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Acquisition and use of Environmental Education in Solid Waste Management Practices

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Research Article

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ABSTRACT

Environmental issues are becoming more multifaceted and difficult to manage, and with the preponderance of pollution shifting toward problems caused by individuals and small entities, a stronger and wider public understanding of environmental management and related issues is a growing necessity. This study identifies contents of environmental education in solid waste management (Reduce, Reuse and Recycle) and assesses the recycling interests of households through a participatory assessment. Using a survey questionnaire that addressed five stages of environmental literacy; (awareness, knowledge, understanding, attitude and skills) as well as solid waste generation, disposal and management, a multistage sampling technique was adopted for data collection. The probability sampling was used to draw 1,230 respondents not less than 18 years of age in selected households from three local government areas, classified into high, medium and low density areas. A correlation test was used to determine the relationship between the knowledge of respondents about waste management and their waste management practices. Findings showed that the knowledge for employing reduction/avoidance, reuse and recycling methods was acquired at a tender age through parents, siblings or relations, and at school. Findings also showed no significant relationship between the knowledge of respondents about the content of Environmental Education (EE) and their waste management practices with a coefficient correlation of 0.107 and p: 0.552 > 0.05. Furthermore, the assessment showed that 96% of the individuals were interested in recycling. Deploying environmental education has a significant impact on waste management practices and early childhood knowledge acquisition is vital to environmental education

Keywords: Environmental education; environmental literacy; reduce; recycling; reuse; solid waste management.

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INTRODUCTION

The menace of solid waste is the most enduring of all the urbanization-induced problems in Nigeria (Agbola and Jinadu, 2006). Agbola (1996), asserted that, while most nations of the world seek innovative ways to solve their enduring and contemporary environmental problems, Nigeria seem to be overwhelmed with the sheer magnitude of its environmental problems, the most noticeable being the abysmal lack of sanitation and general unkemptness of the urban environment with heaps of uncleared refuse. This assertion still holds true even today. Glenn (2009) affirmed that improper disposal of household solid waste is a source of air, land and water pollution which creates hazards to humans and the physical environment. It is a major environmental concern to many nations especially the developing countries. In most urban areas, solid waste is indiscriminately disposed of at any available space without considering the negative impacts on the environment. This poses serious threat to human health and the environment. Improper management of solid wastes defaces the environment, spreads disease, and contaminates ground water, air and land quality (Festus and Offor, 2012). A key solution to this menace is environmental education. Environmental education in the Nigerian ambiance has very much been overlooked to a worrying point for the average environmental conscious mind (Eze, 2021).

Hungerford, and Tomera (1987) maintained that environmental education goes beyond the mere imparting of information to provide: a working knowledge of environmental issues, specific knowledge of approaches to address those issues, the ability to make appropriate decisions, and possession of certain affective qualities (attitudes) that make people care about and pay more attention to environmental conditions. Ajiboye and Ajitoni (2008) asserted that an effective environmental education should involve strategies and learning experiences that are planned, focused, experiential, participatory, anticipatory, and cumulative. They opined that all individuals should have access to learning about the environment. In essence, the goal of environmental education is environmental literacy.

The 1978 Tbilisi Declaration suggests that environmental education programmes do not only build knowledge but also attitudes and skills which people need to address environmental problems (United Nations Educational, Scientific and Cultural Organization, 1978). Sometimes, environmental education provides the knowledge and skills to take action immediately, with educational intervention programmes capable of building behavioural changes. Environmental education programmes aim to instil a stewardship ethic and promote learning, caring, and skills that will lead to future pro-environmental behaviours. Coyle (2005) affirmed that as environmental topics and problems become more complex and pervasive, decades of reliance on trained experts within the private and public sectors to handle human needs are nearing an end. In the future, many leading environmental problems, ranging from water quality, waste management to ecosystem management, will require the efforts of more skilled non-experts acting as individuals, through small business, or as community leaders.

Similarly, waste production is an inevitable by-product of human existence, consequently, its disposal is a must (Afon, 2007). The sheer magnitude of the municipal solid waste problem in Nigeria is hard to comprehend. There are not enough public waste receptacles. Municipal solid waste accumulates and overflow the receptacles. Households and businesses do not help the situation; they pile up the waste in the median of major roads and set them on open fire without

pollution control (Walling, Fosko, Geraminejad, Whitaker, and Arpey, 2004). In some parts of the municipality, waste is indiscriminately dumped around market places, homes, road sides and open land. The municipal solid waste finds its way into water ways and drainage system resulting to serious environmental problems (Peter, 2016).

