Cronbach's alpha was used to determine reliability ($\alpha = 0.767$). Purposive, stratified and simple random sampling techniques were used to select 70 respondents for the study from a population of 1352. The study revealed that the level of knowledge was mediocre, and one-way ANOVA showed no statistically significant difference in the level of knowledge among the groups ($F(3,66) = 2.376, p = 0.078$). Results also showed a positive attitude towards environment and sustainability issues; and identified the need to train every student about environment and sustainability (83%), with government support (93%) to achieve an environmentally sustainable world (96%). It was concluded that although the attitude among students was positive, the current syllabi are not explicit about environmental and sustainability issues which bear negatively on their environmental knowledge. The study recommends the introduction of a compulsory environmental education course in Higher and Tertiary Education in order to raise the environmental and sustainability literacy.

Keywords: Environmental education, Environmental literacy, Higher and tertiary education, Sustainability literacy, Sustainable development.

Introduction

Environmental and sustainability literate people are not only aware that their choices have impacts on the environment, but also know that their choices can either help or harm the environment. They also understand that there is a limit to the earth's ability to sustain human and other life. As such, the environmentally and sustainability literate people are motivated and empowered to keep the environment healthy and be able to meet current and future generations' resource needs. The opposite is also true for environmentally illiterate citizens: they pollute the environment and are not concerned about the

impact their choices have on the environment. Environmental literacy is a branch within the field of environmental education concerned with the "awareness of, and concern about, the environment and its associated problems as well as knowledge, skills and motivations to work towards solutions of current problems and the prevention of new ones" (UNESCO, and North American Association for Environmental Education (NAAEE), [1]. The term was first used in the 1960s by Roth who inquired "How shall we know the environmentally literate citizens?" This was in response to media reports referring to those who were polluting the environment as "environmentally illiterate" [2].

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Recognizing the need for environmental and sustainability literate citizens, the field of environmental education emerged. Environmental education is seen as a process of infusing into the educational system's environmental content in order to enhance the awareness of the people on environmental issues at all levels of education [3]. It is concerned with knowledge, values, attitudes, skills, application and it aims at environmental responsible behaviour. In 1978 UNESCO,[2] put forward the 1977 Tbilisi Declaration's three basic goals of environmental education as: (1) to foster a clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas; (2) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; (3) to create new patterns of behaviour of individuals, groups and society as a whole towards the environment. Consequently, the concept and aim of environmental education has evolved and has been modified to emphasize environmental education for sustainable development with the expectations of cultivating environmental and sustainability literacy among citizens in order to promote environmentally sustainable societies throughout the world.

Environmental education is ideal for the achievement of sustainable development. Sustainable development is that type of development that meets the needs of the present generation without compromising future generations meeting their own needs [4, 5]. The concept of sustainable development emerged in the 1970s, and it gained more attention in 1987 after the publication of the Brundtland report "*Our Common Future*" by the World Commission on Environment and Development. Ever since, the concept of sustainable development has been widely discussed as seen by the several local and international initiatives such as the International Union for Conservation of Nature (IUCN), Tbilisi Declaration, International Environmental Education Program

(IEEP), the United Nations Conference on Environment and Development, the Earth Summit, Agenda 21, the 2002 World Summit on Sustainable Development, Decade of Education for Sustainable Development (DESD: 2005-2014), Millennium Development Goals (MDGs) and the 2030 Agenda for Sustainable Development (17 sustainable development goals (SDGs)). At the heart of every approach to sustainable development, is education and learning. The DESD (2005-2014) aimed at integrating the principles and practices of sustainable development into all aspects of education and learning, to encourage changes in knowledge, values and attitudes with the vision of enabling a more sustainable and just society for all, [6]. In the 2030 Agenda for Sustainable development numerous education-related targets and indicators are contained within other SDGs on top of the SDG number 4 on quality education: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" [5].

