

Evaluation of Energy Literacy among Nigerian Senior Secondary Students

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ABSTRACT

The main objective of this research is to assess and evaluate the energy knowledge of senior secondary school students in Nigeria. Proposing an energy education policy for Nigeria is the aim of the research. A questionnaire was designed to check the cognitive, affective and behavioral energy knowledge of the students and was administered to 225 students from five different senior secondary school. Statistical package for social sciences (SPSS) software was used in analyzing the data obtained from the questionnaires. The overall energy literacy level of the students as concluded from this research is 47.3%. Although the overall energy literacy level is low, the students showed a good knowledge about the basics of energy. 90.7% of the students know the basics definition of energy and 83.5% of the students know that each and every action on the earth requires energy. Only 22.7% could identify the current electricity production capacity in Nigeria but almost all the student know the authority in charge of electricity production. Also 92.9% of the students recognize that saving energy is important and 88.5% agrees that energy should be an important part of Nigeria senior secondary education curriculum. No specific factor was discovered to affect the students' energy knowledge as a serious disparity is recorded in different analysis.

INTRODUCTION

Energy is regarded as an omnipresent commodity in this modern age. Both, institutions (private corporations, governments, schools, universities etc.) and individuals depend seriously on reliable access to useful energy in all its forms ^[1]. Energy (electrical) has become an indispensable commodity to the human race in this 21st century ^[2], and has consequently increased the global warming reducing the safety in the world at large. Literacy, being the ability to read and write is a fundamental human right and the foundation of human lifelong learning. Being literate possesses the ability to recognize the good and bad of a particular issue and this comes majorly with learning in a formal environment ^[3]. Although introduction of renewables, energy policies, energy efficiency gadgets and energy conservation measures has being widely adopted in many nations of the world, energy education is one of the fundamental ways to solve the energy issues of the future. Energy education is paramount at every stage of education and to the world at large but major attention should be given to the younger generation as they will be the ones making energy decisions in the near future. This branch of energy is gradually being accepted into the educational curriculum in many (developed/developing) countries and a need to apply same to Nigeria's educational curriculum is important in order to solve the nation's epileptic power supply. The main aim of this research is to assess and evaluate the energy knowledge of senior secondary school students in Nigeria and also encourage energy education in Nigeria. Nigeria being the Giant of Africa currently does not have a specified/special curriculum for energy subject or course at any of her educational levels. The broad objective of this survey includes:

- Evaluating the general energy knowledge of senior secondary students in Nigeria.
- Checking the students' energy cognitive level, energy behaviors/behavioral knowledge.
- Observing the willingness of students to learn about energy related issues.
- Correlation of the students' background/general/personal data against their energy behavior, knowledge and consumption rate.
- Evaluating the effect of different levels of class and different scope of study (science, arts and social science) against their

energy literacy level.

Overview of Nigeria Formal Education System

According to Webster dictionary education is “the act or process of educating; the result of educating, as determined by knowledge skill, or discipline of character, acquired; also the act or process of training by a prescribed or customary course of study or discipline; as, an education for the bar or the pulpit; he has finished his education. To prepare us for far complete life is the function which education has to discharge”^[4]. Education in a general sense is a system or a form of learning in which a group’s knowledge, beliefs, skills, values and habits are transferred from one generation to the next through storytelling, training, discussion, teaching, research or training^[5]. This is either informal (transmission of information, habit, skill etc.) or formal (preschool, primary school, secondary school/college, tertiary school, apprenticeship or time based training)^[6]. A school environment is the standard environment for a formal education, which involves multiple classrooms designed for students and teachers. Home, street, environment etc. are generally referred to as the first educational school or stage for a child and this involves a non-contiguous communication (informal education) that is mostly presented in the absence of an educational system^[5]. Education outside the school is also done when it is needed and is most times not limited as regards to specific issues^[7].

