
RELATIVE CONTRIBUTION OF KNOWLEDGE OF POLLUTION, SOLID WASTE DISPOSAL AND POPULATION ON STUDENTS' PRACTICES TOWARDS ECOLOGICAL DEGRADATION IN IBADAN

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Abstract

This study provides relative contribution of knowledge of pollution, solid waste disposal, and population on students' practices towards ecological degradation. Research design was descriptive survey. The population was taken from Senior secondary school students in Oyo state. Twenty (20) public Senior Secondary Schools and their 600 students participated. Specifically, aspect of study was restricted to Students' Knowledge of Pollution ($r=0.75$), Knowledge of solid waste disposal ($r=0.86$), and Knowledge of population ($r=0.79$). These coefficients showed that the instruments were reliable for data collection. Two research questions were answered. Instruments designed by the researcher include: Students' knowledge on Pollution, Solid Waste Disposal and Population Education (SKWDPE) and Students Environmental Practices Scale (SEPS). Data collection lasted for five (5) weeks. Data was analysed using Multiple Regression Analysis. Results revealed that only knowledge of pollution with ($\beta = -0.245$, $t = -2.798$, $p < 0.05$) and knowledge of solid waste disposal ($\beta = -0.249$, $t = -2.514$, $p < 0.05$) predicted students' practices towards ecological degradation. It was recommended that knowledge of sewage disposal of Sewage disposal and knowledge of pollution should be adopted as viable for studying environmental degradation.

Keywords: Knowledge, Pollution, Solid Waste Disposal, Population

Introduction

The environment has supplied housing for humans and numerous organisms for centuries, yet humans' voracious wants have forced them to invent survival and adaptation tactics. Several of these tactics, particularly those using technology, have had direct and indirect detrimental effects on the nearby environment, leading to its degradation. Many of today's environmental issues are becoming more and more the result of individual behaviours, personal consumer decisions, and small and large business activity. Nonetheless, the truth remains that the health of the world's economy and people is intrinsically linked to environmental health. This means that there is a greater need now than ever before to comprehend the declining environment's patterns, relationships, systems, and core causes. Environmental education is a

powerful instrument for preventing the escalation of 21st-century environmental problems, which are growing increasingly alarming. A thorough grasp and use of behavioural models and theories is a must for reaching this goal. Environmental knowledge has six distinct components. These are (i) environmental awareness, (ii) information, (iii) skill, (iv) attitude and values, (v) individual responsibility and (vi) active involvement. All these components are imparted into the knowledge of solid waste, population and pollution. Scientists consider environmental sensitivity, attitudes and values in these six components in the affective domain title Active participation was also assessed within the title of individual responsible behaviours. Thus, he stated that environmental literacy consists of four parts as knowledge, skill, affective domain and behaviour. On the other hand, in 2008, McBeth, Hungerford, Marcinkowski, Volk, and Meyers described the components of environmental knowledge as environmental sensitivity, ecological knowledge, environmental emotions, problem and action abilities, verbal commitment (volunteering to act). More recently, the North American Environmental Education Association (NAAEE) has identified four interrelated components of environmental literacy: knowledge, trends, competences and responsible behaviours towards the environment. These important features of environmental knowledge emphasize the notion that people will be interactive and developmental when it comes to nature, which implies that environmental knowledge, whether it is developed or not, will evolve via the knowledge process.

Environmental degradation which has grown to their present state of near uncontrollable stage dates back to the 1890's when a Swedish Chemist, Svante Arrhenius alerted the people around that burning fossil fuel and clear standing forests used for various developmental purposes had released an unusual amount of Carbon IV oxide into the atmosphere resulting in the increased warming of the climate. Consequently, Americans constitute less than 5% of the world's population, but produce roughly 25% of the world's carbon (IV) oxide, and generate approximately 30% of world's waste, China has overtaken the United States as the world's biggest producer of carbon (IV) oxide (Guardian.uk, 2007). About 400 million metric tons of hazardous wastes are generated each year. The United States alone produces about 250 million metric tons. Studies conducted by David, Michael, and Caroline (2010) have estimated that the number of people killed annually in the United States of America because of pollution and ecological disturbance could be over 50,000.