While several philosophies have informed and shaped environmental education, various published environmental sustainability frameworks, [7] have reflected the UNESCO's 1978 objectives which include awareness, knowledge, skills, attitudes and participation, [8]. Building on this information, this research was based on the premise that knowledge (behavioural beliefs, normative beliefs, control beliefs) affect dispositions (attitudes, subjective norms) and competencies (perceived behaviour control) which ultimately affect behaviour intention, and finally pro-environmental behaviour, [9]. While the simplest forms of environmental knowledge are learnt at home (indigenous knowledge systems), Higher and Tertiary Education (HTE) provide learning opportunities for more complex environmental issues. Environmental education in such institutions of higher learning establishes a knowledge base upon which individuals can make environmentally sustainable decisions and build an environmentally sound future.

Environmental and sustainability assessment then, therefore, provides a baseline of the knowledge, abilities, dispositions and behaviour of students that futuristically enable them to make environmentally informed decisions and act to address environmental issues. It is against such a background that this research was undertaken to assess students' environmental and sustainability literacy level at a selected institution of higher learning in Zimbabwe.

Statement of the Problem

Despite the fact that environmental education is now widespread in Zimbabwe, environmental challenges are on the increase. Recognition of increasing challenges associated with environmental management and sustainable development has implications for, and linkages with, environmental education in institutions of higher learning. As tertiary education students are expected to be the torch-bearers in the alleviation of these challenges through their envisaged acquired skills and knowledge, [9]. Little is known about the environmental and sustainability awareness, knowledge, attitudes and cognitive skills of students. Environmental literacy assessments are therefore principal sources of information about the status of environmental and sustainability literacy in higher and tertiary education institutions, [10]. These assessments also assist to determine the extent to which different environmental education programs and approaches have on students' environmental and sustainability literacy. It is against this background that the research on environmental and sustainability literacy was undertaken to assess the students' environmental and sustainability literacy level, and if such gained knowledge is translatable into environmentally responsible behaviour.

Purpose and Research Objectives

The research intended to measure environmental and sustainability literacy among students at a selected institution of higher

learning; and therefore, the following objectives were addressed:

- i. To examine environmental and sustainability literacy level among higher and tertiary education students in Zimbabwe.
- ii. To assess students' attitude towards environmental and sustainability issues.
- iii. To ascertain the relationship between fields of study and literacy level on environmental and sustainability concepts.

The third objective was ascertained using the null hypothesis that: "There is no significant difference in the level of knowledge of environmental and sustainability concepts between fields of study" (divisions).

Methodology

Research Design

The main aim of the study was to measure environmental and sustainability literacy levels among students at a selected institution of higher learning. A descriptive cross-sectional design was used in this research to generate both qualitative and quantitative data. The study design provides a snapshot of students' level of environmental and sustainability literacy at a point in time. It also describes the situation as it is on the ground so that plans for change can be designed if the picture portrayed by the study is not desirable; and can also be a basis for more in-depth studies.

Population and Sample

The population in this study included four groups of students and key informants. Students were selected from the following four fields of study areas (divisions): applied sciences, engineering, applied arts and commerce (N = 1352). These fields of study (divisions) were used to stratify the population. Four key informants from the four fields of study were selected using a purposive sampling strategy. Using fields of study as strata, simple random sampling technique was used to select

participants from the student population giving rise to 70 (5.2%) respondents who participated in this study. A sampling rate of over 5% in social science research is considered a large enough sample, [11]. This sample excluded students in their first year of study.

The researcher sought and was given permission to undertake the research; and informed consent by respondents was also sought and anonymity was ensured. Data collected was only used for the purpose of this research. After data was collected, it was analysed using descriptive statistics. First, it was cleaned, coded and later it was entered into IBM SPSS statistics 20 in order to analyze environmental and sustainability literacy levels among students at a selected institution of higher learning.

Data Collection and Analysis

A questionnaire checklist was used for students to obtain relevant information for this study. The questionnaire was divided into three sections. The first section (Section A) included statements about students' attitudes on environmental issues and processes. Each statement was measured on a 5-point Likert scale (strongly disagree–strongly agree). The second section (Section B) included statements about students' behaviour towards environmental issues and processes. Each statement had three possible responses (Frequently do it/ sometimes/ never). The third section (Section C) included statements on students' knowledge of environmental issues and processes. Each statement had five options.