Out of the total estimated population of Nigeria (over 150 million people), 30 million are estimated to be students and the active participation and intervention of government has made education in Nigeria more of a public enterprise. Similar to most countries of the world where education is seen as the bedrock for development^[8], educational policy in Nigeria is used as a means of achieving national development. Western education in Nigeria was first introduced by Christian missionaries in the mid-19th century. This was well accepted and adopted by the people in the southern and south-western part of Nigeria and then the development has continued till date. Nigeria literacy level is rated to be about 61%^[9]. Education in Nigeria is the responsibility of the ministry of education at Federal, State and Local Government level. The educational structure in Nigeria before 1984 was 6 years for primary education, 5-7 years for post-primary (secondary or training college) education and 4-6 years tertiary education. In 1985, the pre-primary education was introduced which has different stages including: playgroup, kindergarten, pre-nursery and nursery school depending on the child’s age. 6 years was the standard age set for a child to be accepted to start a formal primary education but this policy was flexible depending on the child’s knowledge and ability^[10]. The 6-3-3-4 educational system (6 years Primary Education, 3 years Junior Secondary Education, 3 years Senior Secondary Education and 4 years Tertiary Education) was actively in place since 1985 until 2007. At this time the Universal Basic Education (UBE) policy was introduced by Universal Basic Education Commission (UBEC). This policy which is under section 15 of UBEC law defines UBE as early childhood care and education. It makes 9 years education/formal schooling, adult literacy and non-formal education, skill acquisition programs compulsory. The 6-3-3-4 educational system was thereby change to 9-3-4 system with the aim of full implementation at the end of 2015^[9,10]. The primary education of 6 years and the junior secondary education of 3 was merged together to form a basic educational system which defines the literacy standard^[9].

Renewable and Non-Renewable Energy in Nigeria

Nigeria is one of the largest oil producing and exporting nation in Africa. With about 37 billion barrels deposit of oil, this country is among the world’s top exporters of Liquid Natural Gas. Despite all these, Nigeria’s oil production is seriously affected by “political” instability and some supply disruptions like oil theft and the natural gas sector is being restricted by inadequate/lack of infrastructure to harvest the natural gas that is burned off during exploration^[11]. This has led to underutilization of these natural resources and also wastage of a sizable percent of the deposit available. Oil production began in Bayelsa State (1950s) less than two decades before Nigeria became a member of OPEC (Organization of Petroleum Exporting Countries) in 1971. According to Studies, Nigeria’s oil reserves is about 35 billion barrels ($5.6 \times 10^9 \text{ m}^3$) and her gas reserves is about 5 trillion cubic meters. Primary energy consumption in Nigeria amounted to about 108Mtoe in 2011 and most of this energy was gotten from traditional biomass (80%) while the rest was from fossil fuels (19%) and hydropower (1%). The domination of biomass signifies that biomass is used to meet cooking needs and off-grid heating mainly in the rural areas of Nigeria^[11]. According to World Energy Council 2014, Nigeria climbed three places, ranking 81 overall in the world energy trilemma index^[12]. In Nigeria the peak of crude oil production was reached in 2005 when the country was able to produce 2.44 million bbl/d. There was a significant decrease in the production due to the activity of militants and terrorist group, by 2009 Nigeria’s crude oil production has dropped to an average of 1.8 million bbl/d (25% drop compared to its’ production in 2005)^[11]. At the end of 2013, Nigeria was the 13th largest producer of crude oil and the exportation of Nigeria (crude oil and condensate) was 2.05 million bbl/d in 2014^[13].

Renewable energy potential in Nigeria is high due to her geographic location^[14]. Renewables like biomass, hydropower, solar are in abundance in Nigeria with little geothermal and wind energy potentials. Being mindful of the global phenomenon of climate change, the future scarcity of fossil fuels and the development of a more sustainable environment, renewable energy have received great attention and development in many countries. Although in Nigeria hydropower is the only renewable energy source in active use for electricity generation, about 90% rural area dwellers uses biomass for energy generation in diverse forms. The largest power plant in Nigeria is a hydropower plant with an installed capacity of 1,330 MW. About 20% of Nigeria’s total hydropower potential (18,600 MW) is in active use currently.

The solar energy daily irradiance in Nigeria (3.5 kWh/m²/day–7.0 kWh/m²/day) is 13,000 times its daily natural gas

production and 4,000 times its daily crude oil production. Other resource like wind and geothermal are also available moderately in Nigeria ^[15,16].

Energy Education/Energy Literacy

Energy is a commodity used by almost all professionals to meet their customer demands. Consequently, energy was not thought of as a separate discipline of education but was incorporated into some aspects (energy conversion, conservation, transmission, utilization, extraction and distribution) of some disciplines (e.g. electrical, chemical and mechanical engineering as well as physics) based on their relevance to the student at that level. Energy education is a means by which the public gets to know about energy, what it entails and also how to use and make energy decisions. Energy education should be classified based on it targeted students/audience. This scope of education should not be limited to the classroom but concerted effort should be made to organize informal educational programs in order to reach out to the general public at large. Energy programs should be promoted on social media and adverts/posters/slogans that bring about energy saving measures should also be encouraged. Some of the important energy education issues are discussed by Garg and Kandpal ^[17]. It is important to have a broad objective for any educational program and this proposed energy education scheme can follow the broad objectives set out.

