



Comparative Assessment of Awareness and Knowledge of Impact of Energy Use Behaviour among Nigerian Higher Education Institutions Residence Students

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Authors' contributions

This work was carried out in collaboration between both authors. Author COI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author EAO chronicled the background to the study, wrote the abstract and managed the literature review searches. Both authors read and approved the final manuscript.

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ABSTRACT

The aim of this study was to understand and compare residence students' awareness and knowledge of the impacts of their reported energy use practices, and to explore their attitudes and reported behaviour regarding energy saving using data collected from three different higher institutions in Southwest, Nigeria namely Obafemi Awolowo University (OAU), Ile-Ife, Rufus Giwa Polytechnic (RUGIPO), Owo and Adeyemi College of Education, (ACE), Ondo. The findings revealed that there is a significant difference between the three tertiary institutions regarding their level of awareness with RUGIPO having the highest and ACE having the lowest awareness level ($F = 3.571$, $p = 0.002$). The research also found that ACE exhibits the highest scores for almost all aspects of energy use behaviour. The correlation analysis shows a significant correlation between level of awareness and energy use behaviour ($R = 0.897^{**}$, $p = 0.001$). The result shows no significant difference between the level of awareness and socio-demographic characteristics of respondents

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except gender in RUGIPO ($F = 7.654$, $p = 0.007$). The result shows no significant difference between the energy use behaviour and socio-demographic characteristics of respondents except age ($\chi^2 = 23.407$, $p = 0.000$) and academic qualification ($\chi^2 = 28.232$, $p = 0.000$) for turning off light when not needed.

Keywords: Energy consumption; energy conservation; awareness; knowledge; impact of energy use behaviour; student's hostel; Nigeria.

1. INTRODUCTION

Energy consumption is an important factor for economic growth and development [1]. Its significance stems from its effect on infrastructure, a number of socio-economic operations and subsequently on the country's living standards. Considering its importance and indispensability, questions have been raised about its use [2]. The issues were posed due to the growing worldwide use of energy in building that causes energy exhaustion and environmental impacts (ozone destruction, environmental degradation, global warming, climate change, etc.) [3,4,5]. Because of this, building energy conservation is now a primary priority globally [3].

Student housing, however, is an integral part of higher education institutions' facilities to alleviate accommodation problems and promote academic success [6,7]. This facility or occupancy, however, ends up contributing to high demand and expenses in higher education institutions [8-10]. This means that higher education institutions must tackle energy usage in this occupancy to move to sustained and productive energy usage. Efficient technical approach has been the subject of previous efforts to address this problem [11-15]. Although these approaches are useful, literature offers data and evidence that higher education institutions need to consider the actions and attitude of energy consumers in order to achieve sustained and effective energy use [9,16-19]. This is because users' behaviour equally affect energy use the same way as technology does. In fact, studies have shown that behaviour influences energy use in buildings as much as 50% even more in some buildings [6,8,18,20]. Studies have also shown that up to 30% of energy could be saved if we understand the behaviour of users [16,21].

It is equally important for consumers to be conscious of and know how their actions towards energy use affects the economy and climate, among other problems that affect human health and comfort negatively [3,6,10]. Knowledge of their effect could make them change their actions

towards energy use if they have an understanding of this. In turn, by increasing awareness and information about energy efficiency, people will be able to take action to conserve energy if they are fully advised about how to save energy and the value of energy conservation. In the same way, successful knowledge and recognition of the impact of inefficient actions in the use of energy in student housing would provide authorities of tertiary institutions with an understanding of the nature of the problem as an essential step to mitigate it effectively.

There have been studies that have investigated energy use in higher education institution in Nigeria [4,5,22,23,24], but there is a dearth of studies in Nigeria concerning residential students energy use behaviour, and as far as the authors of this article are concerned, there are no studies in this area. Therefore, in order to achieve sustainable productive energy transfer, higher education institutions in Nigeria need to research the energy-use behaviour of residence students. In addition, the students' needs to be aware of their energy consumption impacts on total energy consumption of higher education institutions and the economy. This is the gap the present study intended to fill. To complement existing studies in higher education institutions in Nigeria, this study investigated residence students' awareness, knowledge, attitude and perception of their consumption impact and energy use behaviour. The worth of this research is that awareness will help provide consumers with tailored advice and information on consistent, sustained and long term knowledge about ways in which behavioural factors influence actual energy savings. The outcome of this study will also be useful in promoting energy conservation behaviour among students thereby contributing immensely to the educational sector's ability to boost national and global economy.

2. LITERATURE REVIEW

2.1 Awareness Level of Students

A considerable literature exists on examining the level of awareness of the impact of energy use

behaviour within the context of higher education institutions. [25] measured and evaluated the degree of awareness and behaviour of electricity conservation at King Saud University. The study was carried out to study KSU faculty, administrators and students in order to measure their awareness and attitudes towards the negative impact of electricity consumption. The study found a low level of awareness among students towards the negative impact of energy consumption in the institution. [26] mentioned that energy wastage action was due to absence of knowledge among students in public and private universities in Malaysia and no precise pattern was accessible to guide students to enhance the condition. In line with this, [21] also propagates that the issue for high energy consumption behaviour in University of Sheffield buildings was that the occupants cited a lack of awareness about the energy consumption of the building and a lack of personal control and responsibility for energy conservation.

In addition, [27] noted that in Kenya Universities energy wastage occurs in the institutions due to lack of awareness among students in the institution on the negative impact of energy consumption in buildings and they have also not been trained on energy saving techniques. [28] pointed that to change the ongoing character of individuals', information, education and awareness raising measures can be used to make the public aware of their behaviour and consumption patterns. The author mentioned that energy awareness can only be developed through the transmission of a message of knowledge and understanding that is suitable. [29] argues that awareness of action is an important requirement for proper behaviour and would constitute an important obstacle to action if the amount of awareness is limited. On the contrary, [30] pointed that education has played a role in raising awareness of energy efficiency and environmental problems, but did not necessarily result in sustained behavioural modifications across university campuses among students. [26] further emphasized the importance of increasing awareness, but most energy managers are still not paying attention to its advantages because facilities tend to be skeptical of behavioural strategy and have little knowledge of them and their capacity.

[31] investigated domestic energy consumption behaviour and public awareness of renewable energy in Qatar. The study found that efficient

energy monitoring, usage and environmental impact is dependent on users' education and awareness. This suggests that a greater awareness of the effects of excessive energy use is required through sustainability education to motivate behavioural change. The results of the study were analysed using self-determination and hierarchal needs theories indicating that education and awareness are the best option for domestic energy conservation. [32] determined energy awareness and energy saving behaviour of secondary school students according to socio-demographic characteristics. The result indicated that the secondary school students had a high level of awareness about renewable energy sources and saving; however, they had a moderate level of interest in energy. Evidence by [33] also noted that energy wastage tends to happen in Malaysian University due to lack of energy awareness and inefficient use of energy among the students. In achieving this, the study showed that raising appropriate energy awareness and improving energy use behaviour among students can improve the energy performance of university. [34] analyzed sustainability awareness among higher education faculty members in Saudi Arabia. The study noted that there is no definitive understanding among faculty members about the concept of sustainability in higher education at the university. In addition, the study opined that the role of faculty members is crucial to strengthen the awareness and knowledge about sustainability in higher education among the new generation.