In Plateau State, Nigeria, the government has attempted to solve the solid waste problem in the state by improving the operations of the existing waste management system through the engagement of tasks force on environmental sanitation, however, the effort has not yielded the desired results (Peter and Ayuba, 2014). The management of solid waste stands as the most visible environmental problem facing Jos Metropolis. It is attaining a worrisome dimension with the increased urbanization. This is reflected in the wide spread of indiscriminate dumping of solid waste across the city urban centers; on the roads, within the neighborhoods, around residential buildings and in different places within the state capital (Da'am, Wungakah, Kanma, and Bikalsoem, 2020). This underscores the importance of a competent and well-applied environmental education, able to help achieve an improved environment, better planned communities, a more vibrant economy, and even optimal human health. These are environmental education's principles and they are achievable (Hungerford *et al*. 2005).

In this study, the underpinning theory adopted for the acquisition and use of environmental education in solid waste management practices is the Theory of Reasoned Action (TRA). This theory was propounded by Ajzen and Fishbein (1980). TRA proposes a causal model of the cognitive processes leading to behavioral decisions. The Theory of Reasoned Action predicts behavior based on seven causal variables which include; behavioral intention, attitude, subjective norm, belief strength, evaluation, normative belief, and motivation to comply. The model, thus, shows that a better understanding of a behavior can be gained by tracing its determinants back to underlying factors such as intention to act and beliefs among others. Accordingly, the behavior can be influenced when sufficient number of the beliefs are changed. This presupposition gives a foundation for the use of this model in understanding variables capable of impacting an individual's waste management practices as they positively or negatively affect the environment. The content of Environmental Education (EE) in waste management is ultimately reflected in the individuals' ability to possess knowledge on the types of solid waste they generate and a knowledge of how each type of waste is managed (reduced, reused and recycled) as well as an ability to translate this knowledge into daily living.

Solid waste management knowledge acquisition starts from childhood and remains a continuous process through growth. Several media, events, circumstances, people and places contribute to the process and types of knowledge acquired. It is, thus, against this background that this study examined the learning and acquisition of EE contents in waste reduction, reuse and recycling in three local government areas of Plateau state (Jos: North, South, East). The study also assessed the recycling interest through a participatory assessment in Plateau State, Nigeria. The choice for the selected LGAs was because, Jos: North, South and East, are the major local government areas located within the state capital of Plateau State, where the waste management problem is most pervasive.
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METHOD

The study employed primary and secondary data sources. The primary sources included key informant interviews and survey questionnaire that addressed the five stages of environmental literacy; (awareness, knowledge, understanding, attitude and skills) as well as solid waste generation, disposal and management within the milieu of reduce, reuse and recycle. The outcome of the survey provided information on socioeconomic and demographic characteristics of respondents, the content of EL in solid waste management practices, waste management practices and factors responsible for such practices. Questionnaire and interviews were the major instruments employed for the data collection. The questionnaire, rated on a 5-point likert scale, ranged from "strongly agree=5" to "strongly disagree = 1". It contained sections that addressed the five stages of environmental literacy; (awareness, knowledge, understanding, attitude and skills) as well as sections on solid waste generation, disposal and management within the milieu of reduce, reuse and recycle. The interview was conducted among the directors and administrators of environmental and waste management organizations in Plateau state.

The reliability co-efficient of the instrument was 0.87. This was obtained, having administered a pre-survey questionnaire to about 20% (200) of the total sample for the study across the different residential densities (high, medium and low). The data obtained was computed and the cronbach alpha derived on the SPSS to obtain a value of 0.87. This implies that the questionnaire instrument had an 87% reliability.

Municipal solid waste management was conceptualized within the ambiance of Environmental Education (EE) using the Environmental Literacy (EL) ladder as an index of measurement. The five stages of environmental literacy are (awareness, knowledge, understanding, attitude and skills). The survey questionnaire addressed these as well as the practices involved in solid waste management within the milieu of reduce, reuse and recycle. A multistage sampling technique was adopted for data collection. The probability sampling was also employed for the selection of one participant not less than 18 years of age in sampled households. A total of 1,230 respondents were randomly selected from three LGAs (Jos North, Jos South and Jos East) classified into high, medium and low density areas.

Data obtained through the use of questionnaires were coded, entered, tested and analysed using the Statistical Package for Social Sciences software (SPSS, 22), the NVIVO and Microsoft Office applications were used for qualitative analysis. Descriptive statistics was used to generate the frequency distributions and other measures of central tendency. A correlation test was used to determine the relationship between the waste management knowledge of respondents and their waste management practices.