The actual environmental practices of the people are a necessary factor towards attainment of a clean and healthy environment. Noibi (1993) reported daily experiences in Nigeria had revealed very poor environmental practices. It is also assumed that beliefs and misconceptions, which young people had, tend to stick to them for a long period later in life. Students enter secondary schools between ages 11 and 14 years and leave between the ages 16 and 19 years (Ojo, 2008). Secondary school students belong to one of the most sensitive groups of population who may be initiated, involved and prepared for understanding and tackling the environment problem to the extent possible. They are usually receptive and strongly motivated and capable of assimilating an environmental education that is value-oriented, community-oriented and concerned with human well-being. Hence, environmental practices should be geared towards sustainable use of the natural resources for both the present and future generations.

Knowledge of solid waste is important especially in the urban centres. There is an alarming rate of poor waste generation and disposal by both families, sellers of various items in the market places and corporate bodies as well as ineffective waste management system and legislation by the government (Abiona, 2008). All these may rightly be attributed to earlier

submission that ignorance or lack of environmental awareness of the right action to take is the greatest single contributor to environmental degradation problems (Ojo, 2008). A consideration for practical solutions for the conservation of all environmental resources in a sustainable manner will be of national interest because the majority of Nigerians will benefit from an improved environment (Ajiboye & Olatundun, 2010). The school is crucial in helping pupils comprehend the knowledge of solid waste management, among other things. Schools, according to David, Michael, and Caroline (2010) have had a significant impact on students' environmental solid waste management. Several research revealed that students reported environmental sentiments had a favorable impact on environmental solid waste management behaviour (Jaiyeoba, 2002)). The 2012 rainy season in Nigeria has been worse than earlier years, and heavy rains at the end of August and the beginning of September led to serious floods in most parts of the country. The Nigerian authorities contained the initial excess run-off through contingency measures, but during the last week of September water reservoirs have overflowed and authorities were obliged to open dams to relieve pressure in both Nigeria and neighbouring Cameroon and Niger, leading to destroyed river banks and infrastructure, loss of property and livestock and flash floods in many areas. By 29th of September, the floods had affected 134,371 people, displaced 64,473, injured 202 and killed 148. By the end of October, more than 7.7 million people had been affected by the floods, and more than 2.1 had registered as IDPs. 363 people were reported dead; almost 600,000 houses had been damaged or destroyed. Out of Nigeria's 36 states, 32 have been affected by the floods. A final comprehensive assessment loss of 2.6 trillion Naira was recorded

Also, World Bank, (2002) discovered that students' practices towards environmental solid waste management influence their actions, notably their decision-making and tenacity. Ajiboye & Olatundun, (2010) argued that in environmental solid waste management. research, attaining environmental practices and examining individual cognition are critical. However, in order to meet the difficulties of environmental concerns and problems (such as pollution, deforestation, salinity, urbanization, global warming, and climate change), it is vital to give our children and grandchildren the environmental information, skills, and practices they need. (Ajiboye & Olatundun, 2010 Ajiboye & Olatundun, 2010), because the environmental management policies in place today will affect and be affected by this generation.

Knowledge of pollution is important especially to the large-scale industrialist that generates a high-profile pollutant in which their industries are located in the countryside such industries include cement and paper manufacturing. Other sources of these environmental problems are from flaring other oil and gas related activities. Natural gas associated with crude oil has been flared in the Niger Delta region of Nigeria for more than four decades. Statistics on crude oil production indicated that about 70 percent of the total gas associated with crude oil was flared in obvious disregard for the country's 1979 Gas Injection Legislation (Atoyebi, 2000). The flaring of gases by oil companies in Nigeria accounted for more than half of the estimated 96.513 million metric tons of carbon (IV) oxide emissions from industrial sources in Nigeria in 1992 (Jaiyeoba, 2002).