[35] assessed the knowledge and awareness of sustainability initiatives among college students. The findings indicates that only minority of the students knew what sustainability was, but 95.8% indicated it was important, while majority of the students were not aware of it. The study concluded that majority of the students were not conversant with sustainability issues and were largely unaware of campus sustainability initiatives. From the reviewed literatures, it is obvious that lack of awareness of energy issues is a major focus that needs urgent attention both locally and globally. In view of this, consumers first need to become aware of their energy consumption and energy issues and also to be provide with adequate information. The absence of information is a key barrier that needs to be bridged in order to turn awareness into changes in behaviour. Raising awareness of energy use is then a study issue that pose the challenge of assigning responsibility also to individuals to

make the energy system more sustainable and effective.

2.2 Energy Use Behaviour of Students

Energy use behaviour refers to human actions that affect the way energy is being consumed. It can also be referred to the way in which energy related technologies are being used and the mental processes that relate to these actions whether positive or negative [18]. [28] [36] carried a study on energy consumption behaviour as cited in studies on energy management intervention. The result revealed that the majority of the students sampled are not very much aware of energy management practices as they don't replace incandescent with CFL lamps, switching off lights when not leaving for a period. [28] revealed that awareness and understanding of basic energy conservation and management practices such as switching off gadgets not in use and use of energy efficient lights and gadgets are effective in making significant gains. The result show that students seem to show low or limited awareness level on practices that are practically deemed to be high energy consuming such as 'ironing garments in bulk' and 'usage of gas over electric cookers.

[37] carried out a study on action for increasing energy saving behaviour in student residences at Rhodes University, South Africa. The result reviewed that a substantial proportion of the respondents reported pro-environmental actions when it comes to turning off lights when they left their rooms or common rooms, unplugging chargers and turning off electronic devices when not in use, use of task lighting and laundry lines for drying clothes. The respondents attributed non engagement in pro-environmental energy use actions to security, laziness, convenience and lack of control of the situation. [28] [37] carried a study on energy consumption behaviour as cited in studies on energy management intervention. The result revealed that the majority of the students sampled are not very much aware of energy management practices as they don't replace incandescent with CFL lamps, switching off lights when not leaving for a period. [38] revealed that residence students in Indian higher education institutions exhibit behaviour such as leaving their light on when not in use, hibernating the laptops when they are not in use, leaving computers on when not needed. [25] reported that the energy use behaviour of students a King Saud University were due to students not switching off their

lighting systems when not in use and also failure to turn off air-conditioning systems when not in use.

[31] presents a high-resolution model of domestic electricity use that is based upon a combination of patterns of active occupancy (i.e. when people are at home and awake, when people switch on the light and put it off) and daily activity profile that characterize how people spend their time performing certain activities. The result also showed that the pattern of electricity use in an individual domestic dwelling is highly dependent upon the activities of occupants and the associated use of electrical appliances. [15] measured the electricity consumption of 72 households in the UK over a two-year monitoring period. They observed that the large variation in the annual energy consumption resulted from variations in the number of occupants, the number and type of appliances and the behaviour pattern of the occupants. The result noted that electricity consumption was measured at 5-min intervals and they observed that it significantly fluctuated according to changes in the behaviour of occupants. Similarly, [39] developed a model of domestic occupancy, activities and energy use based on time-use data. The result identified a number of occupants' behaviour for household appliances usage including switch-on times, usage durations, choice of power mode for the appliance operation and behaviour towards stand by. This was also similar to the findings of [40] [41] who identifies occupants' behaviour and activities in relation to household appliances (turning off appliances when not in use, leaving light on when spaces are not occupied).

[37] carried out a study on action for increasing energy saving behaviour in student's residences at Rhoda University. The results opined that students behaviour such as not turning off lights when not in use, not turning off computers when not needing, leaving computers in hibernate modes were the major reasons for poor energy use in the institution. Moreso, [42] revealed that students' attitude and reported behaviour on campuses in UK and Portugal were due to students not turning off light when they are not in use, turning down the heater, not buying things that are likely to involve less energy or resource use, paying less attention to more environmentally friendly products, charging mobile phones overnight, not turning off the stand-by button of the TV set or switch appliances off at the plug and not using

rechargeable batteries. In the same vein, [43] also determined the behaviour affecting high energy consumption behaviour among students in Indian higher education institutions students. The result found that the high increase of inefficient energy use in the institutions were attributed to students energy use behaviour such as leaving light on when not occupied, leaving laptops on when not in use, leaving fans and air-conditioning systems on when the rooms are not occupied.

Furthermore, [44] found out that students energy use behaviour in higher education institutions in Ghana were attributed to not turning off light in their rooms when not needed, leaving electrical gadgets unplugged, constant boiling of water, not turning down water heater thermostat and not maximizing the use of natural lighting whenever possible by turning off lights in the room when there is adequate daylight. [45] characterized energy saving behaviour of the residence students in Kenya as failure to turn off light when going out, turning off air conditioning in dormitory when leaving the room, shutting down computers when going out. [46] mentioned that student's laziness to wake up and switch off light in the room at night, leaving bulbs on when not in use, failure to install energy saving bulbs and purchase of low energy consumption equipment. However, these studies did not compare their level of awareness among different groups and categories of students. Many studies have also been conducted regarding energy use in Nigeria. For instance, [4] suggested that energy consumption in the University is on the increase and can possibly be reduced by enhancing the efficiency of electrical appliances, utilisation of day-lighting, maximizing natural ventilation and better management practices. It was further concluded that a well- dictated and strongly pursued energy efficiency policies in the university can lead to an estimated annual savings of 16% in electricity consumption. [5] examined the patterns of electricity use and determined the proportion of electricity consumption by various stakeholders in tertiary institutions in Southwestern, Nigeria. The result indicated that lighting, cooking and space cooling are the major electricity consuming activities that are major performed in the student's residence.

[47] investigated energy demand and its utilization in Federal Polytechnic, Ilaro. The study found that inefficient energy use in the institution occurs as a result of the electrical appliances and gadgets used by students in the dormitories. [48]

also mentioned that in students housing in Ramat Polytechnic, Maiduguri, energy use is on the increase in the institution due to increased use of air-conditioning system, lighting and electrical equipment. [49] investigated the level of compliance to electricity energy efficiency practice by residential households in Lagos Metropolis. The result found that the type of appliances used by consumers in households and their compliance to energy efficiency influence energy conservation in the area. Also, the result revealed that consumers in households have poor attitudes towards energy efficiency practices both behaviorally and technologically. [22] conducted a survey on the energy consumption and demand of electricity in University of Lagos. The study categorize electrical energy end-use at the University of Lagos includes space cooling that includes all the energy used for ventilation and air conditioning equipment.

[50] carried out a research on assessment of energy wastage and saving potentials for higher educational institutional buildings in south western, Nigeria. The result found that energy wastage are common with lighting consumption, poor controls and regulators for both lighting and other appliances as students leaves light turned on in unoccupied spaces mostly in lecture halls, classrooms and hostel residences and high level of usage of fans and ACs over natural ventilation, simultaneous running of multiple appliances in hostels, leaving plug appliances in socket unused. [24] investigated energy use efficiency of students' hostel in Gidan-Kwano Campus in Minna. The study found that the inefficient energy use in student's halls of residence was due to frequent use of electricity for cooking, lighting and space cooling. The result attributed the energy increase to the unregulated use of hotplates and poor user's habits in the hostels. However, these studies neither investigate nor compare energy use behaviour and level of awareness as well as the knowledge of the impacts of energy use behaviour among the respondents. This is the gap the present study intended to fill to complement existing studies on energy consumption and its conservation in higher education institutions in Nigeria.