The study was carried out in Jos, the capital of Plateau State, Nigeria. Jos Plateau is located in Nigeria's middle belt with an area of about 26,899 square kilometers and a population of 3.5 million people. Plateau State is located between latitude 8^0 and 10^0N, longitude $10^0$and 15^0 East while Jos, the Plateau state capital, is located between 9°56′N 8°53′E. Jos has three local government areas- Jos North, South and East for ease of administration and the three LGAs were the study areas (Figure 1).

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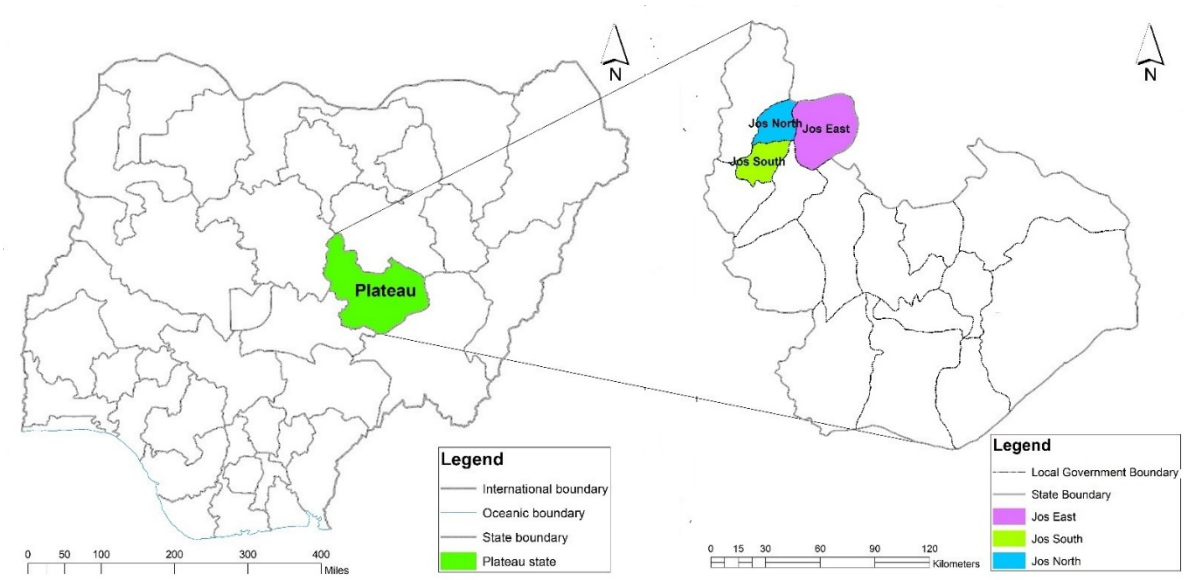

Figure 1: Plateau State in Nigeria; Jos North, Jos South and Jos East in Plateau State.
Source: Geographic Information Science Lab; University of Jos.

These were selected on the basis of their location in the state capital and the pervasiveness of waste management problems in these areas. Also, solid waste management practices in Jos Metropolis has not reached acceptable standard of orderly collection, transportation, processing, treatment and disposal. This has led to numerous social and environmental problems (Da'am, Wungakah, Kanma, and Bikalsoem, 2020). In addition, these local government areas have a representation of the entire population of the state capital (National Population Commission, 2006). This article is spatially limited to Jos North, South and East. The content is limited to the acquisition and the use of environmental education in solid waste management practices.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

Only one household was interviewed in each house and one person not below the age of eighteen (18) years. The largest cohort, constituting 489 (39.8%) persons were youths aged 25 – 34 years. This is followed by those between the age of 35 years – 44 years (21.4%), 18 years – 24 years (21.2%). This shows that over 80% of the respondents were between the age group of 18 years and 44 years. The implication of this to SWM is that there is a vast potential of human resource that can be deployed into SWM since much of the active population are in this cohort. Over half of the sampled respondents were married 54.5%, 42.7 % unmarried and 3% widowed or divorced. Findings showed that 6% households had more than 10 occupants as shown in table 1, 55% had between 1 and 5 persons, while 38.8% had 6 – 10 persons in a house. The household size plays a significant role in the type and quantity of waste solid generated. The larger the household size, the more the solid waste likely to be generated and vice versa. Furthermore, respondents had one form of education or the other save for 65 persons (5.3%) who did not have a formal education. 1.5% have vocational education while 10.6%, 42.4% and

40.3% had acquired primary, secondary and tertiary education respectively. It is expected that with this relatively high level of education, environmental literacy and knowledge on MSWM should be considerably high.