Most developing countries of the world especially countries in Africa still have a lot of energy challenges in the power generation. Nigeria being the case study of this research still has a larger percentage of its population suffering from inadequate or lack of power supply. Though energy education is generally needed in the world at large, there is a crucial need for it in the developing countries. Most developing countries are blessed with vast renewable energy sources and these sources are still being underutilized or unutilized till date as the case maybe in different countries. The solar potential in Nigeria is highly remarkable but it underutilization or non-utilization is evident on the power sector of the country. Some of the features available in developing countries which make energy education paramount include ^[18].

- ◇ Most developing countries have good solar radiation potentials which make energy education a way forward in the development of these resources.
- ◇ Most of these countries are also oil-producing nations and the inadequate energy education experienced by most of its citizens doesn't bring about the maximum utilization of the oil produced by the country.
- ◇ In order to improve her citizen's living standard, developing countries should increase their energy per capita ratio and this can be done by improved energy educational system.
- ◇ Presently, few developing countries have special/specific energy education programs at their institute of learning.
- ◇ Large biomass resources and moderately high wind speed are also available in most of these countries but the utilization of renewable energy is still at it early stages in most developing countries of the world.
- ◇ Lack of funding and acute resources availability for energy programs is also a major setback in developing countries.
- ◇ Trained and skilled energy personnel and academia are highly lacking in most of these countries and these reduce the quality of energy education available in the country.
- ◇ In most developing countries, other issues like corruption, health problem, nutritional challenges; political crisis affects its energy decision and productivity.
- ◇ Most developing countries still have a larger percent of their population being energy illiterates and also a larger percent of her schools provide little or no energy education to it students.

Problem Statement of the Study

The aim of this study is to evaluate the following problems:

1. The main statement problem for this study is; "what is the current energy literacy level of Nigeria senior secondary school students" and their attitude towards energy education.
2. Is there a statistical significant relationship between the student's energy knowledge and their: class, gender, type of school, age range, field of study ^[19].

RESEARCH METHODOLOGY

Research Design

The descriptive analysis was carried out with the use of a questionnaire. This questionnaire checks the knowledge of the students on energy literacy, energy conservation, energy efficiency, renewable energy and general energy topics. It is also used to check the students' behavior and awareness about energy applications. The questionnaire is designed in accordance with the model designed/created by ^[6]. Although, questionnaires were of two types, the questionnaire used in this research is of a single type with few typical questions bearing semblance with that of reports. Some of the "middle school" questions were extracted

(omitted) as this is the best equivalence to the secondary school level in Nigeria. Some questions were also added in order to adapt the study to Nigerian social and cultural realities. The descriptive research is carried out to check (determine) the degree to which students are knowledgeable about each subject and also check variation between similar questions.

Sample of the Study

The universe of this research consists of senior secondary schools in Nigeria. The sample consist of 225 senior secondary school students [64.9% (n=146) female, 35.1% (n=79) male] who were selected from different secondary schools in some states in Nigeria. The information about the demographic characteristics of the students is presented in **Table 1**.

Research Instrument

Demographic characteristics

5-items is prepared in the research model to collect the data about students' age, type of school, gender, class, field of study.

Energy knowledge

32-items from 3 sections in the questionnaire are used to determine the students' knowledge about:

- a. General Energy topics
- b. Renewable Energy
- c. Energy Efficiency/Energy Conservation.

The students were asked to choose the correct option for each question from 5 different options provided.

Energy behavior/attitude and policy

19 items in section 5 and section 6 of the research model is used to assess the students' willingness to learn about energy, their energy behavior, attitude towards energy and encouragement of an energy education related policy in Nigeria. The student were to rate their opinion from 5 options (strongly agree, agree, undecided, disagree, strongly disagree).

Independent Variable		n	%
Type of school	Federal Government college	50	22.2
	Public/State Government secondary school	100	44.4
	Private secondary school	25	11.1
	Missionary school	50	22.2
Age	11-13 years	26	11.6
	14-17 years	186	82.7
	17-20 years	12	5.3
	Above 20 years	1	.4
Gender	Male	79	35.1
	Female	146	64.9
Class	SS 1	64	28.4
	SS 2	68	30.2
	SS 3	93	41.3
Field of study	Science	132	58.7
	Arts	55	24.4
	Social Science	38	16.9

Table 1. Students' demographic characteristics.

