Acquisition of Environmental Literacy by Nigerian University Students: An Empirical Study

Caroline L. Eheazu, PhD.

Department of Adult & Non-Formal Education, University of Port Harcourt

Box 133 UNIPORT P.O., Choba, Port Harcourt, Nigeria

E-mail: lc4sure@yahoo.com

Abstract

The purpose of the study was to ascertain the extent to which Nigerian University students attain appropriate levels of Environmental Literacy (EL) that would enable them later, as adult members of society, to effectively contribute towards national and global sustainable development. Roth's (1992) definition of environmental literacy levels was adopted. A total of 1,514 students in seven Departments/Programmes within four faculties in three selected Nigerian Universities were involved in the study. Percentages, means, the Pearson Product Moment Correlation Coefficient, the Spearman-Brown Formula and the Analysis of Variance (ANOVA) were the statistical methods used to analyze data obtained through a Questionnaire. From the analysis, it was established that the students acquired the nominal level of Environmental Literacy (ELL_1) most, less of the functional level (ELL_2) and least of the operational level (ELL_3). It was also established, among other facts, that the three Universities studied did not differ significantly in exhibiting this trend of limited student EL acquisition. The findings were discussed, conclusions drawn and some remedial suggestions made, clearly emphasizing the need for inclusion of core environmental protection and management courses in all Nigerian University Undergraduate Programmes to equip students with desirable knowledge, values and skills for tackling contemporary environmental issues and problems.

Keywords: Acquisition, Environmental Literacy Levels, Nigerian University Students.

1. Introduction

This study was motivated by contemporary environmental problems and the urgent need to tackle them. For instance, global warming, occasioned by various factors of environmental degradation (deforestation, pollution, industrial effluents and so on) has become a major concern of man on earth today (Eheazu, 2011). The sustainability of life on earth has been seen to depend largely on man's knowledge, awareness and capability to protect and positively manage his environment. The creation of an environmentally literate citizenry has therefore become a major task for society.

In 1992, Roth identified three levels of environmental literacy, namely, the nominal level (ELL_1), the functional level (ELL_2) and the operational level (ELL_3). Each of these levels has got expected attributes to be manifested by those who are environmentally literate at the level. The attributes involve certain acquisition of knowledge, skills, attitudes, behavior or action specific to each level. Breadth of knowledge of the environment and the ability to feature effectively in environmental issues are minimal at ELL_1, more ingrained at ELL_2 and advanced at ELL_3. In all, environmental literacy aims to produce a citizenry with creativity and responsibility in the solution of environmental problems. Universities are considered to have a major role to play in the production of the requisite environmentally literate citizenry, but as McIntosh and his colleagues (2001) have observed, most students of higher education graduate and yet remain environmentally illiterate because most higher education curricula do not actually address the societal needs for graduates who will help to promote environmental sustainability.

Nigeria is a signatory to an international ten point action plan popularly known as the *Talloires Declaration* which is an agreement by committed colleges and universities to promote education for societal sustainability and environmental literacy (ULSF, 1990). The level of implementation of the declaration by Nigerian Universities is not yet clear.

2. The Problem

While it could be said that Nigerian Universities and Faculties like Engineering, Social Sciences and Education have courses that touch on aspects of the environment, it could hardly be said with certainty that these Faculties promote environmental literacy even up to the second level. Following this uncertainty and in view of the importance of the inculcation of environmental literacy among University students as already highlighted, the need has clearly arisen to find out what Nigerian Universities have done so far or are doing currently to promote high levels of environmental literacy among their students in order to avert the calamity of continuously producing graduates without appropriate orientation or literacy levels for environmental management and protection. To satisfy this need and thereby forestall the calamity, was the problem of this study.