Table 1: General Demographic Characteristics of Respondents

Demographic Characteristics		Frequency	Percent
Residential Density	High	700	56.9
	Medium	370	30.1
	Low	160	13.0
	Total	**1230**	**100.0**
Gender	Male	566	46.0
	Female	664	54.0
	Total	**1230**	**100.0**
Age	18 years - 24 years	261	21.2
	25 years - 34 years	489	39.8
	35 years - 44 years	263	21.4
	45 years - 54 years	124	10.1
	55 years - 64 years	65	5.3
	65 years and above	28	2.3
	Total	**1230**	**100.0**
Marital Status	Single	525	42.7
	Married	670	54.5
	Divorced	13	1.1
	Widowed	22	1.8
	Total	**1230**	**100.0**
Educational Level	Primary	130	10.6
	Secondary	521	42.4
	Tertiary	496	40.3
	Vocational	18	1.5
	No Formal Education	65	5.3
	Total	**1230**	**100.0**
Religion	Christian	1024	83.3
	Islam	203	16.5
	Traditional	3	.2
	Total	**1230**	**100.0**
Occupation	Farming	37	3.0
	Public/Civil Service	125	10.2
	Private Company	150	12.2
	Trading/Artisan	572	46.5
	Unemployed	127	10.3
	Others	219	17.8
	Total	**1230**	**100.0**
Income	No Income	305	24.8
	Less than N20,000	508	41.3
	N21,000 - N40,000	239	19.4
	N 41,000 - N 60,000	108	8.8
	N61,000 - N80,000	29	2.4
	N81,000 - N100,000	12	1.0
	N100,000 or more	29	2.4
	Total	**1230**	**100.0**
Household Size	1 - 5 persons	679	55.2
	6 - 10 persons	477	38.8
	11 - 15 persons	47	3.8
	16 - 20 persons	20	1.6
	> 20 persons	7	.6
	Total	**1230**	**100.0**

Source: Author's Field Work (2017)

Furthermore, the main occupations of respondents include: trading, private jobs and public service. A negligible number 3% engaged in farming, reason being that the study was conducted in the municipal area. Artisans and traders constituted 46.5% of the total population, those engaged in private jobs, 12.2%, 10.2% and 10.1% respectively for those engaged in public service and the unemployed. Other details of occupational involvement are shown in table 1, including the income earned. Income levels are generally low in the study area. 24.8% of the respondents had no income, while 41.3% earned less than ₦20,000. 19.4% earned 21,000 – 40,000, 8.8% earned 41,000 – 60,0000 while less than 10% earned above 60,000. The lack of income and the low income level characterizing these areas have an impact on the quantity and the nature of waste generated. Studies of Zia, Batool, Chauhdry and Munir (2017) have established that the higher the income levels, the more the quantity of solid waste generated.

Ideal age for acquiring environmental education

Learning is continuous and cumulative over time. When the wrong knowledge is acquired in any phase of an individual's growth, such knowledge is likely to be carried on through life unless there is reorientation. The danger of such is over reaching. Many of the respondents, 70%, acquired their knowledge on waste practices and management in their childhood, only 13% did when they became teenagers and 17% as adults (Figure 2).

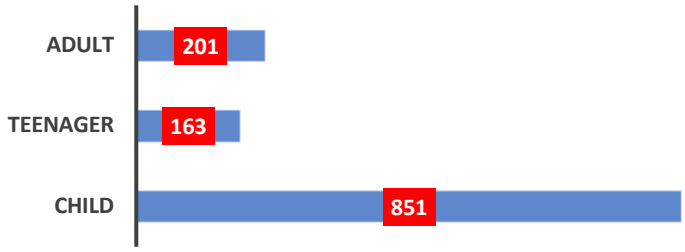

Figure 2: Stage in life when waste knowledge was acquired
Source: Author's Analysis (2017)

While research attention has been focused on parents' ability to shape the behaviour of their children (Clark, 2007), far less attention has been paid to the ways that this more traditional dynamic can be turned around with children shaping the behaviour of their parents (Akintunde, 2017). When EE is attained from an early stage, there is a great probability that the child will grow with such knowledge as admitted by 76.8% of the respondents. Several reasons given for why EE should be taught at an early age include: the children's ability to learn fast, easily and grow with such knowledge; ability to retain lots of information in their memory because at that level, they are very impressionable; ability to learn by observing and practicing what others do as well as contribute to waste management practices. Environmental education programmes aim to instil a stewardship ethic and promote learning, caring, and skills that will lead to future pro-environmental behaviours. This longer-term perspective of environmental education aims at creating a citizenry that is prepared to deal with a variety of environmental issues they will face not just at the moment but also in the future (Ardoin, Heimlich, Braus and Merrick, 2013).