2.3 Strategies to Improve Lack of Awareness and Energy Use Behaviour of Students

Several studies have also revealed how user's awareness on energy issues can be raised or

improved. For instance, [51] carried out a research in Sonora University in Mexico found that electricity use was reduced by 32 percent in residences at a US university after a combination of interventions such as feedback on energy performance and incentives for saving energy. [52] similarly found that providing regular feedback and incentives to students resulted in energy savings ranging from 10.7 to 16.2 percent in residences at Otago University, New Zealand. A study by [30] carried out in University of Kent in UK found energy savings of 5-15% via energy feedback meters and real-time electricity feedback display. [53] also found that providing information on energy conservation translated into energy savings in residences at Stellenbosch University, South Africa. According to a research carried out by [37], the provision of rewards for efficient behaviour towards energy consumption seemed to encourage residence based social norms which according to respondents helps to encourage energy users to save energy.

[54] affirmed that the provision and importance of incentives encourages change in energy use behaviour of students in hostels at Indiana University, USA. Also, in a research carried out [55] in Saudi Arabia, interviewee identified the unavailability of incentives as a barrier for green buildings in Saudi Arabia. It was noted that the existence of incentives is as important as the existence of penalties. In the same vein, [56] found that competition was a good motivator among students in encouraging efficient energy conserving behaviour. Activities such as competitions, challenges and contests combined with award programs could encourage and motivate students to participate in the program. Award program can also help build momentum, generate interest and motivate behavioural change. This suggests that provision of incentives can potentially enhance energy use behaviour among students in order to achieve a collective goal. Awards can range from small items such as compact fluorescent lamps, T-shirt, setback thermostats, etc.

[37] carried out a study on action for increasing energy saving behaviour in student residences at Rhodes University, South Africa. The result reviewed that feedback on energy saving performance was given to students of FT group. The result show lower energy consumption rates in the FT group. The result suggests that behaviour change interventions can be an important tool for encouraging energy use

behaviour in common spaces such as university residences. The result further suggested competition among residences and provision of rewards to residences demonstrating good environmental practices as this would be important for the students to decide the form of rewards they want as this may enable the incentives to be in line with student's needs. [10] further carried out a research in Bowdoin and Colby College in Brunswick, Maine in 2015 in which the university decided to launch a contest to decrease the quantity of electricity used by students in the university hostels for some weeks, the electricity use between the schools was monitored and analyzed to know which school could conserve electricity more. Colby College was able to decrease its consumption of electricity by 7%, while Bowdoin College was able to decrease its consumption by 8.7%.

[57] mentioned that in Williams College, Williamston, Maine, there was increased environmental literacy and reduced energy consumption through an energy conservation project called the 'Do it in the Dark Energy Saving Competition'. This project was designed to reap short-term reductions in energy consumption and to create general environmental awareness that could promote further reductions. The Williams program involved an energy competition between individual residential houses and spanned a one month period. Energy consumption was reduced by 40% in the first phase. In the second phase, energy consumption was reduced by 12%. [58] examined effective education for energy efficiency on the students and their parents. The paper describes the result of an energy thrift information and education project taking place at different levels of education in Crete-Greece. The result proves that this behaviour changes to a more energy efficient one after the dissemination of relevant information and the participation of individuals in the energy education projects. [36] reviewed a study on intrinsic changes on energy saving behaviour among resident university students. The result revealed that student's feedback on the ecoMeter promoted a greater awareness of appliance energy consumption and a reminder to perform the selected behaviours, commonly switching off unused appliances or lights. Students indicated that the ecoMeter helped to reduce energy consumption but had a greater impact on helping the students understand the importance and ease of reducing energy. The result suggested that the ecoMeter contributed to a greater awareness of energy

usage and facilitate reduced energy consumption. The success of the above mentioned interventions in promoting energy savings is attributed to awareness raising and increasing knowledge on the environmental benefits of engaging in pro-environmental behaviour and provision of tips for saving energy which cultivates positive attitudes towards the environment. From the foregoing, the literature has shown the importance of awareness and energy use behaviour of residence students. Therefore, it is equally important and necessary to domicile this in the Nigeria context and find reasons behind unsustainable use of energy in student's halls of residence in tertiary institutions in Nigeria.

3. METHODOLOGY

A multi-stage sampling technique was used for the study. In the first stage, purposive sampling was used to select relatively tertiary institutions and students' halls of residences. In this regard, Obafemi Awolowo University (OAU); Rufus Giwa Polytechnic, Owo (RUGIPO); and Adeyemi College of Education (ACE) were selected. The second stage was the stratification of electricity users in students' hostels. Student halls were categorized into two: undergraduate and postgraduate hostels. Student hostels were purposively selected to capture variation in gender and levels of study. In OAU, RUGIPO and ACE, Awolowo hall, Male hall 8 and Kiladejo male hall respectively were selected as representatives of male undergraduate hostels in the three tertiary institutions, while Moremi hall, Female hall A and Cafe female hall were selected as female undergraduate students in OAU, RUGIPO and ACE, respectively. Muritala Muhammed Postgraduate hall in OAU for both Male and Female students were also sampled. The population of students occupying these hostels earlier determined were 1021, 184 and 170 for Moremi, Female hall A and Cafe female hall, respectively; 1120, 228 and 128 for Awolowo, Male hall 8 and Kiladejo male hall, respectively, while there were 1013 students in Muritala Muhammed PG hall. Five percent (5%) of the students was selected in OAU and twenty percent (20%) of the students was selected in RUGIPO and ACE. Using this method, 157, 83 and 60 students were sampled in OAU, RUGIPO and ACE respectively. The sample size determined for students in OAU, RUGIPO and ACE were 157, 83 and 60 respectively. We adopted quantitative survey and questionnaire as instrument to gather relevant data from electricity

end users in the study area. The data were compiled and analyzed using SPSS 17.0.

4. RESULTS

4.1 General Information of Respondents

The general information about the respondents in the sampled tertiary institutions is presented in Table 1. Over half (50.6%) of the entire respondents were male and 49.4% were female. Over half (81.4%) of respondents that participated in the survey were between 20- 29 years, followed by age group 30-39 years (18.2%) while the least age group was 50 years and above (0.0%). Also, 24.7% of the respondents earns income of about #5000-10000, 32.4% of the respondents earns income of about #10000-15000 while the least income level was #20000 and above (16.2%). Meanwhile, more than half (70.9%) of the entire respondents were Yoruba's; 24.7% of the respondents were from the Igbo tribe while 4.0% of respondents that participated in the survey were from the Hausa tribe.

4.2 Awareness of the Impact of Energy Use Behaviour

The result of the analysis as presented in Table 2 indicates that there is significant differences between students of the three tertiary institutions regarding their level of awareness with RUGIPO having the highest awareness level and ACE having the lowest awareness level. Therefore, it can be concluded that there are significant differences between students of the three tertiary institutions regarding their level of awareness.

