

INVESTIGATING ENERGY LITERACY OF SECONDARY EDUCATION STUDENTS IN NIGER STATE, NIGERIA.

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ABSTRACT

The behavioural interventions aimed at households have been proving to be cost effective in reducing energy use and reduce emission. Hence the study investigated energy literacy of secondary education students in Niger state. The study adopted a mixed methods research design. Specifically, the study utilized the explanatory design as it uses qualitative data to help explain quantitative results that need further exploration. The study was carried out in Niger State. The population of the study comprised of 23,456 students of secondary education in Niger State. 45 secondary education schools were sampled; 15 secondary education schools from three zones in the State and a total of number of 326 students were sampled for the study. Questionnaire and interview were instrument used for data collection. The reliability coefficient for the entire items of the questionnaire was 0.93. Out of 326 copies of the questionnaire administered to respondents, 292 were returned representing 89.57% return rate. 135 students were interviewed three from each school. Mean, Standard Deviation and Percentage were used to analyze the data collected to answer the research questions. The findings revealed low awareness on energy savings. 87.5% of the secondary education students across Niger State said they do not turn off the lamp while leaving the room. 93.2% of them agreed that they do not boiled minimum quantity of water to be used. 91.78% of the secondary education students want energy education be included in their school curriculum. It was recommended among others that; Government and concern personal or group should create awareness on energy savings. Energy literacy programmes should be designed and implemented in secondary schools to improve the awareness, consequences and attitudes toward behaviour regarding energy usage and its effect on environment.

Keywords: Energy Literacy, Secondary school, Niger State, Nigeria

INTRODUCTION

Energy is a fundamental possession, essential to the functioning of our economies. It can be described as a rare commodity. The important of energy to national development cannot be over emphasised. The use of energy makes life better, easier and more efficient. Energy has established positive relationship with economic growth. Providing adequate, affordable and clean energy is a prerequisite for eradicating poverty and improving productivity. Thurman and Younger (2008) defined energy as the capability to do work as influenced by the ability to perform work. Energy has many forms in nature among which are mechanical, chemical, light, electrical and heat (or thermal) energy.

Energy plays a substantial element in global development. The energy usage in developing countries like Nigeria is expected to increase due to economic expansion which will exhaust the limited energy resources, due to energy crisis, the gap between demand and supply will constantly increase (Olatunji, et al, 2018). Today's world is looking for energy solution and alternative due to the threat of energy shortage, sky rocket energy price, unsecure of energy supply and the issue of enormous wastages. The world community should think globally and act locally to solve this issue by creating a long-term programme in order to optimize the limited source of energy. The fossil fuels which are used to power the generators to produce electricity are considered to be unclean and harmful to the environment because of adverse smoke and gases they produce, this makes it be considered as not sustainable fuel. The continuous usage of this fuel to power generators has a significant environmental effect, it is the causes of global warming including its concomitant climate change (Olaide, et al, 2017). All these, challenges the society on need for proper energy education among its citizens to save energy.

Tsado (2014) pointed out that there are rich chances to save 70% to 90% of energy and cost for running fan, lighting, electric pump systems; 60% in areas such as heating and cooling systems, office electric equipment/appliances and 50% for electric motor through

proper adoption electrical energy management practices. Electrical energy conservation can be regarded as effort made by human to reduce the use of energy through application of right behavioural practices (Saba, et al., 2016). It can also be referred as the use energy efficiently, thereby reduces waste of energy. energy conservation may not only bring reductions in carbon dioxide emission, but may also lead to savings in the expenditure on energy. It should therefore be one of the first problems to receive the attention of the government to be tackled. Besides saving money, energy saving effort can also improve the quality of environment and extend the life span of non-renewable energy resources.