The sources of environmental knowledge was first studied in details by Eyers (1976) several studies have since been conducted across the world (Hungerford and Volk, 1990; Wahab, 1996; Coyle, 2005; WEEF. 2011; Wahab. and Ogunlola. 2014). In North America and Europe, formal schooling is thought to contribute 40% or less to the environmental education of students while 60% of the environmental education knowledge and attitude held, comes from reading, talking, radio and the Television (Eyers, 1976). In modern African cities, 50% - 80% of environmental knowledge could come through formal schooling. However, in rural areas, especially where there is little formal education beyond the primary level, close to 100% of environmental knowledge and practically all attitudes come from the community (Atchia, 1982).

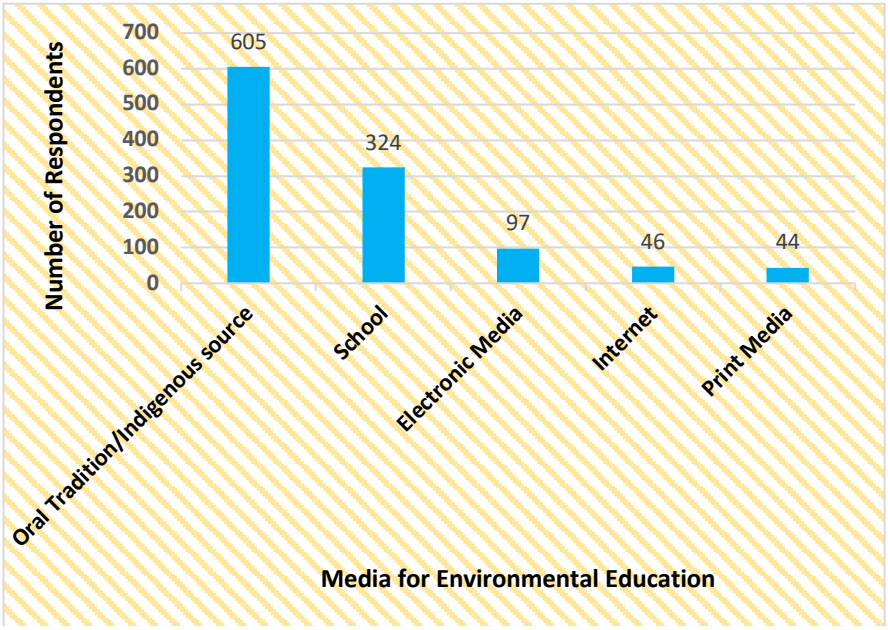

Figure 3: Major Sources of MSWM Knowledge
Source: Author's Field Work (2017)

Despite majority of respondents having at least a primary school education, over 50% indicated that they obtained their knowledge of MSWM from oral tradition or indigenous sources. These findings align with the assertions of Wahab (1996) who stated that Indigenous Knowledge (IK) is part of the people and their development. It represents a people's creativity, ingenuity, novelty, technology and skill. He stated further that IKS are timeless and capable of being adopted at any period to solve varying problems in any given society. The remaining sources are schools, and the print and electronic media as shown in figure 3. This finding is important because it will help redirect the point of information empowerment and concentration in event of intervention. So much is spent today on waste sensitization through the print and electronic media while the indigenous sources which have been proven vital are neglected. The findings show that knowledge passed down to generations have proven to be credible, strong and reliable.

Environmental education and solid waste management through waste reduction, reuse and recycling

(1) ***Reduction/Avoidance:*** Findings from the household survey indicated that the knowledge for employing reduction/avoidance method was acquired through parents, siblings or relations, at school, and experience/common sense. Majority claimed it was the current hard and biting economic situation in the country that constrained them to adopt the method(s) they were using, while others indicated that they acquired the knowledge from friends and associates, immediate community/environment, grandparents, the media and house to house campaign. Most of the respondents stated that they learnt reduction method while they were growing up. They grew into families and communities where this practice was the norm.