Data Analysis

Statistical Package for Social Science (SPSS) is used to analyses the data collected via the questionnaires. The 16.0 version of this software (SPSS) is used to generate charts and tables to present the findings. Also crosstab and correlation analysis are used to check the relationship between the students' age, sex, and class level, field of study, type of school and their energy knowledge. Table and charts are used to display the result of the research.

"Pearson Correlation" is used to show the relationship between students' response and their general information/demographic data. The strength of association between the continuous and qualitative variables is investigated with the level of significance showing the closeness of the result tot the set point.

Cross-tab analysis is used to evaluate and check the relationship between (ordinal or nominal) variables or category of data. This analysis displays the relationship between the two categories of data by doing a side-to-side check of the independent and dependent variables being tested. A Monte Carlo system (a method of determining the distribution property) is used to test the data and a 95% confidence interval is set which makes the significance level 0.05 and below. A significance difference is recorded

if the correlation of each socio-economic/general information characteristics against a response is 0.05 or below. This means that a change in the students' socio-economic/general information characteristics type or range will affect the students' response (positively or negatively). The crosstab table is used to display the frequency of the students' response according to their socio economic characteristics which makes it possible to know the group (in terms of socio-economic characteristics) with the best response and the worse response.

RESULTS AND DISCUSSION

These section present results obtained from the data collected when 225 students in different Nigeria senior secondary schools were interviewed. Although the questionnaire used 60 questions, a sizeable number of those questions are selected and discussed. The students' personal data is discussed in Section 1 of this result and discussion while section 2 to section 4 summarizes the students' energy knowledge (cognitive knowledge). The affective and the behavioral knowledge of the students are discussed in Section 5 and section 6.

General Information

225 students were picked at random from different Nigeria senior secondary schools for this research work as stated earlier in the methodology. 44.4% of these students attends a State Government owned Secondary School usually called "Public Secondary School", while 22.2% attends a School owned and managed by a religious organization (Missionary Secondary School), 22.2% also attends a Federal Government owned Secondary School and the remaining 11.1% attends a Private Secondary School. The majority of the students interviewed (82.7%) were between 14-17 years of age, 11.3% were within 11-13 years age bracket, 5.3% were between 17-20 years age group and one student was above 20 years. 35.1% of the students were male and 64.9% were female.

In this research, the students' abilities to learn in the classroom are rated as the same regardless of their sex. 28.5% of the students interviewed were currently in "Senior Secondary School One" (SSS 1), 30.2% of them were in "Senior Secondary School Two" (SSS 2) while the other 41.3% are in "Senior Secondary School Three" (SSS 3). In order to compare students' knowledge based on their field, the students' current field of study was considered. 58.7% of them were in the "science" section while 16.9% were in "Social Science" section and the last 24.4% are in the "Arts" section (**Table 1**).

General Energy Knowledge

Some of the important questions asked to test the students' general knowledge about energy were chosen and discussed in this section. 90.7% of the students know the basic definition of energy and also 83.6% of the students understand that each and every action on earth involves energy. In Nigeria, convectional thermal power plants generate the most of the electricity. However 64% of the students indicated that hydropower generate most electricity while 12.4% knew that it's from burning of fossil fuels. It is quite strange to see 17.3% of the students to have the opinion that electricity generation is from solar energy despite the high under-utilization of the high solar irradiance/potential available in the country. Furthermore, the popularity of the oil scandals in the country makes the public to believe that crude oil (petroleum) as the most abundant fossil fuels in Nigeria, at almost everyone's disposal both old and young. A big majority (75.1%) of the students knew that crude oil is the most abundant fossil fuel in Nigeria and the remaining 24.9% gave a variety of response such as coal, natural gas, tar sand and wood distribution in unequal ratio. According to World Energy Council, only 48% of Nigerians has access to electricity^[18]. This value was rounded off to 50% and posed as a question in this research in order to determine the students' level of information about the percentage of the country's population that has access to electricity. Only 24.9% of the total respondent had this information correct.

Despite the convincing response recorded about the most abundant fossil fuels in Nigeria, the students showcased their poor knowledge of energy source when they were asked to identify a source that is not a fossil fuel. Due to the low popularity of "tar sands" 46.2% responded indicated this as not a fossil fuel. While 8.4% thinks crude oil (petroleum) is not a fossil fuel, 11.6% thinks natural gas and some 2.7% thinks coal is not a fossil fuel. This supports the idea above that the information available at the students' disposal about the abundance of fossil fuels in Nigeria is mostly collected from the media. Only 31.1% knows that wood is not a fossil fuel and the other 68.9% marked a fossil fuel as their answer. This response also shows that energy subject/course should be introduced to the student in classroom beside energy related subjects like biology, physics chemistry, etc.