3. Area of Coverage/Scope of Study

The study covered three universities in the South-South Geopolitical Zone of Nigeria. This zone, usually referred to as part of the Niger Delta of Nigeria, experiences serious environmental problems (various forms of pollution, land and water degradation and so on) arising from vast oil and gas explorations and related industrial activities. Accordingly, the zone presents ample opportunities and/or reasons for educational institutions (especially the Universities) located therein to promote knowledge and understanding of hazards of and necessary responses to the prevailing environmental problems. The Universities of Port Harcourt (UNIPORT), Calabar (UNICAL) and the Rivers State University of Science and Technology (RSUST) selected for the study are all within the said area of coverage. The three Universities were selected for being the oldest within the Region (each spanning over 15 years of existence) with considerable experience of the prevailing environmental problems which should have prompted some integration of environmental matters in cognate departments and courses. Four faculties in each of the universities were involved; namely, Faculties of Science, Education, Social Sciences and Management Sciences. Specifically, final-year students in selected programmes/departments form each of the faculties were the subjects of study. Selection of the final-year students was based on the anticipation that such students would have acquired nearly all (if any) environmental knowledge, skills, and attitudes their universities would have afforded them during their four years of study. Seven departments in the four faculties were focused on. These were the departments available in all the three universities and which were considered apt for the survey as they offered courses that had some relatedness to environmental issues. Details on the Universities and Programmes/Departments are given in table 1 below under "Population and Sample of the study".

4. Purpose and Objectives of the Study

The purpose of the study was to ascertain the extent to which Nigerian University Students attain appropriate EL levels that would enable them, later as adult members of society, to effectively contribute towards national and global sustainable development.

Specifically, the objectives of the study were to:
    i)   ascertain the levels of environmental literacy acquired by would-be graduates of Nigerian Universities at the final year of their undergraduate education in the various faculties and programmes studied;
    ii) find out what programmes and faculties currently produce the highest level of environmental literacy (ELL_3) among their students.
    iii) make relevant suggestions/recommendations that would foster the establishment of programmes for the acquisition of high levels of environmental literacy by would-be graduates of Nigerian Universities.

5. Research Questions

The study sought to answer the following questions:
    i)   What is the extent of acquisition of the various levels of environmental literacy by final-year students of the Nigerian Universities according to:
        (a) Universities
        (b) Faculties?
    ii) What are the relative positions of the various University Programmes/Departments in the production of students with the highest level of Environmental Literacy (ELL_3)?

6. Hypotheses

The following null hypotheses were tested.

$H0_1$ There are no significant differences in the extent of students' acquisition of ELL_1 in the Universities and Faculties.

$H0_2$ There are no significant differences in the extent of students' acquisition of ELL_2 in the Universities and Faculties.

$H0_3$ There are no significant differences in the extent of students' acquisition of ELL_3 among the Universities and Faculties.

$H0_4$ There are no significant differences in the extent of students' acquisition of ELL_3 among the University Programmes/Departments.

7. Procedure

7.1 Population and Sample

A sample of 1,514 final year students (60%) out of a total population of 2,527 were selected for the study. A proportionate random sampling technique was adopted to ensure equal distribution of the said sample among the relevant Universities/Faculties/Programmes/Departments. In other words, 60% of the final year students in each of the Universities/Faculties/Departments were involved in the study.

Table 2 below shows the aggregated and segregated populations and samples by Universities/Faculties/Departments and the totals. The samples are enclosed in brackets.

Table 1 Distribution of the Population and Sample of Students for the Study by Universities/Faculties/ Departments

FACULTY	DEPARTMENT	POPULATIONS & SAMPLES BY UNIVERSITY			OVERALL FACULTY POPULATION & SAMPLE
		UNIPORT	UNICAL	RSUST	
Science	Physics	55(33)	166(100)	27(16)	
	Chemistry	29(17)	57(34)	53(32)	(623(373))
	Biology	82(49)	130(78)	24(14)	
Education	Adult & Community Education	75(45)	58(35)	45(27)	278(166)
	Science Education	64(38)	17(10)	19(11)	
Social Sciences	Geography& Environmental Studies	76(46)	413(248)	54(32)	543(326)
Management Sciences	Business Management	100(60)	954(572)	29(17)	1,083(649)
Total		481(288)	1,795(1,077)	252(149)	2527(1,514)