4.3 Energy Use Behaviour of Students

From the result in Table 3, ACE exhibits the highest scores for almost all aspects (shut down all computers unless in use, set your laptop to hibernate or sleep mode at night, turn off or unplug electrical equipment when not in use and boil water every time). Also, OAU is highest in "leaving computer running overnight" and "buy low wattage equipments". In the same vein, RUGIPO is superior in "turn off light when not needed". According to the result of the F statistics, all the variables are significant for differentiating between the groups ($p < 0.05$) except the variables "leave computer running overnight" ($p = 0.350$) and "buy low wattage equipments" ($p = 0.231$). Therefore, it can be

concluded that students from the three sampled institutions have similar behaviour regarding leaving computer running overnight and buying low wattage equipments.

4.4 Relationship between Level of Awareness and Energy Use Behaviour

The study examined the relationship between awareness level and energy use behaviour of students in the sampled institutions in Table 4. This was necessary to enhance understanding of specific energy use behaviour of students associated with level of awareness in students' hostels. Pearson's Correlation was employed for this analysis. This statistical technique was adopted to test the proposed relationship. The correlation analysis shows a significant correlation between awareness level and turning off light

when not needed ($r = 0.897, p = 0.001$), awareness level and shutting down all computers unless in use ($r = 0.189, p = 0.044$), awareness level and leaving computer running overnight ($r = 0.452, p = 0.003$), awareness level and turning off or unplugging electrical equipments when not in use ($r = 0.647, p = 0.026$). Also, a significant correlation was found for awareness level and setting laptop to hibernate or sleep mode at night ($r = 0.049, p = 0.044$). During the course of the research, some of the respondents reported that lack of awareness is the reason why they have refused to turn off light when not needed, not shutting down computers when not in use, leaving computers running overnight, not unplugging electrical equipment when not in use etc. This indicates that awareness is related to the behaviour of energy users which means awareness is prior to effective consumer's

Table 1. General information of respondents

	Frequency (n)	Percentage (%)
Gender		
Male	122	49.4
Female	125	50.6
Age Group (Years)		
20-29yrs	201	81.4
30-39yrs	45	18.2
40-49yrs	1	0.4
50 and above	0	0.0
Academic Qualification		
OND	41	16.6
HND	27	10.9
NCE	42	17.0
B.A.	12	4.9
B.Ed.	27	10.9
B.Sc.	56	22.7
M.Sc.	31	12.6
Ph.D.	11	4.5
Marital Status		
Single	235	95.1
Married	0	0.0
Separated/Divorced	2	0.8
Others	0	0.0
Income level		
#5000-10000	61	24.7
#10000-15000	80	32.4
#15000-20000	66	26.7
#20000 and above	40	16.2
Ethnic Group		
Yoruba	175	70.9
Hausa	10	4.0
Igbo	61	24.7
Urhobo	0	0.0
Isekiri	0	0.0
Others	1	0.4

Table 2. Awareness of the negative impact of energy use behaviour by institution

Energy use behaviour		N	Mean	SD	F	Sig.
Do you know that your energy use behaviour have negative effect/impact on the environment	OAU	129	1.18	0.384	3.571	0.002
	ACE	50	1.14	0.351		
	RUGIPO	68	1.21	0.408		

Table 3. Energy use behaviour of students by institution

Energy use behaviour		N	Mean	SD	F	Sig.
Do you turn off light when not needed	OAU	129	1.47	0.501	6.654	0.000
	ACE	50	1.44	0.501		
	RUGIPO	68	1.72	0.452		
Do you leave computer running overnight	OAU	129	1.55	0.499	2.380	0.350
	ACE	50	1.50	0.505		
	RUGIPO	68	1.49	0.503		
Do you shut down all computers unless in use	OAU	129	1.49	0.502	4.142	0.026
	ACE	50	1.66	0.479		
	RUGIPO	65	1.49	0.503		
Do you set your laptop to hibernate or sleep mode at night	OAU	129	1.60	0.491	8.532	0.014
	ACE	46	1.72	0.454		
	RUGIPO	67	1.57	0.498		
Do you turn off or unplug electrical equipment when not in use	OAU	129	1.25	0.531	12.528	0.000
	ACE	48	1.48	0.707		
	RUGIPO	68	1.44	0.500		
Do you boil water every time	OAU	129	1.57	0.496	9.450	0.003
	ACE	50	1.60	0.495		
	RUGIPO	68	1.51	0.503		
Do you buy low wattage equipments	OAU	129	1.52	0.502	5.429	0.231
	ACE	50	1.34	0.479		
	RUGIPO	68	1.47	0.503		

Table 4. Relationship between level of awareness and energy use behaviour

Energy use behaviour	Level of awareness					Sig.
		N	Mean	SD	R	
Turning off light when not needed	OAU	129	1.47	0.501	0.897**	0.001
	ACE	50	1.44	0.501		
	RUGIPO	68	1.72	0.452		
Do you leave computer running overnight	OAU	129	1.55	0.499	0.452**	0.003
	ACE	50	1.50	0.505		
	RUGIPO	68	1.49	0.503		
Do you shut down all computers unless in use	OAU	129	1.49	0.502	0.189**	0.044
	ACE	50	1.66	0.479		
	RUGIPO	65	1.49	0.503		
Do you set your laptop to hibernate or sleep mode at night	OAU	129	1.60	0.491	0.049**	0.044
	ACE	46	1.72	0.454		
	RUGIPO	67	1.57	0.498		
Do you turn off or unplug electrical equipment when not in use	OAU	129	1.25	0.531	0.647**	0.026
	ACE	48	1.48	0.707		
	RUGIPO	68	1.44	0.500		

Table 5. Gender and level of awareness

Institution	Gender	N	Level of awareness		F	Sig. (2-tailed)
			Mean Rank	SD		
OAU	Male	63	1.24	0.429	0.610	0.436
	Female	66	1.18	0.389		
ACE	Male	24	1.13		0.083	0.775
	Female	26	1.15			
RUGIPO	Male	35	1.06		7.654	0.007
	Female	33	1.30			

Table 6. Academic qualification and level of awareness

Institution	Gender	N	Level of awareness		F	Sig. (2-tailed)
			Mean Rank			
ACE	NCE	42	1.14		0.017	0.897
	B.Ed.	8	1.13			
OAU	Ph.D.	11	1.24		0.354	0.841
	M.Sc.	31	1.18			
	B.Ed.	27	1.22			
	B.A.	12	1.17			
	B.Sc.	56	1.21			
RUGIPO	OND	41	1.17		0.023	0.881
	HND	27	1.19			

Table 7. Income level and level of awareness

Institution	Gender	N	Level of awareness		F	Sig. (2-tailed)
			Mean Rank			
OAU	5,000-10,000	29	1.21		0.656	0.581
	10,000-15,000	37	1.19			
	15,000-20,000	40	1/28			
	20,000 and above	23	1.13			
ACE	5,000-10,000	11	1.18		0.873	0.462
	10,000-15,000	23	1.09			
	15,000-20,000	10	1.10			
	20,000 and above	6	1.33			
RUGIPO	5,000-10,000	21	1.24		0.472	0.703
	10,000-15,000	20	1.20			
	15,000-20,000	16	1.13			
	20,000 and above	11	1.09			