A pool of 38 statements that belonged to these three sections was generated. The questionnaire was validated (by undertaking a pilot testing) and the Cronbach's alpha was employed to determine reliability. Initially, it yielded an alpha co-efficient of 0.735. Five statements "with a negative Corrected item-total correlation" were later deleted, resulting in Cronbach's alpha = 0.767 (Cronbach's alpha "if item deleted"). As a

result, the final questionnaire had a pool of 33 statements, upon which data analysis was based. Cronbach's alpha ranges from $\alpha = 0$ to 1, with $\alpha = 0.7$ or greater taken to be sufficiently reliable, [12].

Data obtained from the questionnaires were triangulated with data from key-informant interviews and document review. Key informant interviews largely asked about their views on environmental and sustainability literacy, as well as how environmental and sustainability is taught in their fields of study; while syllabi in the four study fields were reviewed to perceive inclusion of sustainability concepts.

The raw data from responses of each participant were coded numerically. For section A, the responses were converted to 0 and 1, for "disagree" and "agree", respectively. For section B, the responses were converted to 0 and 1, for "never do it" and "do it", respectively. For section C, the responses were converted to 0 and 1, for incorrect and correct answers, respectively ("don't know" responses were coded as incorrect). Data were entered and analyzed using IBM SPSS statistics 20. One-way ANOVA was employed to determine if a statistically significant difference exists between the group means and the Least Significant Difference (LSD) post hoc test was also used to determine where the real statistically significant difference exist among the groups.

Results and Discussion

All the 70 questionnaires distributed to respondents were returned (100%). These questionnaires were assessed for completeness of responses, and all were valid for analysis and presentation. Below, figure 1, shows the distribution of participants per division/ strata.

The engineering division contributed the highest proportionate sample (37.1%) and applied arts contributed to the least proportionate sample (8.6%).

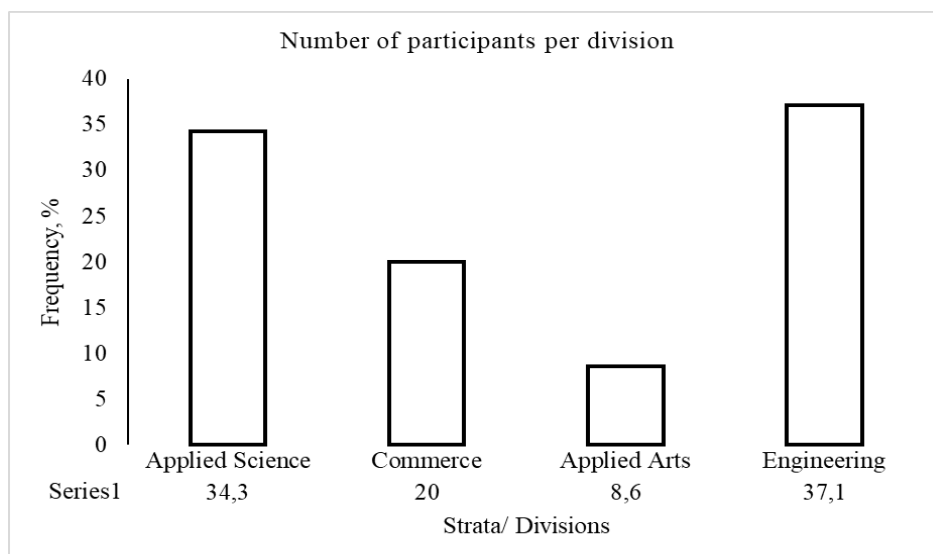


Figure 1. Data on Number of Participants per Division/ Strata

Table 1a. Knowledge on Environmental and Sustainability Concepts

Statement	Mean	Std. Deviation
Renewable resource	.69	.468
Type of hazardous waste	.27	.448
Term describing diversity of living things	.26	.440
Electricity generation in Zimbabwe	.97	.168
Sustainability refers to	.51	.503
Definition of sustainable development	.26	.440
Causes of climate change	.54	.502

Respondents' Knowledge on Environmental and Sustainability Concepts

The following tables, table 1a and 1b show the level of knowledge possessed by respondents in the various divisions.