7.2 Instrument

A questionnaire modelled after Roth's (2002) Q*uestioning Framework for Shaping Environmental Literacy* was designed and used by the researcher. Based on the research questions and null hypothesis the questionnaire was designed to establish the students acquired levels of environmental literacy with reference to the three levels identified by Roth (1992) and cited earlier in the introduction to this paper. The items of the questionnaire consisted of ten structured multiple choice questions for each level of EL to measure the students' competence at the three levels. The instrument was validated with the assistance of three professional colleagues in Environmental Education at the University of Port Harcourt. A pilot study was conducted with thirty final-year students of Engineering outside the selected samples. Using the split-half method, the responses of the thirty respondents were analyzed with the aid of the Pearson Product Moment Correlation Statistic. The Spearman-Brown formula(rt $=\frac{2rh}{1+rh}$) was applied to the obtained reliability coefficient for error correction. A final reliability index of 0.92 was realized, proving the instrument reliable.

7.3 Data Collection and Analysis

The questionnaire was administered and retrieved personally by the researcher with the help of three trained assistants. A total of 1,769 copies of the questionnaire were distributed to 70% of the final-year student populations in the seven selected departments. From the returned duly completed copies of the questionnaire, the required percentage (60%) of students in each University/faculty/department were randomly picked to make up the total sample of 1,514.Percentages, means, the Pearson Product Moment Correlation Coefficient, The Spearman -Brown Formula and the Analysis of Variance (ANOVA) were the statistical methods used to analyze the obtained data.

7.4 Scoring

The overall percentage mean $(\overline{\overline{X}})$ scores of the final-year university students were calculated from obtained data according to universities/faculties & programmes/departments. The result is as shown in table 2 below

Table 2 Overall Percentage Mean ($\overline{X}$) Scores of the University Students in the Selected Universities, Faculties and Programmes/Departments at various Levels (ELL$_1$, ELL$_2$, ELL$_3$) of Environmental Literacy

FACULTY	PROGRAMME/DEPT.	UNIVERSITY	% -AGE MEAN SCORES OF STUDENTS		
			ELL$_1$	ELL$_2$	ELL$_3$
SCIENCES	Physics	UNIPORT	87	60	47
		UNICAL	84	65	44
		RSUST	81	62	48
	Chemistry	UNIPORT	94	72	68
		UNICAL	90	66	43
		RSUST	82	67	45
	Biology	UNIPORT	95	62	60
		UNICAL	80	71	57
		RSUST	75	66	48
EDUCATION	Adult & Community Ed	UNIPORT	76	55	44
		UNICAL	70	58	42
		RSUST	76	63	49
	Science Education	UNIPORT	72	53	48
		UNICAL	70	56	44
		RSUST	80	71	57
SOCIAL SCIENCES	Geography & Environmental Studies	UNIPORT	86	64	56
		UNICAL	84	72	58
		RSUST	73	67	47
MGT. SCIENCES	Business Management	UNIPORT	68	49	39
		UNICAL	66	50	38
		RSUST	67	48	33

Source of data: Computations from Students' Responses to the Questionnaire

7.5 Analysis of Data

7.5.1 Research Questions

Using pooled mean score of the students in table 2 above, answers have been provided for research questions 1(a) and 1(b) of the study in tables 3 and 4 below. The tables (3 & 4) respectively show the extent of acquisition of the three levels of environmental literacy by the final-year students according to Universities and according to departments/programmes of the universities.