Knowledge of the study of population education in the Nigerian school curriculum is gaining acceptance gradually as an important part of education. There is very little evidence of its impact on students' knowledge and attitude to population and related issues especially among its teeming youthful population that accounts for about 33% of her population. Nigeria has been experiencing explosive population growth and one of the highest growth and fertility rates in the world (United Nations, 2005). According to the National Population

Commission (2015), Nigeria has a population growth rate of 3.2% which to a demographer is exponential and can lead to population explosion, more unemployment and poverty on the street of this great nation. According to Nigeria Demographic and Health Survey NDHS (2013), knowledge of family planning methods is high in Nigeria; 85% of women and 95% of men age 15-49 know at least one method of family planning but only fifteen per cent of currently married women use any method of contraception, this has been used to reduce the population of the country. It has been established that education remains the potent tool for change and an 'instrument par excellence'. According to Ehigiamusoe (2012), Nigeria's ability to realize her vision of becoming one of the largest twenty economies in the world by the year 2020 is largely dependent on the capacity to transform her population into highly skilled and competent citizens capable of competing globally. In other words, the citizenry must be equipped with relevant knowledge and skills that can help them demonstrate competence in tackling challenges they face or are likely to face in a global world in population and related matters.

As population of this world is growing at a rapid pace, raising awareness among people regarding family planning and letting them know about serious after-effects of overpopulation can help curb population growth (Conserve Energy Future, 2015). Information about a country's population is fundamental to rational policy making, planning and programme implementation (UNFPA, 2012). Population education is controversial in nature due to some aspects of the curriculum content that are perceived as negating some religious and cultural beliefs, norms and practices which are already engrained in the students by both their families and the society. United Nations (2003) submitted that implementation of population education in Nigeria is often affected by family and kinship organization.

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School-based programmes offer a very large target population and provide an opportunity for interventions to reach a very large number of young people before or around the time that they become sexually active and engage in high-risk behaviour (World Bank, 2002). According to

Kavita (2002), the adolescents of today will be the adults and parents of tomorrow and their reproductive behaviour will play an important role in controlling the rate of population growth. It is imperative therefore that they be educated about the importance of population education as it relates to reproductive health, sexual behaviours, size of the family and the like. They are also expected to develop a favourable practice towards population related issues. Also, Clarke (2008) affirmed that appropriately designed and implemented education programmes are able to increase knowledge about HIV and AIDS and reduce reported risk-taking behaviours.

Statement of the Problem

Environmental concept is one of the essential themes in the senior secondary school biology that is aimed at changing the culture of environmental or ecological degradation among the people of Sub-Saharan Africa. This objective is in line with sustainable development goals. However, the challenges of environmental pollution, solid waste management and gradual increase in world population with specific reference to Nigeria has remained unabated. This ugly scenario has significant threat to the well-being, health and existence of humanity in general. What then is the root cause of these problems over the past decades, from generation to generation? Environment is largely becoming unsafe due to human practices. Has the learning of environmental concepts in the senior secondary school biology been able to transform the practices of biology students over the years? will their knowledge of environmental concepts be able to predict the nature of students' practices towards the environment? These are some of the problems that require answers from all the concerned stakeholders on the issue of environment. Hence, the knowledge of the population, knowledge of solid waste management and knowledge of pollution is necessary for the youth because the adolescents of today will be the adults and parents of tomorrow and their knowledge and practices towards the environment will play an important role in controlling the menace of pollution, solid waste and increasing population. This study attempted to provide relative contribution of knowledge of pollution, solid waste disposal and population on students' practices towards ecological degradation.

Research Questions

The following research questions were raised to guide this study.

Research Question 1: What is the level of Students' Knowledge of Pollution, Knowledge of solid waste disposal, and Knowledge of population education on students' Practice towards ecological degradation?

Research Question 2: What is the relative contribution of pollution, solid waste disposal, and population on students' practices towards ecological degradation?