Renewable Energy

The test about the basic definition of renewable was the first question asked to the students in this section and 66.7% of the students know renewable energy as the source of energy that can be replenished in a short while by nature. A serious disparity in the response of the students was noticed when they were asked to identify the option that is not a renewable energy source. Only 24% of the student could identify the right answer (coal) which negates the earlier show of a good knowledge about renewables with their definition. 23.1% chose geothermal energy as an energy source that is not renewable. Another 21.8% chose solar, 20% were of the opinion that it is biomass (wood waste plants) but only 11.1% chose hydro due to the popularity of hydropower as a source of generating electricity in Nigeria. This two consecutive question shows that the students have little knowledge about renewable energy and renewables.

64.9% of the student could identify sun as the source of all renewable energy sources while 14.7% indicated it is water. Also 63.6% of the student know that renewables (Electricity generation by Solar (PV) cells) doesn't affect the environment. Only 21.3% of the student could identify the major setback as cost while a larger percentage thinks its 26.7% possibly due to the few renewable energy experts available currently in the country. Some (21.8%) also feels it's the availability of the technology and this is a bit justified due to the low publicity given to different renewable energy technologies in Nigeria. 13.3% thinks it's time and 16.9% choose the technology itself. A question about the main advantage of renewable was also asked and the result shows truly

that the students don't have a good knowledge about the renewable aspect of energy. 17.3% of the students identified the correct answer (carbon emission). 35.1%, 28.9%, 12.4% and 6.2% chose Reliability, ease access, cost and technology respectively.

When the student were asked to identify the odd means/technology of converting solar energy to useful energy, only 17.3% of the student could identify these as being the "solar perforator". While 20.4% thinks its concentrated solar power, solar chimney recorded the highest frequency (29.8%). 16% of the respondents chose solar photovoltaic and 16.4% chose solar water heater.

Energy Efficiency/Energy Conservation

The summary of the data extracted from the energy efficiency and energy conservation section of this research shows that the student has a very poor understanding of this concept. Although the students showed little knowledge when asked of energy conservation related questions, all the questions asked about energy efficiency was answered wrong by a larger percent of the students. Only 26.2% of the total correspondent could identify the simple definition of the efficiency of a power plant, 21.8% were able to give the basic definition of energy efficiency in general while just 48.9% could identify the main goal of energy efficiency and energy conservation (**Table 2**).

An example of a widely known energy efficient appliance was picked to further test the knowledge of the student as regards the case of energy efficiency. 63.6% of the students know that the best reason for buying an "A+ Appliance" is to use less energy which may be due to much publicity (advertisement) given to this type of appliances in the media.

For such an appliance, 10.7% think it's usually bigger, 9.8% chose the option "cost more", 8.0% feels it because of their modern look and another 8.0% thinks the appliance cost less ^[17].

Questions	Responses	%
Which of the following is not a fossil fuel?	Coal	2.7
	Natural Gas	11.6
	Crude Oil (Petroleum)	8.4
	Tar Sand	46.2
	Wood	31.1
Solar Energy can be converted to useful energy using the following technology except:	Solar Photovoltaic	16.0
	Concentrated Solar Power	20.4
	Solar Water Heater	16.4
	Solar Chimney	29.8
	Solar Perforator	17.3
The best reason to buy A+ appliance is	Usually Bigger	10.6
	Cost More	9.8
	Use Less Energy	63.6
	More Modern Look	8
	Cost Less	8

Table 2. Energy efficiency response.

Respondent Attitude/Views about Energy/Energy Education

The last two sections of the questionnaire used in this research asked to check the students' opinion and attitude towards energy and electricity at their disposal currently. This is to evaluate the affective and behavioral knowledge of the students as related to energy issues.

88.5% of the students agree that energy education should be part of the secondary school education curriculum. While 58.7% (the highest frequency) strongly agrees to this school of taught, 29.8% just agree. 92.9% of the students recognized that saving energy is important both for the present world (climate change effect/carbon emission problem) and for the future generation (in order to avoid possible energy crisis in the future). 80.6% of the students interviewed believe/strongly believe that they can contribute to solving the energy problems in the world. 88% of the students agreed that more ways should be developed to utilize and harvest the renewable energy resources available in the country. Also 68.5% believe Nigeria should develop more ways of using renewable energy technology other than fossil fuels even if it means it will cost more. Finally, 87.5% are of the opinion that Nigeria should conserve more energy ^[20].