Table 8. Gender and energy use behaviour

Energy use behaviour	Gender		χ^2	Sig.(2-tailed)	
	Yes	No			
Do you turn off light when not needed	Male	59	63	2.116 ^a	0.031
	Female	72	53		
Do you shut down all computers unless in use	Male	58	67	3.444 ^a	0.042
	Female	71	51		
Do you turn off or unplug electrical equipment when not in use	Male	42	80	4.376 ^a	0.025
	Female	47	78		

Table 9. Age and energy use behaviour

Energy use behaviour	Age		χ^2	Sig. (2-tailed)	
	Yes	No			
Do you turn off light when not needed	Under 20yrs	18	27	23.407 ^a	0.000
	21-26yrs	38	73		
	27-32yrs	39	25		
	33-38yrs	21	6		
Do you shut down all computers unless in use	Under 20yrs	18	27	4.255 ^a	0.235
	21-26yrs	64	47		
	27-32yrs	32	32		
	33-38yrs	15	12		
Do you turn off or unplug electrical equipment when not in use	Under 20yrs	17	28	7.549 ^a	0.273
	21-26yrs	38	72		
	27-32yrs	20	43		
	33-38yrs	3	24		

Table 10. Academic qualification and energy use behaviour

Energy use behaviour	Academic qualification		χ^2	Sig. (2-tailed)	
	Yes	No			
Do you turn off light when not needed	NCE	24	18	28.232 ^a	0.000
	B.Ed.	14	13		
	Ph.D.	10	1		
	M.Sc.	21	10		
	B.A.	3	9		
	B.Sc.	25	31		
	OND	8	22		
	HND	11	27		
Do you shut down all computers unless in use	NCE	12	30	9.782 ^a	0.134
	B.Ed.	14	13		
	Ph.D.	4	7		
	M.Sc.	17	14		
	B.A.	8	4		
	B.Sc.	17	39		
	OND	7	26		
	HND	26	9		
Do you turn off or unplug electrical equipment when not in use	NCE	13	28	25.852 ^a	0.011
	B.Ed.	7	19		
	Ph.D.	9	2		
	M.Sc.	10	21		
	B.A.	3	9		
	B.Sc.	10	46		
	OND	19	13		
	HND	11	25		

behaviour while lack of awareness leads to ignorant and energy wastage. From the result in Table 4, awareness level correlates with energy use behaviour. Therefore, it is necessary to make sure students are aware of the negative impact of energy use behaviour and various strategies should be inculcated to curb the excessive use of energy by students in the hostels.

4.5 Demographic Characteristics and Level of Awareness

In this section, the test of differences between respondents' awareness level across socio-demographic attributes in the sampled institutions was determined. This was achieved using a one way ANOVA test. Table 5 shows the

differences between gender and their level of awareness. The result indicates that there are no significant differences between male and female students in OAU ($p = 0.436$) and ACE ($p = 0.775$) regarding their level of awareness of energy use behaviour. However, this study agrees with Ishak and Zabil (2012) that found no significant differences between gender and level of awareness of individuals. However, the study found a significant difference between the level of awareness of male and female students in RUGIPO ($p = 0.007$).

Table 6 shows the differences between academic qualification and their level of awareness in the institutions. The result indicates that there are no significant differences between students' academic qualification in the three sampled institutions since $p > 0.05$. The result indicates that academic differences of respondents does not necessarily mean that energy will be conserved.

Table 7 shows the differences between income level and students' level of awareness in the institutions. The result indicates that there are no significant differences between students' income level in the three sampled institutions since $p > 0.05$. The result indicates that income level of respondents does not necessarily mean that energy will be conserved.

4.6 Demographic Characteristics and Energy Use Behaviour

In this section, the test of differences between respondents' energy use behaviour across socio-

demographic attributes in the sampled institutions was determined. This was achieved using Chi-square test. Table 8 shows the differences between gender and students energy use behaviour. The result indicates that there is a significant differences between male and female students in the aspect of "turning off light when not needed" ($p = 0.031$), "shut down all computers unless in use" ($p = 0.042$) and "turn off or unplug electrical equipment when not in use" ($p = 0.025$). However, this study agrees with [60] that found a significant differences between gender and energy use behaviour of individuals.

The result in Table 9 shows the relationship between age of respondents and energy use behaviour of respondents. The result indicates that there is a significant difference between age and turning off light when needed ($p = 0.000$). However, no significant difference was found between age of respondents and shutting down computers unless in use ($p = 0.235$) and turning off or unplugging electrical equipment when not in use.

The result in Table 10 shows the relationship between academic qualification and energy use behaviour of respondents. The result indicates that there is a significant difference between academic qualification and turning off light when needed ($p = 0.000$) and turn off or unplug electrical equipment when not in use ($p = 0.011$). However, no significant difference was found between academic qualification and shutting down computers unless in use ($p = 0.134$).

Table 11. Income level and energy use behaviour

Energy use behaviour	Income level		χ^2	Sig. (2-tailed)	
	Yes	No			
Do you turn off light when not needed	5,000-10,000	33	28	1.365 ^a	0.714
	10,000-15,000	46	34		
	15,000-20,000	32	34		
	20,000 and above	20	20		
Do you shut down all computers unless in use	5,000-10,000	34	27	1.277 ^a	0.735
	10,000-15,000	40	40		
	15,000-20,000	32	34		
	20,000 and above	23	17		
Do you turn off or unplug electrical equipment when not in use	5,000-10,000	14	47	8.354 ^a	0.213
	10,000-15,000	24	54		
	15,000-20,000	24	42		
	20,000 and above	16	24		

The result in Table 11 shows the relationship between income level and energy use behaviour of respondents. The result found no significant differences between income level and turning off light when needed ($p = 0.714$), shut down all computers unless in use ($p = 0.735$) and turn off or unplug electrical equipment when not in use ($p = 0.213$).

The result of the analysis indicates that there are significant differences between students of the three tertiary institutions regarding their level of awareness with RUGIPO having the highest awareness level and ACE having the lowest awareness level. This shows that there are differences between students of the three tertiary institutions regarding their level of awareness. The research also investigated the energy use behaviour of students according to institutions and it was found that ACE exhibits the highest scores for almost all aspects of energy use behaviour (shut down all computers unless in use, set your laptop to hibernate or sleep mode at night, turn off or unplug electrical equipment when not in use and boil water every time). From the result, there was a significant correlation between level of awareness and energy use behaviour of students in the sampled institutions.

The result also shows a significant difference between the level of awareness of male and female students in RUGIPO but no significant difference was found in OAU and ACE students. Also, no significant difference was found in the level of awareness of students regarding academic qualifications and income level in all the three tertiary institutions. This means academic qualification and income level of students does not necessarily dictate the level of awareness of the students. The result also found a significant difference between gender and energy use behaviour, but no significant difference was found for age of respondents and energy use behaviour except "turning off light when not needed", no significant difference between academic qualification of students and energy use behaviour except "shut down all computers unless in use". Lastly, no significant difference was found between income level of respondents and their energy use behaviour.

From the result, respondents cited a need for more information and issues related to lack of responsibility towards energy use. Across majority of the respondents, it was concluded that their awareness of problems related to

energy use was caused by lack of information from their institutions about the importance or the need to reduce energy consumption.