Less than 50% of the participants got statements 2, 3 and 6 correct: types of hazardous waste (27%), a term used to describe a diversity of living things (26%) and definition of

sustainable development (26%). Almost half number of participants correctly defined sustainability (51%). On average, students failed to articulate essential concepts of the environment such as important cause-effect relationships or even the basic environmental concepts such as types of hazardous waste, definition of biodiversity, sustainability or sustainable development, or the causes of climate change.

Table 1b. Summary Data on Level of Knowledge on Environmental and Sustainability Concepts

Descriptive Statistics			
Strata/ Division	N	Mean	Std. Deviation
Applied Sciences	24	3.42	1.56
Commerce	14	3.07	1.21
Applied Arts	06	2.67	1.21
Engineering	26	4.00	1.30
Total Score	70	3.50	1.412

Applied arts division had the lowest mean-score of level of knowledge (2.67) and the Engineering division had the highest mean-score (4.00). Students who took an environment-related subject or topic were more aware of environmental and sustainability concepts compared to students without (Table 1b). However, about 51.4% of the respondents got scores greater than 3.5 (average mark). This shows that the level of knowledge pertaining to environmental and sustainability concepts is low. This low knowledge levels are in direct contrast with programs and strategies implemented at the institution aimed at instilling environmental responsible behavior. These strategies include existence of an institutional environmental management policy and planned awareness and clean-up campaigns. However, such strategies should be coupled with enabling curricula, but the current syllabi are not explicit about environmental and sustainability issues. While some syllabi are silent about environmental and sustainability literacy, others are inclined towards industrial safety and/or waste management; for example, the following are extracts from the sampled syllabi:

1. *“The aim of the subject is to develop with the knowledge, skills and attitudes to promote sustainable environmental health”*
2. *“The aim of the subject is to develop with the knowledge, skills and attitudes of environmental pollution and control and industrial safety”*

Besides such aims, the contents of such syllabi do not articulate or point to ways or means of contributing to sustainable development. This leaves the mandate to individual lecturers who may or may not link topics to sustainable development. [13] said that it is a critical need of society for HTE to develop graduates who help implement a paradigm of sustainability, yet often times educational curricula do not adequately address this need. With the current curricula, most of those students who graduate are environmentally and sustainability illiterate. The same was also echoed by [14] who noted that unless students were majoring in biology or environmental studies, they could complete their studies without gaining basic environmental literacy. On the other hand, [15] asked the question *“Isn’t it time that sustainability concepts such as environmental literacy and social responsibility/ civic engagement become an integral part of all higher education degrees?”* With the state of our current environment and our current higher education curricula, it is at that time that sustainability concepts be an integral part of higher education. [16] echoed the same sentiments when he said that the whole education process should be “reshaped” for sustainable development.

The findings also showed that there was a no significant difference in level of knowledge on environmental and sustainability concepts between divisions as shown in table 2a.

Table 2a. Results of One-way Analysis of Variance (ANOVA)

ANOVA Table			Sum of Squares	df	Mean Square	F	Sig.
Total Score * Division	Between Groups	(Combined)	13.405	3	4.468	2.376	.078
	Within Groups		124.095	66	1.880		
	Total		137.500	69			

There was no statistically significant difference in knowledge between groups as determined by one-way ANOVA ($F(3, 66) = 2.376, p = 0.078$). This finding was in contrast with the findings of [17, 18] who found a

significant increase in environmentally responsible behaviour among students who were exposed to environmental literacy concepts compared to those students without; and the former were more willing to take actions to make

a positive difference. Although such a single subject may be enough to change some unsustainable attitudes and behaviours, they may not be enough to help the students to understand, internalize and contribute to the intricate sustainable concept in the long-term.