Awareness of electrical energy conservation and efficiency is an all-important element of electrical energy management practices, as lack of awareness may be the barrier for electrical energy wastages (Saba, et al., 2016). Awareness facilitate behavioural change and without the knowledge by the consumers on electrical energy management practices, it will be difficult to provide electricity users with better electrical energy conservation programmes. It is crucial to note that any plan to conserve energy must ensure to reduce wastages associated energy usage without hindering the rate of growth and productivity through the use of energy. Although a little decrease in comfort can be accepted. In other to conserve energy, there is need for investment in new technology that is more efficient to replace the ones that are inefficient. That is to say conservation of energy can lower costs of energy. Electrical energy conservation and efficiency is also seen as a major factor that can reduce changes in climate and policies in energy sector in many countries of the world energy efficiency is crucial, especially in Nigeria where the demand for electricity is increasing rapidly.

The effects of energy use are global. All sectors of society have important roles to play in ensuring that energy is managed more efficiently. As school buildings usually have great potential for improving energy efficiency and secondary school students can benefit from increased knowledge of how to use energy efficiently, schools are a promising location for addressing energy savings. An energy-literate individual is characterized as one who is cognizant and knowledgeable; understands energy use in daily life, the impact of energy

overconsumption on the society and environment, and the need for energy conservation and alternative energy resource development; can make appropriate energy choices and decisions; and can take actions reflecting one's skills and action for a sustainable society (Arya, et al., 2020). Thus, it can be argued that energy literacy is a common ability that is fostered by energy education to overcome energy challenges in the world (Azizi, et al., 2019).

PROBLEM STATEMENT

Slowing global warming will require a massive reduction in Green House Gas (GHG) emission. The most prevalent source of GHG emission has been noted as burning of fossil fuels for transportation, electricity generation. The uses of these fossil fuels are considered to be unclean and harmful to the environment because they produce adverse smoke and gases which makes it to be regarded as not sustainable fuel. It is the most potentially threatening and most intractable problem. The overconsumption of energy to satisfy human desires has, however, triggered critical issues of resource depletion, greenhouse gas emissions, and global climate change (Akitsu, et al., 2017). Climate change has become more and more visible, creating significant impacts on production activities as well as the livelihood of people around the world. Countries have agreed on the necessity of changing the energy usage structure to mitigate climate change as well as promote sustainable development (Nguyen, et al., 2021).

Energy saving behavior at the level of the individual is an important pro-environmental behavior and holds a huge potential in bridging the gap from the demand side and bringing about positive changes to the environmental condition (Arya, et al., 2020). They further noted that behavioral change is an effective solution of a lasting nature. It is now clear that several efforts must be put in place to manage electricity and thereby reduce the effect of GHG emission.

The behavioral interventions aimed at households have been proving to be cost effective in reducing energy use and reduce emission.

To achieved this since secondary education students, play notable role in the operation of electrical energy consuming equipment at home. Effort should be made to integrate energy education in secondary education curriculum. To achieve this, first step is to gain an understanding of secondary education student's current energy literacy and their habit towards energy usage.

Aims and Objectives.

The study investigates energy literacy of secondary education students in Niger State, Nigeria. Specifically, the study will determine;

1. Energy management awareness of secondary education students.
2. The habits of secondary education students towards energy usage.
3. Willingness of students to participate in energy education

Research Questions.

The following research questions were formulated to guide the study:

1. How aware are secondary education students on energy management?
2. How are the habits of secondary education students towards energy usage?
3. How willing are students to participate in energy education?

METHODOLOGY

The study adopted a mixed methods research design. This design is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative research and methods in a single study to understand a research problem (Creswell, 2012). Specifically, the study utilized the explanatory design as it uses qualitative data to help explain quantitative results that need further exploration. The study was carried out in Niger State. The population of the study comprised of 23,456 students of secondary education in Niger State. 45 secondary education schools were sampled; 15 secondary education schools

from three zones in the State and a total of number of 326 students were sampled for the study. Questionnaire and interview were instrument used for data collection. Cronbach's Alpha statistic was used to ascertain the internal consistency of the instrument and the extent of homogeneity of the items. The reliability coefficient for the entire items of the questionnaire was 0.93.