4.6.1 Some comments made by respondents to support the point;

"In all my four years in school, I have not heard anything about energy saving measures, I don't even know that my energy use behaviour causes increase in the institution energy bills" (Okunade Ayomiposi)

"I don't know anything about energy saving measures. If I am aware, this might make me more conscious of my actions" (Awoniyi Godwin)

"I believe that energy is a necessity and should be free and readily available. At least it is part of the amenities that one should enjoy in the country which is why I don't consider the need for energy conservation" (Ayoola Deji)

"I don't pay for energy bills, I think that is the responsibility of the school authority" (Bamidele Abidemi)

This perceived lack of responsibility can also be related to others level of concern with energy conservation. In fact, it was recognised that a propensity to take action was likely related to respondents' personal views on energy saving actions and their environmental views and that those with less concern for the environment will be less aware and less concerned about energy issues.

Also, there was also opinion that tertiary institutions should make available conservation efforts and that energy saving measures should be a more visible priority for the institutions. A perceived priority for the institution will be to make available more detailed and accessible information about energy usage both the level of consumption and methods to reduce energy consumption. Some respondents also felt that the existing means of communication (e.g. hostels regulation) were ineffective and that a more could be provided via other means (e.g. social media, text messages, posters and banners where energy use data will be displayed in campus buildings. It was suggested that the usefulness of social media channels can help reduce the resistance to change especially when people start to share their realized benefit derived from energy conservation.

"I have a phone and am always browsing online, but I have never come across the issues of energy consumption or energy conservation"

"There is no means of advertisement on energy consumption, energy wastage, problems associated with its usage and problems it has on the environment, so how would I have known that such is happening"

Respondents also suggested student's orientation or education needs to be provided for students especially during their first year in school or at the beginning of their education career. To further buttress their awareness, posters, banners and flyers could be hanged at different locations in the academic environment to provide feedback on sustained energy goals.

Energy wastage or energy conservation has never been announced in the hostels, so there is no way I would have known that energy is wasting or that my school is paying huge amount for electricity.

In my third year of being in school, I have neither been taught on energy management nor have I ever heard anything like energy conservation.

"I have not been trained on energy saving measures, I am not even aware of the impacts of wasting energy"

Respondents also suggested that incentives needs to be provided to students across campuses as this might motivate them to change their behaviour to reduce energy consumption. Also, encouraging energy saving competitions among students can be a tool to proving energy saving measures.

"Incentives to encourage us to conserve energy is not available, so I think that's the business of the institution"

5. DISCUSSION AND IMPLICATIONS

From the result, respondents discussed their awareness of energy use behaviour, their level of control towards energy use and barriers to action to reduce energy consumption. There are various factors that can be attributed to the inefficient energy use by students in the study area;

5.1 Lack of Adequate Information

Respondents suggested that the tertiary institutions desires to reduce energy use across campus had not been successfully communicated to them, resulting in a lack of awareness about current energy use in their hostels and a general feeling that it is not their responsibility to manage it. This result is also in accordance to the study of [21] [46] which pointed that lot of energy wastage occurred in the University of Sheffield and Kenya Universities due to lack of awareness among students. It was felt that providing information on usage would make people more aware of how much they are consuming and this may in turn lead to them to consider it to be their responsibility and promote conservation. More generally, however, it suggests that there is a need for institutions to regularly evaluate the actual penetration of efforts to increase awareness of sustainability/energy reduction initiatives, so as to test their actual on-going effectiveness. Therefore, to achieve all these benefits, regular communication with the audience is needed, repeating the message and varying the presentation of the message so that they do not lose interest [61].

5.2 Prioritized Technological Change

Priorities for the reduction of energy use initially centred on technological changes, to make equipment as efficient as possible and to increase the occupants' ability to moderate the building temperature. Discussion of how to then change behaviour focused on the monitoring of energy use and incentivising reductions and rewarding conservation efforts. This preference for technological intervention could perhaps be seen as a by-product of the above issues of awareness, control and responsibility. That is, to the extent that people are not aware of their energy use behaviour, how to reduce it, or personal responsibility for doing so, imposed technological interventions are a perceptively simple solution, with low personal cost, but potentially high personal gain (e.g., in terms of the introduction of new energy-efficient equipment).

5.3 Motivational Factors

Also, promotional items such as t-shirt, coffee mugs, hats and stickers can also be used to motivate students' in enhancing energy conserving behaviours in institutions and also

improves their level of awareness. This goes in line with the findings of [52]. Individuals can make a difference because everyone has a role to play. The success of the program depends on everybody's contribution and participation. Management in tertiary institutions should make the messages real by providing context for the information to be communicated. For instance, if lighting represents 20 to 40% of the institutions energy bill, the messages could communicate that a 40% savings from turning off light when not in use could save specific amount every year and the savings could be related to equivalent such as teaching supplies, an upgraded lobby in the hostels, an investment in medical programs, increased laboratory facilities etc. In my opinion, students or the society as a whole (Nigerians) are more likely to "buy into" energy efficiency when potential cost savings are translated into concrete benefits that they can relate to i.e. for them to give their supports, they might need to know how they will be affected.

5.4 Lack of Feedback

As highlighted in the present study, and argued by [62] the conscious decision process and subsequent re-evaluation of norms requires individuals to be provided with information and feedback so that they know the nature of the problem, the existing options and their respective consequences and impacts. It shows that if students are aware of the implications of their actions, habits, attitudes and norms, they could be motivated to inculcate behaviours that conserves energy. This could help schools and Nigeria at large to inculcate behaviour that conserve energy. Meanwhile, completing a study about how feedback can influence student behaviour, the researchers found that real-time feedback was the most effective method of influencing students to lower their consumption. This method works because it allows students to see the consequences of their actions as they are occurring. By being able to see the consequences immediately, students were able to have a better understanding of what their consumption actually means [51].

6. CONCLUSION

Awareness of impact of energy use behaviour among students in different tertiary institutions in Nigeria were investigated. The result from the study indicates that there is significant differences between students of the three tertiary institutions regarding their level of awareness

with RUGIPO having the highest awareness level and ACE having the lowest awareness level. Therefore, it can be concluded that there are significant differences between students of the three tertiary institutions regarding their level of awareness. From the result, there was a significant correlation between level of awareness and energy use behaviour of students in the sampled institutions. The analysis indicates that a large number of students have low level of awareness of the negative impact of energy use behaviour. It is therefore clear that the level of awareness of electricity end users is very low and consequently a lot of energy will be wasted in return.

The research also investigated the energy use behaviour of students according to institutions and it was found that ACE exhibits the highest scores for almost all aspects of energy use behaviour (shut down all computers unless in use, set your laptop to hibernate or sleep mode at night, turn off or unplug electrical equipment when not in use and boil water every time). The result also shows a significant difference between the level of awareness of male and female students in RUGIPO but no significant difference was found in OAU and ACE students. Also, no significant difference was found in the level of awareness of students regarding academic qualifications and income level in all the three tertiary institutions. This means academic qualification and income level of students does not necessarily dictate the level of awareness of the students. The result also found a significant difference between gender and energy use behaviour, but no significant difference was found for age of respondents and energy use behaviour except "turning off light when not needed", no significant difference between academic qualification of students and energy use behaviour except "shut down all computers unless in use". Lastly, no significant difference was found between income level of respondents and their energy use behaviour.