However, the Least Significant Difference (LSD) post hoc test revealed that there was a statistically significant difference between engineering and commerce divisions ($p = 0.045$) and between engineering and applied arts division ($p = 0.035$); as shown in table 2b below.

Table 2b. Results of the Least Significant Difference Post Hoc test

Multiple Comparisons						
Dependent Variable: Total Score						
LSD						
(I) Division	(J) Division	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	.345	.461	.457	-.58	1.27
	3	.750	.626	.235	-.50	2.00
	4	-.583	.388	.138	-1.36	.19
2	1	-.345	.461	.457	-1.27	.58
	3	.405	.669	.547	-.93	1.74
	4	-.929*	.455	.045	-1.84	-.02
3	1	-.750	.626	.235	-2.00	.50
	2	-.405	.669	.547	-1.74	.93
	4	-1.333*	.621	.035	-2.57	-.09
4	1	.583	.388	.138	-.19	1.36
	2	.929*	.455	.045	.02	1.84
	3	1.333*	.621	.035	.09	2.57

The mean difference is significant at the 0.05 level

Students' Attitudes on Environment and Sustainability

The figure 2 below shows data on the attitudes of students on environment and sustainability issues. Most statements had their mean-scores higher than criterion mean of 0.5 (which served as a benchmark) signifying a positive attitude on the environment and sustainability among students. Positive environmental responsible behavior attitude is determined with responsible environmental behavior. [8] stated that:

“based on the theory of reasoned action, when pro-environmental behavior of students is positive (attitudes) this would result in greater intention (motivation) and students would most probably exhibit pro-environmental behavior.”

Statements on *Industries should continue to pollute the environment as long as they pay* and *There is no point for students to get involved in environmental management since the government and industries have the power to do what they want* had mean-scores of 0.014 and 0.043, respectively. These statements were negatively constructed, and hence ultimately signify a positive students' environmental attitude. However, of note are statements on *our school is environmentally clean* (0.514) and *our nation is environmentally healthy* (0.257). This negative attitude on the state of our country's environment signifies that what is learnt or practiced in these institutions is not easily translatable into environmental responsible behavior when one completes his or her higher education.

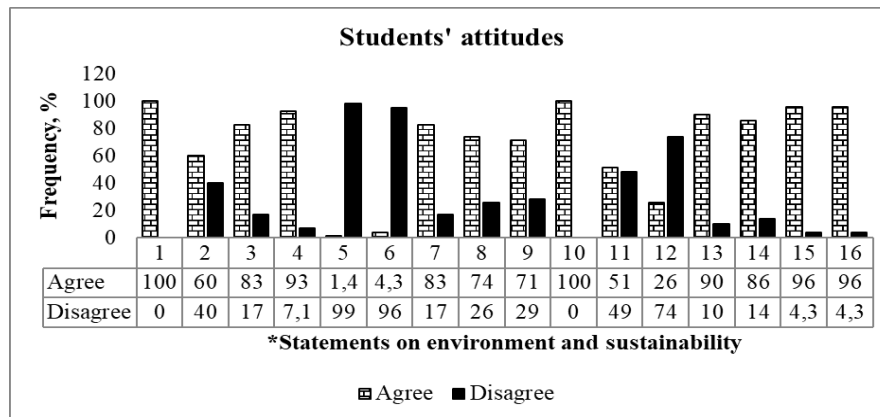


Figure 2. Data on Students' Attitudes on Environment and Sustainability Issues

Key: Statements on Attitudes about Environment and Sustainability Concepts

1. Unpolluted learning environment is a right.
2. Technology will find solutions for environmental problems.
3. HTE should to train all students in EE/ SD
4. Government should support EE/SD in HTE
5. Industries should continue polluting
6. Students should not participate in environmental management
7. Involvement in clean-up programs has had positive impact
8. Government to pass waste recycling mandatory laws
9. Interested in working to protect the environment
10. Nation becomes socially, economically, environmentally well-developed
11. School is environmentally healthy
12. Nation is environmentally healthy
13. I am part of the community to solve environmental problems
14. Develop community to be environmentally sustainable
15. To lead a sustainable lifestyle
16. To live in an environmentally sustainable world