These results indicated that the instrument is reliable and it is therefore considered appropriate for use. Out of 326 copies of the questionnaire administered to respondents, 292 were returned representing 89.57% return rate. 135 students were interviewed three from each school. Mean, Standard Deviation and Percentage were used to analyze the data collected to answer the research questions. Decisions on the research question one was based on the resulting means score interpreted relative to the concept of real lower and upper limits of numbers as shown in Table 1.

The standard deviation was used to decide on the closeness or otherwise of the responses to the mean. Any item with a standard deviation of less than 1.96 indicated that the responses were not too far from the mean or one another in their responses and any item having standard deviation equal or above the stated value signified that responses were far from the mean.

Table 1: Interpretation of the five-point Scale.

S/N	The scale of R.Q 2	Point
1	Always	4.50- 5.00
2	Often	3.50 – 4.49
3	Occasionally	2.50 – 3.49
4	Rarely	1.50 – 2.49
5	Never	0.50 – 1.49

Source: (survey 2022)

Key: R.Q = Research Question

RQ 1: How aware are secondary education students on energy management?

Table 2: the students' responses.

S/N	ITEMS	HA	A	SA	NA
1	allowing hot food to cool to room temperature before refrigerating saves energy	26	80	149	37
2	the use of fossil fuel to drive generator that produce electricity that power appliances and devices generate Green House Gas (GHG) emission that led to climate change and environmental degradation	13	34	109	136
3	Utilization of minimum wattage lamp to provide required light saves energy	30	46	154	62
4	Usage of appropriate colour for wall, ceiling and floor for better illumination saves energy	21	38	138	95
5	Wash clothes at a cooler temperature and with a full load saves energy	7	35	98	152
6	Change your light bulbs to LEDs saves energy	43	72	87	90

Source: (survey 2022)

Key:

Highly Aware= HA;

Aware = A;

Somehow Aware = SA;

Not Aware = NA
 The students' responses show that they allow hot food to cool to room temperature before refrigerating to saves energy. 26 which is 8.90% were highly aware, 80, 27.40% were aware, 149 which represented 51.03% were somehow aware and 37 which is 12.67% were not aware. Responses indicated that 13 which is 4.45% were highly aware, 34, 11.64% were aware, 109 which represented 37.33% were somehow aware and 136 which is 46.58% were not aware that the use of fossil fuel to drive generator that produce electricity used to power appliances and devices generate Green House Gas (GHG) emission that led to climate change and environmental degradation. The level of awariness on Utilization of minimum wattage lamp to provide required light saves energy

revealed that 30 that is 10.3% were highly aware 46 , 15.8% were aware; 154, 52.7% were somehow aware and Not aware 62, 21.2%; Usage of appropriate colour for wall, ceiling and floor for better illumination saves energy revealed that 21; 7.2% were highly aware 38 , 13.0% were aware; 138, 47.3% were somehow aware and Not aware 95, 32.5%. Wash clothes at a cooler temperature and with a full load saves energy; 7; 2.4% were highly aware 35, 12.0% were aware; 98, 33.6% were somehow aware and Not aware 152, 52.1% and Change your light bulbs to LEDs saves energy; 43; 14.7% were highly aware 72, 24.7% were aware; 87, 29.8% were somehow aware and Not aware 90, 30.8%.

RQ 2: How are the habits of secondary education students towards energy usage?

Table 3: Mean and S.D of responses on the habits of secondary education students towards energy usage.