7. AREA FOR FURTHER RESEARCH

The research generates useful insights on level of awareness of the impact of energy use behaviour of students in tertiary institutions. The study can be used as a foundation to extend the comparison to other institutions and other countries. Also, findings from this study was adapted for the educational sector, there is a need to replicate this study in other sectors to establish the possible differences in the way

energy use behaviour affects the sectors. For instance, the prevalence of energy use behaviour of students in tertiary institutions may not be the case in the business, health and commercial and manufacturing sector.

8. LIMITATION OF THE RESEARCH

Further studies may consider a larger sample size and wider scope. It is also important to compare results of findings on level of awareness of the impact of energy use behaviour in tertiary institutions to other sectors such as the health and business sectors. This will facilitate a multi-sector comparison with implications for future developments in tertiary institutions. Findings from this study are confined to the views of students alone. Knowledge on level of awareness of the impact of energy use behaviour may be broadened by considering the views of staffs and other stakeholders in tertiary institutions. This will facilitate useful comparisons and better approach to mitigating inefficient energy use behaviour in the society.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Stern D. The Role of Energy in Economic Growth. Crawford School Centre for Climate Economics and Policy Paper. 2012;3(10):26-51. Available:<http://dx.doi.org/10.2139/ssrn.1878863>
2. Aliyu SA, Ramli TA, Saleh AM. Nigeria Electricity Crisis: Power Generation Capacity Expansion and Environmental Ramification. *Journal of Energy*, 2013;61:354-367. DOI: 10.1016/j.energy.2013.09.011
3. Perez-Lombard L, Ortiz J, Pout C. A Review on Buildings Energy Consumption Information. *Journal of Energy and Building*. 2008;40(3):394-398.
4. Oyedepo SO, Adeleke T, Leramo RO, Kilanko O, Babalola OP, Balogun AO, Akhibi MO. A Study on Energy Demand and Consumption in Covenant University, Ota, Nigeria. International Conference on African Development Issues (CU – ICADI): Renewable Energy Track. 2015: 203–211.
5. Olanipekun EA, Nunayon SS. Electricity End Use Characteristics of Public Universities in Southwestern Nigeria. *British Journal of Environmental Sciences*. 2017;5(3):30-46.
6. Bernard J. Energy Behaviour in Dutch Student Houses: An Analysis of Energy Use and Energy Time of Use in a Field Lab Setting. A Published Master's Paper Submitted to the Faculty of Wageningen University and Research; 2016.
7. Moore PH, Carswell TA, Worthy S, Nielsen R. Residential Satisfaction among College Students: Examining High-End Amenity Student Housing. *Family and Consumer Sciences Research Journal*. 2019;47(3): 260-275.
8. Galis V, Gyberg P. Energy Behaviour as a Collectif. The Case of Colonia Students' Dormitories at a Swedish University. *Journal of Energy Efficiency*. 2011;4(2):1-19. DOI:<http://dx.doi.org/10.1007/s12053-010-9087-1>
9. Chiang T, Natarajan S, Walker I. A Laboratory Test of the Efficacy of Energy Display Interface Design. *Energy and Buildings*. 2014;55:471-480.
10. Jeff V. The Effectiveness of the Colby College Electricity Competition on Promoting Electricity Conservation to Students. *Journal of Environmental and Resource Economics*. 2016;3(1).
11. Sarnadas R, Fonseca P, Paulo TJ. Intelligent Architecture for Home Appliances and energy management control. In Proceedings of the Conference on Design of Integrated Circuits and Systems; 2005.
12. Manan A, Zainuddin Lim JS. Energy Efficiency Award System in Malaysia for Energy Sustainability. *Journal of Renewable and Sustainable Energy Reviews*. 2010;14(8):2279-2289.
13. Ahmad AS, Hassan MY, Abdullah H, Rahman HA, Majid S, Bandi M. Energy Efficiency Measurements in a Malaysian Public University. IEEE International Conference on Power and Energy. 2012;564-569.
14. Al-Daraiseh A, Shah N, El-Qawasmeh E. An Intelligent Energy Management System for Educational Buildings. International

- Journal of Distributed Sensor Networks; 2013.
15. Anastasi G, Corucci F, Marcelloni F. An Intelligent System for Electrical Energy Management in Buildings. An Intelligent System for Electrical Energy Management in Buildings; 2013.
 16. Janda KB. Buildings Don't Use Energy, People Do. Conference on Passive and Low Energy Architecture. 26th Conference on Passive and Low Energy Architecture, Quebec City, Canada. 2009;54(1):15-22. DOI: 10.3763/asre.2009.0050
 17. Abrahamse W, Steg L. How do Socio-demographic and Psychological Factors Relate to House-holds' Direct and Indirect Energy Use and Savings? Journal of Economic Psychology. 2009;5(30):711–720.
 18. Kate C. Learning Energy Systems: A Holistic Approach to Low Energy Behaviour in Schools. 30th International Plea Conference, CEPT University, Ahmedabad. 2014;1-8.
 19. Khan K, Shah A, Jaffar K. Electricity Consumption Patterns: Comparative Evidence from Pakistan's Public and Private Sectors. The Lahore Journal of Economics. 2016;1:99-122.
 20. Keyur V. In-use Energy Performance Evaluation of a Student Accommodation in the UK. International Journal of Low-Carbon Technologies. 2012;9(4):268-276.
 21. Whittle C, Jones C. User Perceptions of Energy Consumption in University Buildings: A University of Sheffield Case Study. Journal of Sustainability Education. 2013;5.
 22. Adelaja AO, Damisa O, Oke SA, Ayoola AB, Ayeyemitan AO. A survey on the energy consumption and demand in a tertiary institution. International Journal of Science and Technology. 2008;2(2):331-344.
 23. Nwachukwu MU, Nnena Flora Ezedinma NF, Jiburum U. Comparative Analysis of Electricity Consumption among Residential, Commercial and Industrial Sectors of the Nigeria's Economy. Journal of Energy Technologies and Policy. 2014;4(3):714.
 24. Olatomiwa LJ, Uligwe JJ, Sadiq AA, Ambafi JG. Investigation of Electrical Energy Use Efficiency of Students' Hostel in Gidan Kwano Campus of Federal University of Technology, Minna. 3rd Biennial Engineering Conference SEET, Federal University of Technology, Minna; 2013.
 25. Al-Ammar E. Meaning and Evaluating Degree of Awareness and Behaviours of Electricity Conservation at King Saud University. International Conference on Energy Planning, Energy Saving, Environmental Education (EPESE-10), Sousse, Tunisia. 2010;1790-5096.
 26. Choong WW, Chong YF, Low ST, Mohammed AH. Implementation of Energy Management Key Practices in Malaysian Universities. International Journal of Emerging Science. 2012;2(3): 455-477.
 27. Richard, K.R. Level of Awareness of Energy Measures of Electricity Users at Universities in Kenya. International Journal of Engineering and Computer Science. 2018;7(4):23875-23882.
 28. Wai, Mohammed A, Alias B. Energy Conservation: A Conceptual Framework of Energy Awareness Development Process. 2006;58-67.
 29. Barr S, Gilg AW, Ford N. The Household Energy Gap: Examining the Divide between Habitual and Purchase - Related Conservation Behaviours. Energy Policy. 2005;11(33): 1425–1444.
 30. Emeakaroha A, Ang CS, Yan Y. Challenges in Improving Energy Efficiency in a University Campus through the Application of Persuasive Technology and Smart Sensors. Challenges. Challenges Open. 2012;3(2):290-318.
 31. Wadha A, Watkins M. An Investigation into Domestic Energy Consumption Behaviour and Public Awareness of Renewable Energy in Qatar. Journal of Sustainable Cities and Society. 2018;41:639-646.
 32. Hilai A. Determining Energy Saving Behaviour and Energy Awareness of Secondary School Students According to Socio-demographic Characteristics. Journal of Educational Research and Reviews. 2011;6(3):243-250.
 33. Ng SY. Energy Awareness and Energy Use Behaviour of Students in Malaysian Universities; 2012.
 34. Alkhayyal B, Labib W, Alsulaiman T, Abdelhadi A. Analyzing Sustainability Awareness among Higher Education Faculty Members. A Case Study in Saudi Arabia. Journal of Sustainability. 2019;11:683.
 35. Msengi I, Doe R, Wilson T, Fowler D, Wigginton C, Olorunyomi S, Banks I, Morel