Table 3 Extent of Acquisition of Various Levels of Environmental Literacy by final-year students according to Universities (using Pooled mean scores of students in the various Depts/programmes of the universities)

UNIVERSITY	Pooled percentage mean scores of students at each level of EL in the universities		
	ELL$_1$	ELL$_2$	ELL$_3$
UNIPORT	83	59	52
UNICAL	78	63	47
RSUST	76	63	47

Source of data: Table 2

From table 3, it is clear that the final-year students of the three universities, generally speaking, had their highest acquisition of environmental literacy at the first level (ELL$_1$), and the lowest acquisition at the 3rd level (ELL$_3$). In other words, all the three universities had their students scoring highest at the ELL$_1$, less at the ELL$_2$ and least at the ELL$_3$.

Table 4 Extent of Acquisition of Various Levels of Environmental Literacy by final-year students according to Faculties (using Pooled mean scores of students in the various Depts/programmes of the universities)

FACULTY	Pooled percentage mean scores of students at each level of EL in the Faculties		
	ELL$_1$	ELL$_2$	ELL$_3$
SCIENCE	85	66	51
EDUCATION	74	59	47
SOCIAL SCIENCES	81	68	54
MANAGEMENT SCIENCES	67	49	37

Source of data: Table 2

In summary, data in table 4 show that none of the Faculties scored up to 55% at the ELL_3. Again, the highest scores were obtained at the ELL_1 followed by the ELL_2 in all the Faculties. Furthermore, the Social Sciences Faculty performed highest at the ELL_2 and ELL_3 – trailing behind the Science Faculty with only a difference of 4% at the ELL_1. Students in the Science Faculty, on the other hand, had the highest acquisition of environmental literacy at the ELL_1 with an average score of 85%. The students of the Science Faculty also were second to those of the Social Sciences Faculty at the ELL_2 and ELL_3 at close range with 66% and 51% mean scores respectively. Students in the Faculty of Management Sciences acquired the least environmental literacy at all the levels (ELL_1 – ELL_3).

Using pooled mean scores of the students in table 2 also, an answer has been provided in table 5 below for research question 2 of the study.

Table 5 Ranking the University Programmes/Departments in relation to their production of students with ELL_3

Programmes/Departments	Pooled mean scores of students at the ELL_3	Rank
Physics	46	5th
Chemistry	52	3rd
Biology	55	1st
Adult & Community Education	45	6th
Science Education	50	4th
Geography & Environmental Studies	54	2nd
Business Management	37	7th

Source of data: Table 2

Table 5 shows the relative positions of the various university programmes/departments in the production of students with the highest level of environmental literacy (ELL_3). As the data reveal, out of the seven programmes/departments, Biology Department ranked first, followed by Geography and Environmental Studies. Chemistry was third, while Science Education ranked fourth. Physics, Adult & Community Education and Business Management ranked fifth, sixth and seventh (last) respectively.

7.5.2 Hypotheses Testing

The four hypotheses of the study were also tested using data in table 2 above. Tables 6, 7, 8 and 9 below respectively provide summary of the data used in testing H0s 1, 2, 3 and 4

Table 6 Summary of Two- Factor Analysis of Variance (ANOVA) in Students' Acquisition of ELL_1 in the Studied Universities and Faculties

Source of Variation	SS	df	MS	Fcal	Fcrit/tab	Decision at 0.05 level
Faculties	583	3	194.3333	7.851852	4.757063	Significant
Universities	68.16667	2	34.08333	1.377104	5.143253	Not significant
Error	148.5	6	24.75			
Total	799.6667	11				

Source of data: Table 2

Key:

Fcal	=	Calculated variance ratio
SS	=	Sum of Squares
df	=	degree of freedom
MS	=	Mean Square
Fcrit/tab	=	critical/table variance ratio

Table 6 summarizes the ANOVA of the students' mean %-age scores at the ELL_1 (Environmental Literacy $Level_1$) in the three universities and four faculties used for the study as calculated from data in table 2 above). Among the Universities, the calculated variance ratio (f cal) of 1.377104 is less than the critical/table (f crit/tab) ratio of 5.143253. Ho_1 is therefore accepted. In other words, there are no significant differences in the extent of students' acquisition of ELL_1 among the Universities at the 0.05 level of significance.