S/N		Mean	S.D	Remark
1	Turn off all lamps before leaving the room	2.54	0.03	Occasionally
2	Be sure of what to remove before opening refrigerator door	2.65	0.06	Occasionally
3	Unplug devices that are not been used	2.64	0.01	Occasionally
4	I usually use natural day light	2.68	0.12	Occasionally
5	I ensure the refrigerator door is closed properly	3.55	0.10	Often
6	I select right temperature during ironing of cloths	2.26	0.04	Rarely
7	Encourage others not to waste energy	2.13	0.13	Rarely
8	I boiled minimum quantity of water to be used	1.49	0.02	Never
9	I encouraged my parents to replace incandescent bulb with more efficient bulb	2.59	0.08	Occasionally
10	I switched off security lamps during the day.	2.52	0.18	Occasionally
	Average	2.51		Occasionally

Source: (survey 2022)

The secondary education students agreed that they practice habits in items 1, 2, 3, 4, 9 and 10 occasionally. Items 6 and 7 were rarely practiced; item 5 was often practiced and item 8 was never practiced. They agreed that, they often ensured the refrigerator door is closed properly and they never boiled minimum quantity of water to be used. The S.D of all 10 items ranges from 0.01 - 0.18 each of these values were less than 1.96 which

indicated that the respondents mean scores were not too far from each other and were close to one another in their responses. This adds value to the reliability of the mean.

The results of the interview conducted with secondary education students across Niger State revealed that 87.5% of the respondents said they do not turn off the lamp while leaving the room. 42.6 % said they usually encouraged their parents to purchase energy efficient equipment and devices. 93.2% of them agreed that they do not boiled minimum quantity of water to be used. 56.7% of them said they do not select right temperature during ironing of cloths. 56.4% of the students said they don't disturb themselves to switch off security light during the day.

RQ 3. How willing are students to participate in energy education?

Table 4 (a): Do you practice energy saving techniques at home?

Response	Number of responses	%
YES	105	35.96
NO	187	64.04

To confirm if the students practice energy saving techniques at home. 105 which represent 35.96% said YES, while 187 which represent 64.04% said NO.

Table 4 (b): If YES, so tick as many that are relevant to you.

S/N	Item	N	%
1	I used energy saving bulbs	87	82.9
2	I turn off light when not in used	78	74.3
3	I use energy saving appliance	62	59.0
4	I clean light bulbs and fixtures always	29	27.6

Out of 105 students that said Yes, 87 which is 82.9% used energy saving bulbs, 78 which is 74.3% turn off light when not in used, 62 which 59.0% used energy saving appliance and 29 which represent 27.6% cleaned light bulbs and fixtures always.

Table 5: Would you be interested in participating in energy saving activities in future?

Response	Number of responses	%	To confirm if the students would you
YES	273	93.01	
NO	19	6.99	

be interested in participating in energy saving activities in future. 273 which represent 93.01% said YES, while 19 which represent 6.99% said NO.

Table 6: Energy conservation and efficiency are vital to national economic development?

<i>Response</i>	<i>Number of responses</i>	<i>%</i>
Strongly Agreed	76	26.03
Agreed	113	38.69
Disagreed	89	30.48
Strongly Disagreed	14	4.79

The students' opinion that energy conservation and efficiency are vital to national economic development. Revealed that 76 which represent 26.03% strongly agreed, 113 which is 38.69 Agreed, 89 which is 30.48% disagreed and 14 which represent 4.79 strongly disagreed.

Table 7: To save energy, I am willing to spend time learning more about conservation.

<i>Response</i>	<i>Number of responses</i>	<i>%</i>
Highly Willing	168	57.53
Willing	86	29.45
Somehow Willing	29	9.93
Not Willing	9	3.08

The students' opinion on their willingness to spend time learning more about conservation to save energy. It revealed that 168 which represent 57.53% highly willing, 86 which is 29.45% willing, 29 which is 9.93% somehow willing and 9 which represent 3.08 not willing.

Table 8: Do you like energy education be included in your school curriculum?

Response	Number of responses	%
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YES	268	91.78
NO	24	8.22

The result indicated that 268 which is 91.78% of the respondents said Yes, that is they want energy education be included in their school curriculum, while 24 which represent 8.22% said No.

FINDINGS AND DISCUSSIONS

Summary of findings.

- I. The level of awareness of energy savings among secondary school students was low.
- II. The students occasionally practice energy management at home, due to energy illiteracy among secondary education students.
- III. The students have little knowledge on energy management.

Discussion of the findings.