(2) ***Reuse:*** Findings showed that the major sources for reuse knowledge were parents, siblings or relations, at school, market/work colleagues, neighbors, and experience/common sense. Sometimes, it came in a bid to manage lean resources and finances. Cans were sold for pot making/exchange, Rusted zinc or spare parts of machines were kept for reuse, old zincs, metals and iron rods were gathered for those who bought them for bending or melting, old/spoilt television were exchanged for other items, desktop computer and cooking stoves were converted to other items. Used or spoilt pots were used to make new ones while metals were melted to make rods for building. In the words of one of the respondents,

"My wife has gathered up to 3 sacks of Aluminum cans"

Gathering such a large quantity of resiliently hardly degradable waste has preserved the quality of the environment and reduced the volume of potential waste in no small measure.

(3) ***Recycling:*** Recycling knowledge was acquired through friends and family, school, elders, neighbors and buyers of the products from the community. There were others who acquired this knowledge through personal initiative, some learnt it from waste pickers that go around collecting used and disposed metals. Some engaged in this for income generation. The level of poverty in the country brings about creativity and ingenuity. One of the findings on recycling was that buyers for recycled items played very significant roles in creating knowledge and value for such items. Respondents affirmed that they did not know such wasted items had any value until they were approached by buyers or when they saw their neighbors selling and exchanging such waste items for other valuable items. Plate 1 shows some management practices exhibited by respondents.

Plate 1: Contents of environmental education applied in solid waste management
Source: Author's Field Work (2017)

Relationship between waste management knowledge and waste management practices

To further explore the nexus between content and use of environmental education in solid waste management, a correlation analysis was used to determine the relationship between waste management knowledge of respondents and waste management practices. No significant relationship was found between the waste management knowledge of respondents and their waste management practices. The results produced a coefficient of correlation of 0.107 and p: 0.552 > 0.05, displayed in Table 2.

Table 2: Relationship between waste management knowledge and waste management practices

		Waste management practices	Waste management knowledge
Waste management practices	Pearson Correlation	1	0.107
	Sig. (2-tailed)		0.552
	N	1230	1230

Source: Author's Field Work (2017)

This indicated that, though a very negligible positive relationship existed, this relationship was not significant enough to cause such knowledge, or the lack of it, to influence waste management practices. In other words, there are other factors such as the internal and external locus of control, attitude and disposition towards solid waste management, skills, capacity for individual and group actions among others that significantly influence waste management practices. This result has been corroborated by Liu, Teng & Han, (2020) who found that good environmental knowledge alone does not necessarily translate into pro-environmental behaviors among youths. Furthermore, a good knowledge of environmental variables may not necessarily translate to good and sustainable waste management practice, and the lack of environmental knowledge or awareness may also not necessarily imply a poor waste

management practice (Hungerford and Volk, 1990; Akintunde, 2017). Environmental knowledge has been established as a behavior-distal, but necessary antecedent of pro-environmental behavior (Geiger, Geiger and Wilhelm, 2019).

Application of environmental education in solid waste management

Regarding the involvements of respondents in any of the waste management practices; reduce, reuse or recycle, those involved in waste reduction were less than those who were not, a ratio of 508:687. In waste reuse, 767 persons were involved in one form of reuse or the other more than the 428 who were not. Recycling also had smaller number of people involved than those who were not, a ratio of 528:660 (Figure 4). Attention for policy formulation should therefore be channelled towards sensitization on waste reuse and recycling.

Considering the different ways respondents practically engaged in waste reduction, reuse and recycling, respondents indicated that they were involved in waste reduction by avoiding food waste; measuring what to cook, warming left overs, buying exactly what was needed and minimizing the use of perishable food items. Furthermore, they disengaged from businesses that generated much waste, insisted on the use of computers in order to save paper, like typing directly on computers instead of writing on papers before typing. Similarly, others downloaded programmes on the internet rather than buying CDs, Some avoided breakables to avoid glass wastes, others bought reusable items, some avoided collecting nylons when they purchased items. One of the respondents in Jos East stated thus:

"*Instead of bringing purchased garri (cassava flour) home in a nylon, we go to the shop owners to consume it there"*