It is also interesting to note that despite the course being studied, respondents echoed that every student should be trained in environmental education for sustainable (0.829) with government supporting environmental and sustainability education in higher and tertiary

education institutions (0.929). This will ensure realization of an environmentally sustainable world (0.957). As beneficiaries of the future, students need to have knowledge of environmental problems and how to participate in creating an environmentally sustainable world. The difference between a sustainable and a chaotic future is learning, [19, 20]. It is, therefore, important that HTE produce not only critical thinkers but also environmentally responsible citizens. [21] noted that an education system needs to foster a sense of connectedness, and ecological citizenship, and provide the competence to act on such knowledge. Such students will, after they graduate, get engaged in creating sustainable environmental solutions.

Statements 5 and 6 (above) were asked in a negative way and were rated low (1.4 and 4.3, respectively). Ultimately, respondents identified the need for industries to stop their unsustainable polluting trends and adopt cleaner production systems. Respondents also realized that their roles as students in sustainable environmental management were crucial.

Responses from Key Informants

Four key informants were purposively selected for the study. They were interviewed basically about their views on environmental and sustainability literacy as well as how environmental and sustainability is taught in their areas of specialty.

Key informants had varied views on sustainability literacy. Responses on their basic

definition of sustainability ranged from “meeting human needs”, “placing humans at the centre of everything” to “trying to conserve the environment for the future.” These views placed much emphasis on the social and economic pillars without giving much regard to the environment pillar of sustainable development. The views or frame of mind of key informants determine environmental behavior in learning institutions. [22] said that it is crucial to determine the frame of mind on sustainability of trainers as this enables cultivation of sustainability in learning institutions as a culture.

When asked about how environmental and sustainability concepts are taught, the general outcome was that the current curricula do not clearly outline sustainability issues. One key informant stated that “*it is scant as sustainable development is only mentioned in the objectives section of the syllabus. It rests upon me to infuse sustainability concepts in the topics I teach.*” Where concepts of sustainable development are not clearly articulated in the syllabi, there won’t be any instrument to measure whether such concept have been infused in topics taught, or to what extent have they been infused [5, 23] pointed out that environmental education (environmental and sustainability) should be conceptualized as an integral facet of education so as to give impetus to sustainable development.

Conclusion

The level of literacy on environmental and sustainability issues among students at the institution studied was low. The low literacy level may be attributed to the curricula not being explicit about environment and sustainability issues. This low literacy level is not ideal for the attainment of a sustainable world.

The literacy level among the four fields of study was not statistically different, although the engineering division had the highest mean-score while applied arts division had the lowest mean-score.

However, the students showed a positive attitude on the environment and sustainability

issues. This positive attitude needs to be coupled with high level of knowledge on environment and sustainability concepts in order to achieve the goals of sustainable development.

Recommendations

In light of the findings of this study, the following recommendations were made:

- Low knowledge levels among students signify that a compulsory generic course, such as Environmental Education for Sustainable Development (EESD), is needed in Higher and Tertiary Education. This can be introduced as an additional subject or be infused into the existing curriculum subjects.
- An updated curriculum for tertiary education should be introduced, which makes explicit environmental and sustainability literacy. This will further call for capacitating such institutions and their human resource to prepare them to teach EESD.
- Proven, flexible, inexpensive and fun approaches to teaching EESD should be used so that gained knowledge can easily be translated into environmental responsible behaviour for sustainable world.

Suggestion for Further Research

This study focused on one selected institution of higher learning in Zimbabwe. As such, more comprehensive studies on environmental and sustainability literacy in higher and tertiary education institutions in Zimbabwe are recommended. Results from such studies are more generalisable and possess greater eternal validity.

Conflict of Interest Statement

The authors Taremba Chirigo, Joe Phaeton Mukaro and Fenton Ruparanganda declare that there is no conflict of interest.

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