The students' responses show that they allow hot food to cool to room temperature before refrigerating to saves energy. 26 which is 8.90% were highly aware, 80, 27.40% were aware, 149 which represented 51.03% were somehow aware and 37 which is 12.67% were not aware; The level of awareness on Utilization of minimum wattage lamp to provide required light saves energy revealed that 30 that is 10.3% were highly aware 46, 15.8% were aware; 154, 52.7% were somehow aware and Not aware 62, 21.2%; These was supported by study of Saba, et al. (2016) which revealed that people lack adequate awareness on energy management in residential houses that usually lead to present level of energy wastages in Nigeria. Oyedepo (2012) affirmed the finding, which he said residents and workers often leave their door and windows open when air-condition is on. This may possibly as a result of low awareness toward that. As long as people are not well informed about these practices, it will often lead to energy wastages.

Their opinion on their willingness to spend time learning more about energy conservation can save energy. The study revealed that 57.53% of students were highly willing, 29.45% willing, 9.93% somehow willing and 3.08 and 91.7% of students that took part in the study like energy education be included in their school curriculum. energy literacy is indispensable for people, and lack of knowledge and understanding for energy-related issues is more likely to affect on various fields in society. Akitsu and Ishihara (2019) in their study noted that The ratio of students that their parents train them about energy-saving was 61% for Thai and 63% for Japan. On the other hand, Japanese students who positively responded to the experience of energy education and energy-related facility tour, and home discipline in energy-saving indicated higher score on the awareness consequences than those of counterparts. energy education programs can be designed and implemented to improve the awareness of consequences and attitudes toward behaviour regarding energy and environmental issues (Akitsu &Ishihara, 2019).

The study revealed that secondary education students occasionally utilized natural daylight at home. Meaning that they prefer to switch on bulb than utilizing natural light. This may be due to lack of knowledge on energy saving. The findings agreed with the study carried out by (2016) as they agreed that electrical energy consumption for lighting in buildings is about 40% within the total consumption. Daylight integrated lighting solutions can significantly reduce energy consumptions. Increasing daylight penetration may significantly save energy, reduce CO2 emissions, improve visual comfort and enhance the quality of the indoor environment. Omowunmi (2015) also agreed that many Nigerians do not put off the outside light during the day, which is due to wrong behavioural practices adopted towards electrical energy usage. The finding was supported by Edward and Torcellini (2002), as they stated that majority of electricity users were aware that usage of day light environment helps in electrical energy savings. They further stated that the employment of day lighting decreases utility costs and improves the well-being of building residents. Loozen and Moosdijk (2001) observed that experiments have shown that through application and appropriate use of positive behaviour towards energy saving about 5–10 % of the energy can be saved, as many people fails to practice. there is a

strong indication that people may misuse rather than creating scarcity of resources. This might be the cause of energy crisis witness in Nigeria. The findings are not in agreement with the work of Ponniran et al. (2007), as recommended that for appropriate saving and judicious utilization of scarce resources such as electricity. It has become necessary to adopt right behavioural practices and any act that may lead to energy wastages should be avoided.

CONCLUSION

The investigation of energy literacy of secondary education students is timely due changes of energy crises in Nigeria. The behavioural approach is vital in any energy conservation programme and is regarded as one of the keys of success in energy management. Awareness is the seed for tomorrow changes and this suggests that, the first step in behavioural approach in energy saving is to raise energy awareness. The study revealed that students of secondary education are not much aware of energy saving practices at home. They occasionally practice energy management at home, due to energy illiteracy among them and the study further revealed that students are interested in participating in energy saving activities in future, willing to spend time learning more about conservation and 91.78% of the secondary education students want energy education be included in their school curriculum.

Recommendations.

Based on the findings and its implementation the following recommendations were made.

1. Government and concern personal or group should create awareness on energy savings through public enlightenment campaigns in televisions, radio and social media. As awareness is the seed for tomorrow changes and this suggests that, the first step in behavioural approach in energy saving is to raise energy awareness.
2. Parents and guidance should play a role of educating their children on needs and ways of managing energy at home.