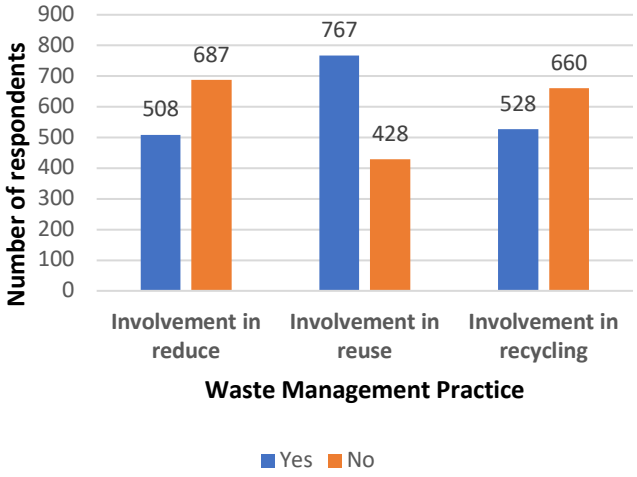

Figure 4: Waste management practices
Source: Author's Analysis (2017)

Describing ways they were involved in reuse, respondents indicated that they gathered black or any type of nylons at home to be reused; they used animal farm waste product as fertilizer on farm; burned waste to ashes and sold them; fed dogs and pigs with wasted food; gave polythene to vegetable sellers; used empty plastic bottles for drinks, oil and fuel; used polythene to make fire when cooking; used broken plastics to make fire and they gathered ashes after cooking for

washing back of pots. Furthermore, empty perfume bottles were refilled, used sacks were used to display vegetables, plastic rubbers were used for waste storage, old metals were used in patching rusted doors and windows, used papers were used as toiletries, used cartons, sacks and milk tins were used to package other items, yard trimmings and unwanted food were given to animals and used water was reused to flush toilet and wash bathroom.

Waste reduction from source was identified as one of the most effective ways of curbing municipal solid waste problems. Findings also revealed that some individuals, when buying items, occasionally thought of the outcome of the item after it had been used. Others did not care at all. Table 3 indicates that those who bought less of items and bought only what they needed constituted 57%, while 43% did not care and would not buy less of what they needed.

Table 3: Waste Reduction from Source

	Buy less of items, or only what you need		Buy reusable instead of disposable items		Buy used items instead of new ones		Buy organic food & products	
	f	%	*f*	%	*f*	%	*f*	%
Yes	690	57.0	649	54.0	291	24.4	833	69.3
No	330	27.3	293	24.4	555	46.5	270	22.5
I don't care	190	15.7	260	21.6	348	29.1	99	8.2
Total Responses	1210	100	1202	100	1194	100	1202	100

Source: Author's Field Work (2017)

Those who bought reusable items instead of disposable items were 54% while 46% of individuals did not. Many individuals expressed their aloofness at buying used items instead of new ones. Only 24.4%, 291 of the respondents were willing to buy used items like clothes, shoes, pots, plastic bottles, used sacks and nylon bags, while 46.5% would not and 28.1% did not care about this.

Recycling Participatory Assessment for Households

One way of curbing the intractable problem of municipal solid waste disposal is by encouraging waste recycling. Waste recycling will slowly but surely decrease the size of landfills, it can help keep pollution in check and decrease it gradually. Scrap metals, cans, old bottles, plastics, junk mail and used rubber tyres are becoming common features of our landfills. All of these may seem endless, but the resources required to make them are depleting rather quickly. Recycling allows junk items to be used over and over again so that new resources do not have to be exploited while at the same time, reducing the volume of waste that would otherwise be generated. Recycling conserves natural resources such as water, minerals, coal, oil, gas and timber. A global recycling rate of 30% used cans is almost equivalent to removing 30 million cars from the roads (CEF, 2017). The following section assessed the willingness of respondents in participating in waste reduction through recycling. Table 4 shows the recycling interest and participatory assessment carried out.

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Table 4: Recycling Participatory Assessment for Households

Willingness to Participate in Waste Reduction and Recycling in your community	Yes %	No %
Willingness to separate materials like plastic, paper, metals into separate bags for collection	87.1	12.9
Willingness to pay for pickup of recycling materials from your home	73.3	26.7
Willingness to participate in a program to compost food and yard waste	90.4	9.6
Willingness to participate in a program to return plastic bottles to places of purchase if paid for every plastic returned	89.4	10.6
Willingness to purchase less throwaway products (such as, plastic bottles) to help reduce the amount of garbage, if an alternative product of the same cost was provided	88.5	11.5
Request for more information about how and what types of garbage you can compost, reuse, and recycle	93.1	6.9
Willingness to carry garbage to skiff if located in community	95.6	4.4
Willingness to participate in building the skiff for community	91.5	8.5
Willingness to participate in the maintenance of skiff	89.4	10.6

Source: Author's Field Work (2017)