Among the Faculties, however, the f cal (7.851852) is greater than the f tab (4.757063). This depicts significant differences in the extent of students' acquisition of ELL_1 from the Faculty perspective. In other words, Ho_1 is rejected in relation to the Faculties at the 0.05 level of significance.

Table 7 Summary of Two- Factor Analysis of Variance (ANOVA) in Students' Acquisition of ELL_2 in the Studied Universities and Faculties

Source of Variation	SS	df	MS	F cal	F crit/tab	Decision at 0.05 level
Faculties	634.9167	3	211.6389	13.39016	4.757063	Significant
Universities	35.16667	2	17.58333	1.112478	5.143253	Not significant
Error	94.83333	6	15.80556			
Total	764.9167	11				

Source of data: Table 2

Table 7 gives a summary analysis of the variance of students' scores at the ELL_2 in the three universities and four faculties used for the research study as calculated from table 2 of this study. In the case of the students' scores in the universities, the fcal (1.112478) is less than ftab (5.143253). Accordingly, Ho_2 is accepted; that is, the observable differences in the extent of the students' acquisition of ELL_2 are not significant at the 0.05 level. This is not the case from the Faculty perspective where f cal (13.39016) is greater than f tab (4.757063). Here Ho_2 is rejected; that is, there are significant differences in the extent of students' acquisition of ELL_2 among the Faculties.

Table 8 Summary of Two-Factor Analysis of Variance (ANOVA) in Students' Acquisition of ELL_3 in the Studied Universities and Faculties

Source of Variation	SS	df	MS	Fcal	F crit/tab	Decision at 0.05 level
Faculties	501.6667	3	167.2222	5.907753	4.757063	Significant
Universities	46.16667	2	23.08333	0.815505	5.143253	Not significant
Error	169.8333	6	28.30556			
Total	717.6667	11				

Source of data: Table 2

In table 8, the variance of students' scores at the ELL_3 in the three Universities and four faculties studied is analyzed. Data in table 2 of this study were used for the analysis. As table 8 shows, f cal (0.815505) is less than f tab (5.143253) in the case of scores of students from the three universities. In effect, Ho_3 is accepted; that is, there are no significant differences in the extent of acquisition of ELL_3 by the students of the three universities. At the level of the faculties, f cal (5.907753) is greater than f tab (4.757063), showing that there are significant differences in the extent of students' acquisition of ELL_3 among the four faculties studied. Ho_3 is therefore rejected with respect to students' extent of ELL_3 acquisition in the faculties.

Table 9 Summary of Two-Factor Analysis of Variance (ANOVA) in Students' Acquisition of ELL_3 in the Selected Universities &Programmes/Departments

Source of Variation	SS	df	MS	F cal	F crit/tab	Decision at 0.05 level
Programmes/Departments	718	6	119.6667	2.580082	2.99612	Not significant
Universities	120.0952	2	60.04762	1.294661	3.885294	Not significant
Error	556.5714	12	46.38095			
Total	1394.667	20				

Source of data: Table 2

In table 9, the variance of the students' extent of acquisition of ELL_3 is analyzed from both the Universities and Programmes/ Departments perspectives. At the University level, fcal (1.294661) is less than the fcrit/tab (3.885294). This implies that Ho_4 is accepted at the 0.05 level of significance, meaning that there are no significant differences in the extent of students' acquisition of ELL_3 in the three universities at the said significance level. In the case of the Programmes/Departments, fcal (2.580082) is also less than fcrit/tab (2.99612). Accordingly, Ho_4 is equally accepted with the conclusion that there are no significant differences in the extent of students' acquisition of ELL_3 among the seven Programmes/Departments at the 0.05 level of significance.