Methodology

The research design to be adopted for this study was descriptive research of correlational type. Six hundred Senior Secondary two (SS II) biology participated in the study. The subjects were from twenty purposively selected co-educational secondary schools in Ibadan North, Ibadan North East and Akinyele Local Government Areas of Oyo State. The selection of schools was based on the fact that those schools are co-educational schools, there was availability of experienced biology teachers with at least three years teaching experience, evidence of SSII students of the schools not to have been exposed to the concepts of the study, evidence of SSII students of the schools having been exposed to pre-requisite concepts necessary for the

understanding of the concepts of the study in their Junior Secondary Schools and willingness of the required members of staff to participate in the study. The choice of SSII biology students was also made because they have been exposed to introductory aspects of pollution, waste disposal and population studies as environmental concepts in junior secondary school basic science and SSI biology which act, as pre-requisites for the study of the chosen concepts. The students were likely to be more receptive to the teaching strategy as they were not under the pressure of preparing for external examination. The teaching of the concepts was also appropriate to the scheme of work at this stage of their spiral curriculum.

Two instruments titled Students' Knowledge on Pollution, Solid Waste Disposal and Population Education (SKWDPE) and Students Environmental Practices Scale (SEPS). Students' knowledge on Pollution, Solid Waste Disposal and Population Education (SKWDPE designed and developed by the researcher were used to measure the knowledge of pollution in Environmental education. The instrument consists of two sections, A and B. Section A seeks the bio-data of Biology students such as Name of school. Section B consists of 40 multiple choice items which were used to test students' knowledge on the three topics selected such as Pollution, Solid Waste Disposal and Population. Each item has options A to D and the options were made up of one correct answer and three distracters. The test items were generated around the six levels of knowledge, comprehension, application, analysis, synthesis and evaluation of Bloom's (1956) taxonomy of cognitive objectives.

Table1: Table of Specification for SKWDPE

Content	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
Student Knowledge of Pollution Test	1, 2, 3,	8, 9	4, 5, 18, 36,	6, 17, 39	10, 11, 23	12, 16, 25, 28	19
Student Knowledge of solid waste disposal	7	31, 32,	33,	21, 30	13, 14	34, 38	10
Student Knowledge of population education test	27,	35, 37	19	20, 22,	15, 24, 29	26, 40	11
Total	5	6	6	7	8	8	40

Student Environmental Practice Scale (SEPS) was adapted from Oladapo (2011) participants environmental education programme for market men and women. It was modified by considering the educational and maturity level of secondary students, it was found to suit the measurement of practices of senior secondary school students towards sewage disposal, population and pollution. The instrument was divided into two parts. Part A is made up of the data of the participants such as name of School of the participants, the class and gender. Part has 20 items with statements that assess the participants' practices on sewage disposal, population and pollution. The items were structured in Four-Point Likert type of Very Often (VO) - 4 marks, often (O)- 3 marks, seldom (S) – 2 marks and Never (N) – 1 mark while the reverse was used for negatively worded statements.

The face and content validity of the test were carried out by lecturers who are experts in test-item construction, measurement and evaluation to ascertain the suitability of the items in

terms of language, clarity of purpose and precision. 60 items were prepared initially but 40 items were finally selected. The instrument was trial-tested on a sample of 30 Biology students from Adekile Goodwill Grammar School in Ibadan. The instrument was also given to colleagues, in related disciplines as well as professionals in the field of Environmental Education. Their comments, criticisms and suggestions were used to expunge, and add some items when necessary. The final drafts were administered to senior secondary school students at Adekile Goodwill Grammar School in Ibadan. The reliability coefficients three in one instruments of Students' knowledge on Pollution, Solid Waste Disposal and Population Education (SKWDPE) were ascertained by using Kuder-Richardson formula 21 to determine the internal consistency of the instrument. It yielded a coefficient of knowledge on Pollution, knowledge on Solid Waste Disposal and knowledge on Population 0.75, 0.86 and 0.79 respectively.

In a similar approach, the reliability coefficient of the questionnaire on Students Environmental Practice Scale (SEPS) were calculated through Ordinal Alpha. Approximated values of 0.91 was obtained. These coefficients showed that the instruments were reliable for data collection. The research instruments were administered at the twenty (20) selected schools with the support of the biology teachers in each of those schools. The instruments were administered on the same day across the four schools. Prior to the administration of the instruments, permission was sought from the school heads through the Secondary Education Board. The students were guided through the instructions given by the researcher on responding to test items and the questionnaire. Each of the instruments took about ten minutes to administer. On the whole, a total of 50 minutes was used in each of the schools. The instruments were retrieved from the students after completion. Data generated from the instruments were subjected to an inferential statistic of Multiple Regression and Pearson Product Moment Correlation (PPMC)

Results

Research Question 1: What is the level of Students' Knowledge of Pollution, Knowledge of solid waste disposal, and Knowledge of population education on students' Practice towards ecological degradation?

Table 1: Students' Knowledge of Pollution levels on students' Practice towards ecological degradation

Variable	Sample number (n)	Standard error	Maximum	Minimum	Standard deviation	Mean
Students' Knowledge of Pollution	600	5.66	48	13	2.955	45.84

Table 1 above showed that the mean score of Students' Knowledge of Pollution level of under the study was 45.84. Therefore, it can be concluded that their Students' Knowledge of Pollution levels toward were high.

Table 2: Students' Knowledge of solid waste disposal on students' Practice towards ecological degradation

Variable	Sample number (n)	Standard error	Maximum	Minimum	Standard deviation	Mean
Self-efficacy	600	5.66	58	20	18.5	2.955

Table 2 above indicated that the mean score of Students' Knowledge of solid waste disposal under the study was 50.4 while the minimum and maximum score was 0 and 58 respectively. Therefore, it can be concluded that the Students' Knowledge of solid waste disposal towards studying was at high level.

Table 3: Students' Knowledge of Pollution levels on students' Practice towards ecological degradation

Variable	Sample number (n)	Standard error	Maximum	Minimum	Standard deviation	Mean
Students' Knowledge of Population	600	5.31	48	13	2.98	45.84

Table 1 above showed that the mean score of Students' Knowledge of Population level of under the study was 45.84. Therefore, it can be concluded that their Students' Knowledge of Population levels toward were high.

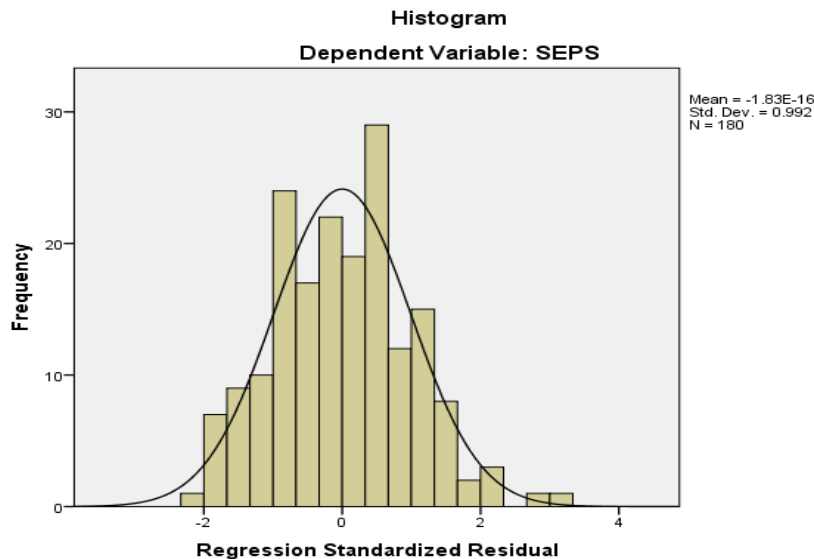


Figure 1: Histogram of students' practices towards ecological degradation

Figure 1 shows that there is a normal distribution of data of students' practices towards ecological degradation

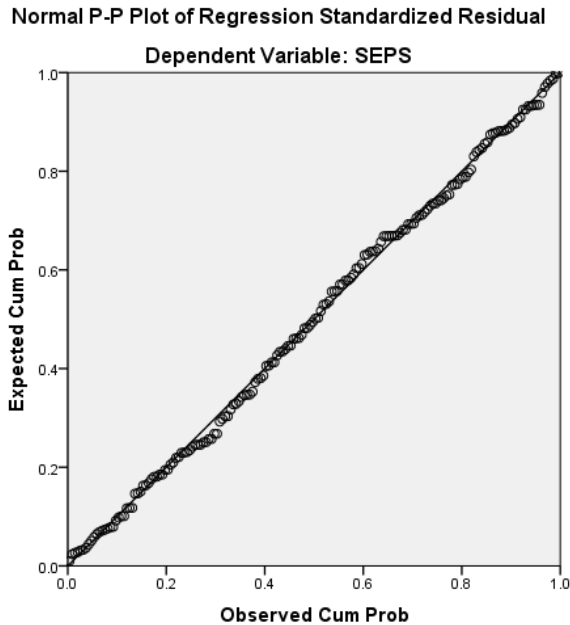


Figure 2: P-P plot of students' practices towards ecological degradation

Figure 2 shows a linearity graph for students' practices towards ecological degradation. Therefore, it can be said that the data meet the linearity assumption, given that the data points are close to the linear.

Research Question 2: What is the relative contribution of pollution, solid waste disposal, and population on students' practices towards ecological degradation?

Table 3: Regression Coefficient of pollution, solid waste disposal and population on students' Practice towards ecological degradation

Coefficients	Unstandardized Coefficients		Standardized Coefficients		T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	51.357	1.499			34.254	0		
Student Knowledge of Pollution Test	-0.711	0.254	-0.245		-2.798	0.006	0.676	1.48
Student Knowledge of solid waste disposal	-0.141	0.275	-0.249		-2.514	0.008	0.577	1.734
Student Knowledge of population education test	-0.142	0.264	-0.049		-0.538	0.592	0.617	1.62

Table 3 shows that among the predictor variables, only knowledge of pollution with ($\beta = -0.245$, $t = -2.798$, $p < 0.05$) and knowledge of solid waste disposal with ($\beta = -0.249$, $t = -2.514$, $p < 0.05$)

were found to have significant relative and predictive contribution on students' practices towards ecological degradation. However, knowledge of population education has no significant predictive ability on students' practices towards ecological degradation with ($\beta = -0.049$, $t = -0.538$, $p > 0.05$). Furthermore, multicollinearity was examined using tolerance and variance inflation factor (VIF). These are the two Collinearity diagnostic factors that can help identify multicollinearity in the study's variables. Tolerance is a measure of collinearity reported by most statistical programs such as statistical package for social sciences (SPSS); the variable's tolerance is $1-R^2$. A small tolerance value indicates that the variable under consideration is almost a perfect linear combination of the independent variables already in the equation and should not be added to the regression equation. All variables involved in the linear relationship will have a small tolerance. Some suggest that a tolerance value less than 0.1 should be investigated further. Thus, with tolerance value in this study, multicollinearity may not be an issue. Also, the Variance Inflation Factor (VIF) measures the impact of collinearity among the variables in a regression model. The Variance Inflation Factor (VIF) is $1/\text{Tolerance}$, and it is always greater than or equal to 1. There is no formal VIF value for determining the presence of multicollinearity. Values of VIF that exceed 5 ($VIF > 5$) are often regarded as indicating multicollinearity. Therefore, none of the VIF values are greater than or equal to 5. Thus, the case of multicollinearity was not probably an issue in this study.

Discussion of Findings

The result of this finding revealed that the students' knowledge of solid waste disposal, pollution and population on students' practices towards ecological degradation level under the study were found to be high. This implies that the students under the study were have high knowledge of solid waste disposal pollution and population on students' practices towards ecological degradation and this has really contributed to their development of necessary practices towards ecological degradation. This corroborates the finding of Ogundiwin (2006) that good knowledge of environmental education received by students make them achieve academically by strategically engaging in behaviour such as e, class environmental practices, participation in sanitation, question asking, advice seeking, studying and participating in study groups. According to Olagunju and Abiona (2004) in their study revealed that the exposure of students to environmental education makes them to enjoy learning science, believe in their ability to learn, and take responsibility for their learning.

This study revealed that there is a sufficient statistically predictive value of students' knowledge of solid waste disposal on students' practices towards ecological degradation. This implies that those in the students' knowledge of solid waste disposal acquired better environmental practices than their counterparts in the other knowledge groups. This is likely to be as a result of the nature of the critical thinking and evaluation programme developed and implemented in the study which emphasized active learner participation. This corroborates the findings of UNESCO (2001 and 2004), UNESCO (2004), Ngothor, Fincham and Quinn (2004), who reported significantly high environmental practices of adults and adolescent learners exposed to their non-formal participatory EE programmes.

This study revealed that there is a sufficient statistically predictive value of students' knowledge of pollution on students' practices towards ecological degradation. Knowledge of pollution appears to allow students to listen actively involved, with little or no interaction with the teacher. Studies have predominantly reported poor environmental practices among Nigerians

including indiscriminate refuse disposal poor drainage caused by construction of road/houses, poor waste management among others. A study carried out by Olagunju and Abiona, (2004) among residents of two local government area in Oyo state reveals that the predominant method of solid waste disposal is open dumpsites on the streets, markets, schools, around homes and even hospitals. This also tends to be a reflection of people's poor environment practices. Olagunju (2002) earlier findings reveal a positive relationship between environmental knowledge and attitude of a target population. Invariably, as Ojo (2008) asserts people's level of ignorance affects the environment and determines the extent of harm they will do to environment. Evidence has also shown that puzzles-based instructional strategies in teaching and learning of science education in Korea Universities improved understanding of abstract concepts and develop problem-solving abilities in students' learning of environmental pollution, population and solid management (Ogundiwin, 2006).

Thus, the relatively higher practices in knowledge of pollution repeats itself in this study as it was in the findings of Chukwuka (2006) and Ajitoni (2009). This is because the knowledge of pollution often subjects the learners to the position of active recipient of fact handed down to him by the teacher.

Educational Implications

The exposure of the learners to knowledge of Sewage disposal and knowledge of pollution education have been found to positively affects the enhancement of students' Practices towards ecological degradation respectively. The study also revealed that there is need to incorporate in our educational system knowledge of Sewage disposal and knowledge of pollution education that could help in providing necessary practices respectively needed to solve various environmental problems prevalent in our surroundings.

Understanding and utilizing the core principles of knowledge of Sewage disposal and knowledge of pollution education to inculcate in students from different environment poses the right environmental practices becomes inevitable because students will be very critical in their thinking and will be able to formulate their own ideas and provide additional source of information from their background and this may have enhanced their practices towards environment.

Conclusion

This study is in line with the work of researchers who believe that strategy learning by teachers improves content learning of students (Olagunju,2002; Awolola,2009) and to develop strategies for resolving environmental problems leading to sustainable development in our country, thus as practicing teachers and would-be teachers were trained and became competent in the use of knowledge of Sewage disposal and knowledge of pollution education in learning environmental concepts, their practices towards environmental degradation will improved.

Recommendations

In the light of the results and discussion, the following recommendations are advanced:

- knowledge of Sewage disposal and knowledge of pollution education should be adopted as viable strategies for studying environmental degradation as they involve the students in monitoring their learning process. These are viable teaching strategies for necessary practices needed by students in selected

environmental concept in our secondary schools like ecology, acid rain, ozone layer depletion, greenhouse effect, population, biodiversity.

- knowledge of Sewage disposal and knowledge of population education give a multi-sensory instruction which combines the use of Intuition to create the optimal setting that must be embraced by teachers and our curriculum planners as a better strategy.

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