The assessment in Table 4 showed that if certain structures were established, recycling would be embraced and encouraged greatly. If a recycling program was set up that collected materials like plastic, paper, metals, 87% of individuals would be willing to separate these items into separate bags for collection, however, 26.7% would not be willing to pay for pickup of these recycling materials from their homes. Findings also showed that 90.4% of the respondents would be willing to participate in a program to compost food and yard waste. Likewise, 90% individuals will participate in a program to return the plastic bottles to grocery stores if they were paid for every plastic bottle returned. About 90% would be willing to purchase less throwaway products (such as, plastic bottles) to help reduce the amount of garbage to be disposed. 93.1% of respondents would appreciate more information about how and what types of garbage they can compost, reuse, and recycle in order to reduce the amount of garbage to get rid of. Overall, 96% of individuals were highly interested in recycling and only 4% were not interested. Skiffs are large open-topped waste containers designed for loading onto a special type of lorry (truck). Instead of being emptied into a garbage truck, they are very important in managing solid waste at community levels. It was observed that almost all respondents 95.6% would be willing to carry garbage to a skiff if it was located in the community, 91.5% would be willing to participate in building the skiff for the community and about the same number of individuals would be willing to participate in the maintenance of this skiff.

Recycling cuts down the number of pollutants that are released into the environment during production and disposal. Recycling conserves resources and saves energy**.** When aluminum cans are recycled, 95% of the energy required to produce those cans from raw materials is saved, energy saved from recycling one glass bottle is enough to light a bulb for four hours**.** Recycling can also bring different groups and communities together**.** Whether it is by picking up trash from the roads or collecting waste materials to raise money for schools and programmes, many simple programmes that make a community stronger can be built upon the many benefits of recycling (CEF, 2017).

Age and pro-environmental attitude

Overall, students tended to have a pro-environmental attitude (NEP global score mean = 4.23). To examine the relationship between age and NEP-score, we conducted a linear regression analysis, revealing that age is a significant predictor for NEP-score ($\beta = -0.086$, $t = -2.83$, $p < .005$, see Figure 1a). With each year that a person gets older, their NEP-score decreases by approximately 0.08 points. This variable also predicted a significant proportion of NEP-score variance in our regression model ($F(1, 168) = 7.997$, $p < 0.005$, $R^2 = 0.046$). As younger students scored higher values, they appear to have a higher pro-environmental attitude than older students.

CONCLUSION AND SUGGESTIONS

This study examined the learning and acquisition of environmental education contents in waste reduction, reuse and recycling and the extent to which they have been applied in the management of solid waste in three selected local government areas of Plateau state (Jos: North, South, East). The study also assessed the recycling interest of the respondents through a participatory assessment. Findings showed that knowledge was very important in stimulating waste management actions. This knowledge is best acquired at childhood. Furthermore, findings showed that knowledge, or the lack of it, was insufficient to influence waste management practices. In other words, there are other factors such as the internal and external locus of control, attitude and disposition towards solid waste management, skills, capacity for individual and group actions among others that significantly influence waste management practices.

Contents of environmental education (waste reduction, reuse and recycling) were evident in the waste management practices of residents. This knowledge was acquired through various media; from the homes, through the communities, experiences and formal institutions. The study affirms that environmental education, its content and its use has significant impact on waste management practices. Early childhood knowledge acquisition is vital. When empowered with quality information and required skills for action, environmental education is capable of influencing a large portion of the citizenry, transforming their knowledge into action and producing an environmentally sensitive population.

The goal of environmental education is environmental literacy. That environmental education goes beyond the mere imparting of information to providing a working knowledge of environmental issues, specific knowledge of approaches to address those issues and make appropriate decisions, and the possession of certain attitudes that predisposes people to care about and pay more attention to environmental conditions.

DECLARATIONS

Data Availability

All or part of the datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethical Approval

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors. The authors, thus, fully agree to the terms of this journal and its license.

Authors Contributions:

EAA conceived the study, guided the study design, data collection, interpretation and manuscript revision.

CAA supported the data collection, entry, and preparation of the manuscript draft.

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On behalf of all authors, the corresponding author states that there is no conflict of interest.

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ABBREVIATIONS (NOMENCLATURE)

EE	Environmental Education
EL	Environmental Literacy
TRA	Theory of Reason Action
NPC	National Population Commission
CEF	Conserve Energy Future
Sig.	Significance
n	Sample size
p-value	Probability value
r	Pearson correlation coefficient
LGA	Local Government Area
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management

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