- R. Assessment of Knowledge and Awareness of Sustainability Initiatives among College Students. *Journal of Renewable Energy and Environmental Sustainability*. 2019;4(6):1-11. Available: <https://doi.org/10.1051/rees/2019003>
36. Black R, Davidson P, Retra K. Facilitating Energy Saving Behaviours among University Students Residents; 2009.
 37. Angel Ancha LB, Gladman T. Action for Increasing Energy Saving Behaviour in Students Residences at Rhoda University. *International Journal of Sustainability in Higher Education*. 2018;19(4).
 38. Kamal A, Barpanda S. Factors Influencing the Energy Consumption Behaviour Pattern among the Indian Higher Education Institutions Students. *International Conference on Technological Advancements in Power and Energy*. 2017;1-6.
 39. Widen J, Molin A, Ellegard K. Models of Domestic Occupancy, Activities and Energy Use Based on Time-Use Data: Deterministic and Stochastic Approaches with Application to Various Building Related Simulations. *Journal of Building Performance Simulation*. 2012;5(1): 27-44.
 40. Wilke U, Haldi F, Scartezini Robinson D. A Bottom-up Stochastic Model to Predict Building Occupants Time Dependent Activities. *Journal of Building and Environment*. 2013;60:254-264.
 41. Yamaguchi Y, Fujimoto T, Shimoda Y. Occupant Behaviour Model for Households to Estimate High Temporal Resolution Residential Electricity Demand Profile. Paper presented at the 12th Conference of International Building Performance Simulation Association; 2011.
 42. Debby REC, Arminda MFP. Energy Saving on Campus: A Comparison of Students' Attitude and Reported Behaviours in the UK and Portugal. *Journal of Cleaner Production*. 2016;1-23.
 43. Anju K, Saswat B. Factors Influencing the Energy Consumption Behaviour Pattern among the Indian Higher Educational Institution Students. *International Conference on Technological Advancements in Power and Energy*. 2017;1-6.
 44. Anthony A, Maimunah S, Ting S, Eugene OK. Factors Affecting Higher Education Residential Students Energy Use Behaviour, Managers' Perspective. *Advance Science Letters*. 2018;24(6):4089-4095.
 45. Zhao S, Song Q, Wang C. Characterizing the Energy Saving Behaviours, Attitudes and Awareness of University Students in Macau. 2019;11.
 46. Mutai WK, Simon W, Francis K, Richard R. Level of Awareness of Energy Saving Measures of Electricity Users at Universities in Kenya. *International Journal of Engineering and Computer Science*. 2018;7(4):23875-23882.
 47. Fadare SA, Ogunyemi J. Energy Demand and Utilization in Tertiary Institutions. A Case Study of the Federal Polytechnic, Ilaro. *International Journal of Electrical Electronics and Data Communication*. 2013;1(7):1-4.
 48. Maina MB, Ngala GM, Shuwa M. Electricity Use Characteristics of Tertiary Institution in Nigeria. A Case Study Ramlat Polytechnic, Maiduguri. *International Journal of Engineering Research and Technology*. 2015;4(12): 596-600.
 49. Otegbulu AC, Egbenta I. Energy Efficient Practice among Residential Households in Lagos Nigeria, Tropical Environment. 2016;13(1):8-118.
 50. Obaju BN, Adeleke JS, Yusuf TO, Buari A, Tokede. Assessment of Energy Wastage and Saving Potentials for Higher Educational Institutional Buildings in South Western Nigeria, IOP Conference Series Earth and Environmental Science. 2019; 331:012006.
 51. Petersen JE, Vladislav S, Kathryn J, Gavin P, Kate W. Dormitory Residents Reduce Electricity Consumption when exposed to Real-Time Visual Feedback and Incentives. *International Journal of Sustainability in Higher Education*. 2007;1(8):16-33.
 52. Bekker, M., Cummin, T., Osborne, K., Bruining, A., Leland, L. Encouraging Electricity Savings in a University Residential Hall through a Combination of Feedback, Visual Prompts and Incentives. *Journal of Applied Behaviour Analysis*. 2010; 43(2): 257-278.
 53. Malan, M. An Investigation of the Impact of Information on Energy Consumption at a Tertiary Institution. Unpublished Master's Thesis, Stellenbosch University; 2014.
 54. Odom W, Pierce J, Roedl D. Social incentive and Eco-visualization Displays: Toward Persuading Greater Change in Dormitory Communities. *International*

- Journal of Sustainability in Higher Education. 2008;1:16-33.
55. Mosly I. Barriers to the Diffusion and Adoption of Green Buildings in Saudi Arabia. *Journal of Management and Sustainability*. 2015;5(4):1925-1940.
56. Brewer RS, Lee GE, Johnson PM. The Kukui Cup: A Dorm Energy Competition Focused on Sustainable Behaviour Change and Energy Literacy. *Proceedings of the 44th Hawaii International Conference on System Sciences*; 2011.
57. Courtney B. Assessing and Reducing the Electricity Consumption of Residential Students' at Worcester Polytechnic Institute. An unpublished B.Sc. thesis, Faculty of Worcester Polytechnic Institute; 2016.
58. Zografakis N, Menegaki AN, Tsagarakis PK. Effective Education for Energy Efficiency. 2008; 3226-3232. Available: www.elsevier.com/locate/enpol
59. Ishak, Zabil. Impact of Consumer Awareness and Knowledge to Consumer Effective Behaviour. *Canadian Center of Science and Education*. 2012;8(13):108-114. DOI:<http://dx.doi.org/10.5539/ass.v8n13p108>
60. Isin NS, Zakaria Z, Yasin ZM, Shariff SH. Analysis on Gender Difference in Energy Conservation Behaviour. Conference: 2018 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE); 2018.
61. Abrahamse W, Steg L, Vlek C, Rothengatter T. The Effect of Tailored Information, Goal Setting, and Tailored Feedback on Household Energy Use, Energy Related Behaviours' and Behavioural Antecedents. *Journal of Environmental Psychology*. 2007;27:265–276.
62. Corinna, F. Feedback on Household Electricity Consumption: A tool for Saving Energy. *Energy Efficiency*. 2008;1:79-104.

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