8. Discussion of Findings

Findings based on the Research Questions (tables 3 & 4) show that in all the Universities and Faculties studied, students acquired Environmental literacy level one (ELL_1) highest, less of ELL_2 and least of ELL_3. Again, among the three Universities and the seven Programmes/Departments involved in the study, acquisition of ELL_3 (the highest level of environmental literacy) varied (table 5). In the particular case of the Departments/Programmes, Biology came first with 55%, Geography and Environmental Studies came 2nd with 54%, while Chemistry was 3rd with 52%. The other departments/programmes ranked 4th to 7th with none of them scoring above 50%. The position of Business Management Programme/department as the 7th (last) in the ranking ladder tends to

corroborate the research findings by Hodgkinson and Innes (2001) which showed that students involved in economically relevant disciplines, such as business, are consistently less pro-environmental than students in other disciplines.

The results of hypotheses testing (tables 6 – 8) revealed no significant differences in the extent of acquisition of $ELL_1 - ELL_3$ among the universities at the 0.05% level of significant. However, significant differences were found to exist in the extent of acquisition of these levels of environmental literacy among the faculties. This could not have been otherwise given the data in table 4 which agree with the finding.

Furthermore, among the seven programmes/departments studied (table 9) no significant differences were found to exist in students' acquisition of the highest level of environmental literacy (ELL_3) at the 0.05% level of significance. This strongly signifies the endemic pervasion of the low levels of environmental literacy acquisition among students of the various universities at both the 'macro' and 'micro' levels.

9 Conclusion

The findings of this study clearly show that acquisition of environmental literacy by students in the Nigerian Universities concerned, was rather low at the University, Faculty and Departments/programme levels. Again, the Universities and Faculties did not differ significantly in the trend of their students' acquisitions of ELL_1 most, less of ELL_2 and least of ELL_3. Accordingly, none of the Universities' disciplines (including those that were environmentally related like Botany and Geography/Environmental studies) could have produced graduates that would effectively contribute to the solution of local and global environmental problems.

A fundamental suggestion here for the remediation of the inadequate situation would be that various levels of the Administration of Nigerian Universities (the National Universities Commission, University Councils and Senates, Faculty and Departmental Boards) should close ranks to design core and compulsory environmental literacy education programmes to form part of the curricula (including the General Studies) at the various departments of the Universities. Environmentally related disciplines like Botany, Geography and so on, need to broaden their contents beyond their basic curriculum concerns to include social, economic and political dimensions of human interaction with natural systems.

The deficiencies in environmental literacy education discovered in the case of the three universities located in the environmentally-hazard-prone Niger Delta Region of Nigeria could, for reasons discussed under area of coverage of this study, provide an insight into what the situation may be like in other Nigerian Universities located in less environmentally endangered regions of the country. Be that as it may, however, there is a need to replicate this study to involve more federal as well as privately owned universities in Nigeria. This would provide more comprehensive information on the overall situation of environmental literacy education in Nigerian Universities and thereby elicit more strategies and suggestions for remedying observed anomalies.

REFERENCES

Eheazu, B.A. (2011), *Global Warming and Climate Change: A Sustainability Alert to Ndigbo*(2011 Ahiajoku Lecture); Owerri (Imo State, Nigeria): Ministry of Information, Culture, Youth and Sports.

McIntosh, M., Cacciola, K., Clermont, S. Keniry J. (2001), *State of the campusEnvironment: A National Report card on Environmental Performance andSustainability in Higher Education*; Reston, VA: National Wildlife Federation.

Hodgkinson, S. And Innes, J. (2001), The Attitudinal Influence of Career Orientation in 1st-yearUniversity Students: Environmental Attitudes as a Function of Degree Choice, *The Journal of Environmental Education* 32(3), 37-40.

Roth, C.E. (1992), *Environmental Literacy: Its Roots, Evolution and Directions in the 1990s;* US Massachusetts: ERIC Clearinghouse for Science, Mathematics and Environmental Education (CSMEE).

ULSF (University Leaders for a Sustainable Future) (1990), Brief History of the Talloires Declaration; http://www.uslf.org/programmes_talloires_ history.html.pp1-2.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar