Original Research Article

Environmental Knowledge and Perception of Secondary School Students in Katsina, Nigeria

Abstract

This study assesses environmental knowledge of some selected secondary school students in Katsina, Nigeria. Three representative schools out of total 39 were selected for the purpose of this study. These are (i) Ulul Al-Bab Science Secondary School (Co-educational School, both girls and boys), (ii) Government College, Katsina (Boys only school) and (iii) Government girls college Katsina (Girls only school). 150 students (25 students per each of levels 1-6 of secondary education) were sampled in each of the three selected schools. The selected students were issued with the prepared questionnaire addressing some key issues that probe students' depth of knowledge of environmental problems, their consequences and solutions of solving them. ANOVA statistical test was used to test for significant variation in the level of environmental knowledge of the students within the individual schools studied in order to identify the extent to which variation in levels of study (i.e. age-grade) on environmental knowledge level of the students. The same test was also used to test for significant difference in the environmental knowledge of the students between different schools in order to determine the effect of variation in gender characteristics on the knowledge level. The results obtained indicate in general that the secondary school students in the town display medium to high level of knowledge on the causes, consequences and solutions of environmental problems, but gender and level of study have generally significant influences the environmental knowledge levels of the students. Appropriate recommendations were made to help improve the level of student's knowledge of environmental issues in the area.

Keywords: Environment; Students; Knowledge; Schools; Katsina; Secondary;

1 Introduction

The value and importance of Environmental Education (EE) has been endorsed internationally long before the sustainable development debate assumed international dimension (e.g. UNESCO, 1978; 2004; 1980; NAAEE, 2000; Potter, 2009; Adejoke et al., 2014; Alvarez-Garcia et al., 2018; Martinez-Borreguero et al., 2020). For long, educational efforts are increasingly being seen as means for increasing individuals' environmental knowledge and capacity to work towards addressing environmental problems, with schools seen as important media through which such knowledge can be acquired (Bradley et al., 1999; Sadik and Sadik, 2014; DiEnno and Hilton, 2015; Oncu and Unler, 2015; Erhabor and Don, 2016; Uyanik, 2017; Chauchan, 2020Itasanmi, 2020). Accordingly, large volume of published research information is available on environmental knowledge of school students for many areas of the world such as USA (Orr, 1992, 1995; Barrow and Morrisey, 1989; Hausbeck et al., 1992; Wilke, 1995; Sivek, 2002), Lebanon (Makki, et al., 2003), Netherlands

(Kuhlemeier et al., 1999), Malaysia (Said, et al., 2003), Israel (Goldman et. al., 2006; Negev et al., 2008), Taiwan (Hsu and Roth, 1999), Canada (Puk and Makin, 2006), Turkey (Tuncer et. al., 2005; Alp et al., 2008; Kilinc, et al., 2008; Tuncer et. al., 2009), Greece (Boyes et al., 1999; Spiropoulou, 1999; Dimitriou, 2007; Kastani, 2009; Tsekos, 2013), Australia (Wosley and Skrzpiec, 1998), China (Boyes et al., 2008), Cross-country (China, USA, Switzerland and England) study (De Chano and Lisa,, 2006) and Jordan (Zyadin, et al., 2012). Similarly, large volume of research works have now been completed assessing the effects of different variables on variations in levels of environmental knowledge of students and teachers in school systems in many countries (Dienno and Hilton, 2005; Hassan, et al., 2009; Duerden and Will, 2010; Sieg et al., 2010; Desa et al., 2011; Ifegbesan, 2011; Michalos et al., 2011; Naquin et al., 2011; Amirad et al., 2013; Birham, 2013; Agut et al., 2014; Ahmad et al., 2015; Schneller et al., 2015; Mohiuddin et al., 2018; Martines-Borreguero et al., 2019; Marchini and MacDonald, 2020; Baieri et al., 2021; Debrah et al., 2021; Ozonur, 2021; Seig and Dreeman, 2021).

In Nigeria, the role of EE in achieving sustainable development has for long been appreciated. Twenty years ago, the country produced its first draft Curriculum for Infusing Environmental Education in Secondary Schools (NERDC, 1992) and the same year a workshop was convened by the country's curriculum development agency to develop strategies for integrating EE in school programmes, with secondary schools (the second of the three-tier education system) seen as the most strategic. Subsequently, much attention has particularly been paid by many research workers towards evolving strategies of effectively integrating EE into elementary and secondary school curricular in the country (Lawal, 1991; Noibi, 1991; Adara, 1996; 1997; Adebayo and Olawepo, 1997; Dienno and Hilton, 2005; Hassan, et al., 2009; Sieg et al., 2010; Ifegbesan, 2011; Birham, 2013; Agut et al., 2014; Ahmad et al., 2015; Mohiuddin et al., 2018; Martines-Borreguero et al., 2019; Marchini and MacDonald, 2020; Baieri et al., 2021; Seig and Dreeman, 2021).).The Draft EE Curriculum for the country became fully operational in 1998 but to date few researchers (Mansaray et al., 1998; Ajiboye and Ajitomi, 2008; Ifegbesan, 2010) have focused on the role of schools as means for increasing people's environmental knowledge in Nigeria. Even then, these studies were conducted in the humid, southern part of the country and unfortunately, more than 2/3 of the country's landmass lie in the northern part which ecologically is dry and dry sub humid in nature with enormous challenges for sustainable environmental development. The personal experience of secondary school students of environmental condition (which is an important determinant of environmental knowledge) is no doubt going to remarkably be different between the southern and northern regions of the country. Consequently, there appears to be a gap in understanding the basic relationship between personal traits of secondary school students (especially gender, age and level of study) and their level of environmental knowledge in northern part of Nigeria. Given the strategic importance of northern Nigeria, especially being the most populous region of country, and Nigeria being the most populous black nation in the world, there is the need for such a gap to be filled and the need for this constitutes the problem of research interest to this study.

This study was hence initiated with the central aim of assessing the environmental knowledge of a sample of secondary school students of Katsina town, in Katsina state of Nigeria.

The objectives of the study are:

1. Ascertaining students' information sources and personal levels of interest in environmental issues as well as their factual knowledge,
2. Assessing their views towards selected environmental issues.
3. investigate the relationships between students' environmental knowledge and their demographic characteristics (study level, age and gender)

2 Methodology

2.1 Study Population

The study was conducted in Katsina town, the capital of Katsina state, Nigeria. The town is one of the largest in the northern region of the country and has the oldest history of western education in the region, with the first college in the region founded there in 1912. The town has a total of 16 public and 23 private secondary schools. As with other states of the country, Katsina state runs a 3-tier education system (primacy, secondary and tertiary). The secondary schools in the state are operated in line with the Nigeria's 6-3-3-4 educational system (6 years of primary, 3 years of junior secondary, 3 years of senior secondary and 4 years of tertiary education). The various secondary schools in the state can be categorised into 3 groups depending upon the composition of students' population:

i. Co-educational (with students' population being both boys and girls) schools
ii. Boys-only schools
iii. Girls-only schools

Three schools considered to be representative of the remaining 36 others and belonging to the above 3 groups were selected for the purpose of this study. The schools are:

i. Ulul Al-Bab Science Secondary School (Co-educational School)
ii. Government College, Katsina (Boys only school)
iii. Government girls college Katsina (Girls only school)

The average students' population of each of the three schools is 1,500 and 10% of this population was considered as representative enough for the purpose of this study. Accordingly, 150 students (25 students per each of levels 1-6 of secondary education) were sampled in each of the three selected schools. For each level, selection of the 25 students was based purely on examinations results, with the results of the students stratified into five groups (top 20%, next 20%, next 20%, next 20% and last 20%). 5 students were randomly picked from every strata. The selected students were issued with the prepared questionnaire designed.

2.2 Research Instrument

In this study, a two-part questionnaire, Children's Environmental Attitudes and Knowledge Scale (CHEAKS), which was originally developed by Leeming and Dwyer (1995) and adopted by Alp *et. al.* (2008) was modified to suit the local situation of the study area and used. The questionnaire consisted of 35 multiple-choice Likert-type items (strongly agree, agree, no idea, disagree and strongly disagree) that systematically sample the different environmental issues that probe students' depth of knowledge of environmental problems,

their consequences and solutions of solving them. This was done to assess students' knowledge of problems related to environment.

The questionnaire was first administered to a total of 90 students of the three selected schools for pilot testing which helped to eliminate ambiguities and unfamiliar terms and items. After the pilot testing, the contents of the questionnaire were modified and validated. Following this, the revised questionnaire was administered to a total of 450 students (150 per school, and 25 per study level) to assess participants' knowledge of the environment, factors causing its problems, as well as environmentally responsible actions that need to be taken to take care of such problems..

Appropriate permission was obtained from the authorities of the selected schools and the measuring tool was administered by the authors during free lecture hours. The participant students duly were informed about the purpose of the study. It was clearly explained to them that their identity would be kept secret and the results of the study would not affect their grades in school.
The Statistical Package for the Social Sciences (SPSS, version 11.0) was used to analyse the data. Means and percentage values were determined through descriptive statistics to assess participants' environmental knowledge. The mean and percentage values were computed to summarise the various responses under every environmental knowledge test items.

3 Results and Discussion

3.1 Level of Environmental Knowledge

Table 1 presents data on the percentage responses received from the respondents on the five Likert-type items used in assessing their knowledge of the causes of environmental problems that will define the extent to which the students know what exactly the environment is all about and the major problems affecting it. Table 2 on the other hand presents the responses received on the items used in assessing their knowledge of consequences of environmental problems while Table 3 presents the responses received on the items used in assessing their knowledge of solutions to solving environmental problems. Table 4 compares the differences the studied schools of the responses received on causes of environmental problems.

It could be seen from Table 1 that about 40% to 70% of the respondents indicated correctly the various knowledge test items they were asked to respond to. On the other hand, between about 5% and 19% of the respondents indicated having no idea on the various items they were asked to respond to, while between about 8% and 24% responded wrongly to the various knowledge test items they were asked to respond to.

These indicate clearly that comparatively greater proportion of the respondents have medium to high level of knowledge of the various environmental knowledge test items on causes of environmental problems on which they were tested. On the other hand, low (less than 25%) of them indicated wrong responses while less than 20% of the respondents indicated having no idea at all on the various environmental problems test items. These indicate that students in general did acquire a satisfactory understanding of causes of environmental problems.

It could be seen from Table 2 that less than 25% of the respondents indicated having no idea of the consequences of environmental problems and solutions to them. Between about 8% and 30% gave wrong responses to the items they were asked on consequences of environmental problems and their solutions.

Table 1: Summary of the responses received on respondents' level of agreement with items on knowledge of causes of environmental problems

Items used in assessing respondents knowledge of cause of environmental problems	School	Percentage responses received on respondents' level of agreement with the item					
		SAG	AG	NID	DAG	SDA	Total
Environmental problem is anything that negatively affect soil, water, plants, air, living things, towns and villages	KTC	41.3	28	12	9.3	9.4	100
	UAB	31.2	13	12	32	12	100
	GGC	28.2	31	15	14.6	12	100
Human activities cause environmental problems that affect this generation only	KTC	40.1	28	14	9.3	8	100
	UAB	36.7	30	12	13.3	8	100
	GGC	30.2	19	17	20	13.3	100
Human activities cause environmental problems that affect future generation only	KTC	39	23	13	13.5	11.2	100
	UAB	30.6	31	17	13.3	8.2	100
	GGC	22.1	17	19	24	17.5	100
Human activities cause environmental problems that affect both the present and future generations	KTC	24.1	33	17	16	9.3	100
	UAB	43.1	19	11	15.2	12	100
	GGC	21	33	12	20.2	13.5	100
Removal of trees make the environment hotter	KTC	31.6	27	17	14.5	10.6	100
	UAB	42.6	32	11	9.3	5.4	100
	GGC	34	26	16	12.1	12	100
Planting of trees make the environment cooler	KTC	40	32	12	10.1	6.4	100
	UAB	50.6	28	8	6.6	6.8	100
	GGC	37.7	35	9.3	10.6	7.8	100
Throwing of waste all over the place make the area look ugly	KTC	37.1	25	16	12.1	9.3	100
	UAB	68	11	8	6.6	6.8	100
	GGC	32	33	16	12.1	6.6	100
Improper disposal of waste can cause many problems such as pollution and diseases	KTC	38.6	15	17	16.2	13.3	100
	UAB	60	17	8	6.6	8.1	100
	GGC	24	30	15	16.1	14.6	100
Environmental problems are occurring largely because government and people are not protecting the environment	KTC	44	12	15	17.3	12.1	100
	UAB	28	35	12	13.3	11.8	100
	GGC	32.6	24	13	17.3	13.3	100
Environmental problems are occurring because people and government are protecting the	KTC	34.7	29	13	12	10.6	100
	UAB	34.4	29	9.4	20.4	6.6	100
	GGC	29.3	24	17	13.3	16	100
Environmental problems can occur even if human activities are not taking place	KTC	20.7	36	12	19.2	12.4	100
	UAB	41.2	20	14	12.6	11.9	100
	GGC	17.3	37	13	12.1	20	100
Increase in number of people in a town is causing more environmental problems	KTC	26.6	23	18	18.6	14.6	100
	UAB	43.6	21	11	16	9.3	100
	GGC	36	22	14	16	12	100
As town grows, more environmental problems occur	KTC	16	24.1	17.3	26.6	16	100
	UAB	21.3	33.3	13.3	20.1	12	100
	GGC	38.6	13.3	17.3	18.6	12.2	100

Note: KTC (Katsina College); UAB (Ulul Al Bab); GGC (Government Girls College)
SAG (Strongly agree); AG (Agree); NID (No Idea); DAG (Disagree); SDA (Strongly disagree)

Table 2: Summary of the responses received on respondents' level of agreement with items on knowledge of Consequences of Environmental Problems

Items used in assessing respondents knowledge of consequences of environmental problems	School	Percentage responses received on respondents' level of agreement with the item					
		Strongly Agree	Agree	No Idea	Disagree	Strongly Disagree	Total
Most human activities are damaging the environment	KTC	21.3	25.3	16.6	15.6	21.2	100
	UAB	36.2	28.4	5.3	24	6.1	100
	GGC	26.5	34.6	16.3	12	10.6	100
Our ways of life are in most cases destroying the environment	KTC	25.3	31.3	10	17.6	15.8	100
	UAB	26.6	29.3	10.6	20.2	13.3	100
	GGC	29.3	20.5	18.6	13.3	18.3	100
Most economic activities help in damaging the environment	KTC	45.9	15.2	14.4	12.1	12.4	100
	UAB	25.3	24	16	24.2	10.5	100
	GGC	30.6	20.3	14.6	21.3	13.2	100
Human beings are the major damagers of the environment	KTC	35	24.1	10.3	9.3	21.3	100
	UAB	43.1	30.3	9.3	9.3	8	100
	GGC	38.1	30.7	16.6	14.6	10;6	100
Science and technology often create more problems than they solve	KTC	37.3	34.6	12.2	13.3	2.6	100
	UAB	21.3	33.3	13.3	20.1	12	100
	GGC	46.9	15.9	11.7	13.3	12.2	100
Environmental problems make the future to look not bright	KTC	25.3	27.6	8.3	12.2	26.6	100
	UAB	32	22.6	10.6	18.6	16.2	100
	GGC	27.1	19.6	7.9	25.3	20.1	100
Flooding is occurring in the town because drainages are blocked	KTC	26.6	30.3	14.6	17.6	10.9	100
	UAB	39.2	27.6	6.6	16	10.6	100
	GGC	18.1	33.3	16	20.6	12	100
Worldwide, most childhood deaths are the results of water pollution	KTC	24	29.3	18.6	17.5	10.6	100
	UAB	22.6	41.6	10.6	14.6	10.6	100
	GGC	20	22.6	24	20.1	13.3	100

Note: KTC (Katsina College); UAB (Ulul Al Bab); GGC (Government Girls College)

Table 3: Summary of the responses received on respondents' level of agreement with items on knowledge of solutions to solving environmental problems

Solutions to Solving of Environmental Problems	School	Number and % of Responses Received for the Various Options					
		Strongly agree	Agree	No Idea	Dis-agree	Strongly Disagree	Total
Proper education of the people can help is protecting the environment	KTC	42.6	22.6	16	12.2	6.6	100
	UAB	56	18.6	9.3	8.1	8	100
	GGC	33.3	30.6	16.1	12	8	100
People worry too much about environmental problems	KTC	36.2	17.3	18.6	14.6	13.3	100
	UAB	32.1	36	6.6	16	9.3	100
	GGC	30.6	25.5	17.3	17.3	9.3	100
Science and Technology can be used to reduce damage of the environment	KTC	34.6	26.6	16.2	13.3	9.3	100
	UAB	33	35.1	13.1	10	8	99.2
	GGC	33.3	17.3	14.6	17.3	17.5	100
Cleaning of the environment can help in solving environmental problems	KTC	34.6	26.6	17.3	9.3	12.2	100
	UAB	54.6	14.6	9.3	9	12.5	100
	GGC	24	26.6	13.5	16.6	19.3	100
Finding food is more important than protecting the environment	KTC	21.3	18.6	14.6	21.3	24.2	100
	UAB	28	26.6	8	21.3	16.1	100
	GGC	26.6	32.6	16.6	14.6	9.6	100
Environmental problems can be solved if people become more proactive	KTC	32	16.3	9.7	26	16	100
	UAB	38.6	22.6	12.2	14.6	12	100
	GGC	21.3	41.3	13.3	12	12.1	100
Sacrifices by people can help solve environmental problems	KTC	33.2	20.2	13.2	12.1	21.3	100
	UAB	26.6	37.4	13.2	13.5	9.3	100
	GGC	28	21.3	24.1	17.3	9.3	100
Environmental protection can reduce level of human activities	KTC	21.3	22.6	22.6	17.3	16.2	100
	UAB	38.6	24	12	16.1	9.3	100
	GGC	26.6	25.3	16.2	18.6	13.3	100
All living things have the same right to the environment	KTC	14.6	29.3	20.2	21.3	14.6	100
	UAB	22.6	25.3	12.2	26.6	13.3	100
	GGC	25.3	26.6	24.1	16	8	100
People have the right to damage the environment in order to survive	KTC	14.6	18.6	24	28.2	14.6	100
	UAB	21.3	22.6	9.5	29.3	17.3	100
	GGC	31.2	28.3	12.1	13.8	14.6	100
The earth is vast, with almost unlimited room and resources so no need to worry about environmental problems.	KTC	17.3	26.6	20	16.1	20	100
	UAB	36.3	31.9	18.5	17.,3	13.3	100
	GGC	25.3	21.3	17.3	20.1	16	100
People must learn to control nature in order to survive	KTC	20	28	14.6	21.4	16	100
	UAB	36.1	38.4	17.6	5.3	2.6	100
	GGC	39.4	17.5	18.6	10.2	14.3	100
Nature should be used to produce goods for people no matter the consequences	KTC	28	25.3	16	13.2	17.5	100
	UAB	22.6	40	12.2	10.6	14.6	100
	GGC	25.3	18.5	23	18.6	14.6	100
People must learn to live in harmony with nature to survive	KTC	19.4	22.1	12.1	16.4	30	100
	UAB	28	28.2	14.6	14.6	14.6	100
	GGC	32	22.6	18.2	15.6	11.6	100

Note: KTC (Katsina College); UAB (Ulul Al Bab); GGC (Government Girls College)

On the other hand, between about 18% and 80% of the respondents responded correctly to the various items they were asked on consequences of environmental problems and their solutions. These indicate clearly that the respondents have generally medium to high level of knowledge on the major items listed in the questionnaire on the consequences and solution of environmental problems.

3.2 Implications of the Findings

In this study, the effect of age/grade level and gender on students' environmental knowledge was investigated and the results obtained indicated that there are variations in levels of knowledge of the various environmental knowledge items considered both within the between the individual schools considered. This finding suggests that variation in age of the students cause significant variations in the level of knowledge) and between the different schools (signifying that variation in gender of the students cause significant variations in the level of knowledge).

A study by McCright (2010) has noted that women convey greater assessed scientific knowledge of climate change and express slightly greater concern about it than do men. He argued that this could not be attributed to differences in key values and beliefs or in the social roles that men and women differentially perform in society.

Tikka *et al.* (2010) carried out a research to establish whether differences in environmental knowledge and attitudes exist among students of different educational establishments. They found out that major variations related to gender and educational level exists among the students, with female students showing more responsibility towards the environment. Students reading subjects related to living things (plants, animals) were found to exhibit more positive attitudes than those reading other subjects (such as economics and engineering).

In a study by Kuhlemeier, et. al. (1999), the environmental knowledge, attitudes, and environmentally responsible behavior were studied under the Dutch National Assessment Program, in a nationwide sample of more than 9,000 students (aged ± 15 years) from 206 secondary schools. Fifty-seven percent of the 9th-grade students had a (very) positive attitude toward the environment, and 35% were prepared to take extra pains or to make (financial) sacrifices for the environment. The students' knowledge about environmental problems was fragmentary and often incorrect, however. Similarly, the environmentally responsible behavior of many of the students was inadequate. The relation between environmental knowledge and environmental attitudes and behavior proved to be very weak. There was a substantial relation between environmental attitude, willingness to make personal sacrifices, and environmentally responsible behavior. Consistent with theories on attitudes, environmentally responsible behavior was more strongly connected with willingness to make sacrifices than with attitude toward the environment.

However, the levels of knowledge of the students can in general be regarded as medium to high and this is slightly at variance with findings of some similar researches undertaken in

other countries, which indicated that school students had low levels of knowledge on basic environmental issues, but relatively uniform and favourable attitudes toward the environment (Kuhlemeier *et al.*, 1999; Makki *et al.*, 2003). In Turkey, alp et al. (2008) have found out that secondary school students are seemed willing to make sacrifices and take precautions to protect the environment, but lacked necessary knowledge to make informed decisions. Their results showed that higher grade level students had significantly higher levels of knowledge on environmental issues and attributed this to the fact that that as students grow older and have more experience with nature, it becomes easier to understand the basic environmental issues. In this study, though differences related to level of study of the students were found to be influencing variations in level of knowledge, the differences are generally low. The relatively low variations might be reflection of the fact that formal environmental education developed in Nigeria since 1998 has still not become fully operational in most schools in the country.

Based on the evaluation of the responses received on some items related to how the students are willing to take part in solving environmental problems appeared to to indicate that the students possess favourable attitudes toward the environment. This finding, which correlates favourably to that made in turkey (Dettmann-Easler and Pease 1999; Dimopoulos and Pantis, 2003), can be attributed to their willingness in the preservation of nature and strong emotional bonding to animals or pets.

In a research study undertaken by Tuncer *etal*. (2005), it was also reported that environmental attitudes of Turkish young people were positive. At the same time, these children suggested that environmental problems in Turkey would become much more complicated unless the individuals make the necessary changes in their lifestyles.

Dimopoulos and Pantis (2003) reported no remarkable difference in environmental attitudes between 5th and 6th grade level students. The results of the present study showed that positive attitudes toward the environment decreased by grade level. The reason why these students gradually lose favourable attitudes may lie in the way environmental issues are presented.

4 Conclusions

The results obtained in this study are generally supportive lf the following conclusions:

i. Secondary school students in the town display medium to high level of knowledge on the causes of environmental problems
ii. The students in the town also display medium to high level of knowledge on the consequences and solutions of environmental problems
iii. Gender, and level of study have generally low influence on variations in level of environmental knowledge of the students

In light of the conclusions reached, the following recommendations are considered as appropriate here:

i. There is the need to ensure full and effective implementation of the developed EE curriculum in secondary schools of the country in order to enhance the level of environmental of knowledge of the students

ii. Besides, traditional knowledge about the environment as it is taught especially at junior secondary school level which at any rate is not in essence action-oriented, there is the need to focus on passing practical proactive knowledge to students.
iii. There is the need to make science teachers to be in a position to stimulate student interest, creativity and motivation in environmental issues.
iv. Teaching of courses related to environment (Geography, Integrated Science, Social Studies, Biology etc) in secondary schools should be re-focused from being teacher-centred, into students-based, activity-based science classrooms in order to prepare environmentally sensitive students who would play an active role in the preservation of nature through making informed decisions.
v. There is the need to explore the possibility of putting in place school-based environmental field projects appear in order to enhance students' environmental knowledge level.
vi. Further research, such as qualitative and longitudinal studies, is needed to investigate deeply the enhancement of students' environmental attitudes, and formation of true environmental concepts. In addition, investigation of other predictor variables of a model focusing on environmentally responsible behaviours may be required to fully comprehend the determinants of students' behaviours.

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