In order to be conclusive about the state of energy (formal and informal) education in Nigerian senior secondary schools and also to determine the means through which the students have learnt most about energy, the students were asked to pick the option that has contributed most to their energy knowledge. 64% of the student have learnt the little they know about energy through informal education and non-formal education (Books, newspapers or magazines they have read on their own, friends or family members, information from the internet and television programs) while just 34% of the total respondents have learnt most of what they know about energy in the classroom (school) ^[21-26].

CONCLUSION

The above findings and discussions based on the data collected from 225 students in different senior secondary schools in Nigeria shows that the energy literacy level among Nigeria senior secondary school students is low. The overall energy performance

of the student from this research is below average (47.3%) which shows that the student needs to be more equipped with the adequate energy knowledge in order to compete with fellow student of their age in other countries and also for the energy future of the country. This is good on a comparative level with North Cyprus which recorded 33% when a similar study was conducted. Dewaters and Powers recorded a low energy education level of 42% when they conducted a study like this in New York. The 42% is calculated based on the student's energy education cognitive knowledge only with the behavioral and affective knowledge having a better result. The general energy knowledge of the students is the only aspect of this research that the students' performance ranked above average; it is calculated to be 53.2% from the students' response [27-30]. The high value/preference given to science courses in Nigeria is one of the major factors supporting this result. The students on a general note showed an average basic energy knowledge but a poor energy knowledge was recorded when the students were asked about energy issues related to the country and basic electrical energy questions, a larger percentage of the students couldn't identify:

- the unit of electrical energy,
- the percentage with access to electricity in Nigeria,
- Nigeria's electricity generation capacity,
- And couldn't not identify the fossil fuel exportation and price status in the country.

On a larger scale the result from this research is expected to reduce if all the students in the country are asked because the correspondent that was interviewed in this research is students with a very good education in terms of quality.

Despite the abundant renewable energy potentials in Nigeria, the students' renewable energy knowledge overall is calculated to be 41.24% from their responses to the questions asked in this section. The students were able to identify the definition of renewable energy and also showed a good knowledge of general renewable energy issues but a lot of disparity was recorded when they were asked about more precise renewable energy questions especially as regards Nigeria. The students' renewable energy knowledge can be concluded to be poor as their level is below average.

Less attention was paid to this aspect of energy in terms of evaluating the students' knowledge, most of the energy efficiency/energy conservation question asked in the research was asked in the students' opinion section. The students' knowledge in this aspect is also discouraging low. Despite the questions asked being basic, the students' knowledge is only 47.3%. It can be deduce from this section that the students knows nothing about deep energy efficiency/energy conservation issues and this is also encouraged by the little attention paid to this aspect of energy generally in Nigeria [31-33].

The students' response to energy education is encouraging with most of the students longing to know more energy and energy related issues. 88.5% of the student is in support of introduction of energy education into Nigeria secondary education curriculum and a larger percent also are of the opinion that Nigeria should save more energy and also develop her renewable energy usage. The energy attitude of the student is considerably high with over 80% with attitudes in support of energy efficiency and energy conservation. 87.5% of the students also feel Nigerians should conserve more energy. Finally, only 56% of the students have taken any energy subject or energy related subject before this research was carried and most of the students were unwilling to accept their ignorance level.

With the information gathered from this research, it is recommendable that:

- An education policy should be developed. This policy should make energy education a core part of Nigerian (secondary) educational curriculum with more attention given to renewable energy and ways to also develop and maximize the renewable energy potentials in the country.
- It is also important for this course/subject to made a general course in that the basics of energy, its technologies, potentials and global update should be taught across all the fields in other to make all the student have a background knowledge of this issue and also be able to educate people in their environmental about the importance of utilizing renewable energy [34-36].
- Informal energy education should be encouraged on social and media networks to also enlighten both the students and the country at large and government should encourage renewable energy education competitions where students are tested based on their energy knowledge, technologies and skills and where the students are adequately rewarded for the effort they put in learning and studying about renewables.
- Energy Education should also be implemented at primary educational level in Nigeria as most people are exposed to this level of education.

Finally, the active utilization of more renewable energy potentials like solar, biomass, wind, etc., and their technologies should be encouraged in other to also broaden the knowledge of the students.

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