3. Energy literacy programmes should be designed and implemented in secondary schools to improve the awareness, consequences and attitudes toward behaviour regarding energy usage and its effect on environment.

REFERENCES

- Akitsu, Y., & Ishihara, K. N. (2019). Energy literacy assessment: A comparative study of lower secondary school students in Thailand and Japan. *International Journal of Educational Methodology*, 5(2), 183-201. <https://doi.org/10.12973/ijem.5.2.183>
- Arya, B. & Chaturvedi, S. (2020). Extending the theory of planned behaviour to explain energy saving behavior. *Environmental and Climate Technologies* 24, (1), pp. 516–528
- Azizi, Z. M., Azizi, N.S.M., Abidin, N. Z. & Mannakkara, S. (2019) Making Sense of Energy- Saving Behaviour: A Theoretical Framework on Strategies for Behaviour Change Intervention. *Procedia Computer Science* 158 (2019) 725–734
- Creswell, J. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.)*. Upper Saddle River, NJ: Pearson Education.
- Edwards, L., & Torcellini, P. (2002). *A literature review of the effects of natural light on building occupants*. Retrieved on March 12, 2022 from <http://www.osti.gov/bridge>
- Loozen, A., & Moosdijk, C. V. D. (2001). A consumer advice on energy efficient use and purchase of household appliances and lighting. In: Bertoldi, P., Ricci, A. & Almeida, A. D. *Energy Efficiency in Household Appliances and Lighting*. Berlin: Springer Press.
- Nguyen, T. T., Duong, K. T & Do, T. A. (2021). Situational factor affecting energy-saving behaviour in direct approaches in Hanoi City. The role of socio-demographics. *Cogent Psychology* 8: 1978634 <https://doi.org/10.1080/23311908.2021.1978634>
- Olaide, M. A., Guerner, A. D., & Zhou, E. (2017). Assessment of Renewable Energy Sources and Municipal Solid Waste for Sustainable Power Generation in Nigeria. *IOP Conf. Series: Earth and Environmental Science* 95 (2017) 042043
- Olatunji, O., Akinlabi, S., Oluseyi, A., Abioye, A., Ishola, F., Peter, M. & Madushele, N. (2018). Electric Power Crisis in Nigeria: A Strategic Call for Change of Focus to Renewable Sources. *IOP Conf. Series: Materials Science and Engineering* 413 (2018) 012053 doi:10.1088/1757-899X/413/1/012053
- Omowunmi, W. S. (2015). *Energy Crisis in Nigeria: Sustainable Option using Nanotechnology as the Way Forward*. A lecture delivered at the 7th Convocation Ceremony of the Redeemer's University of Nigeria, Sept 28, 2015. Retrieved on December 8, 2015 from <https://run.edu.ng/media>
- Oyedepo, S. O. (2012). Energy efficiency and conservation measures: tools for sustainable energy development in Nigeria. *International Journal of Energy Engineering*, 2, (3), 86-98.

Ponniran, A., Sulaiman, E., Jumaat, S.A., Ishak, M., Chulan, M.A. & Saiman, S.

(2007). A study on electric energy usage at the residential area. Proceedings of EnC«n 2007 1st Engineering Conference on *Energy & Environment* December 27 28, 2007, Kuching, Sarawak, Malaysia. Retrieved on January 23rd , 2022 from <https://www.google.com.ng>

Saba T. M., Tsado, J., Bukar B., & Ohize E. J. (2016). Level of Electrical Energy Management Practice Awareness among Residents in Niger State, Nigeria. *American Journal of Engineering and Technology Management*. 1(1) 1-6

Thumann, A., & Younger, W. J. (2008). *Handbook of energy audits*. Liburn: Faimont press.

Tsado, J. (2014). National energy saving initiative and right lighting. Paper presentation at the 8th International Lighting Conference 2014 (November.18th – 20th) at Hotel De Bently, Utako District, Abuja