

Solid Waste Management Knowledge Sources and Use Across Residential Densities in JOS, Nigeria: A Case for Indigenous Knowledge

by

Elijah Akintunde¹

Department of Environmental Management, Pan African University,
Institute of Life and Earth Sciences and Agriculture (PAULESI), University of Ibadan, Nigeria
Email: elyaaaak@gmail.com

Bolanle Wahab

Department of Urban and Regional Planning,
Faculty of Environmental Design and Management, University of Ibadan, Ibadan, Nigeria

Babatunde Agbola

Human Settlement Office, Research, Innovation and Engagement,
Mangosuthu University of Technology, Umlazi, Durban, South Africa

Abstract

This study identified and evaluated sources of solid waste management knowledge, its use and effectiveness in solid waste management as well as explore the relationship between the knowledge of respondents about the content of Environmental Education (EE) and their waste management practices. Primary and secondary data were used. The primary sources included key informant interviews and questionnaire survey that addressed the five stages of environmental literacy (awareness, knowledge, understanding, attitude and skills) as well as solid waste management within the framework of reduce, reuse and recycle. A total of 1,230 respondents were selected from three local government areas in the state capital. Descriptive and inferential statistics were employed in analyzing the data. The Pearson moment correlation was used in testing the relationship between the knowledge of respondents about the content of Environmental Education (EE) and their waste management practices. Findings showed a significant relationship between the knowledge of respondents about the content of Environmental Education (EE) and their waste management practices with $P: 0.030 < 0.05$. Half of the population acquired their knowledge of Municipal Solid Waste Management (MSWM) from indigenous sources with respondents from the medium density area relying more on indigenous sources (60.4%) against high and low density areas which recorded 52.6% and 46.5% respectively. The print and electronic media were least important in providing waste management knowledge to citizens in the high

¹ Correspondence author

density area. The study concludes that indigenous knowledge (IK) is unique and valid enough to provide additional knowledge to the conventional sources of environmental knowledge capable of producing a citizenry knowledgeable enough to manage solid waste and preserve the quality of the environment.

Keywords: Indigenous knowledge, environmental education, solid waste management

Introduction:

Knowledge is commonly seen as a necessary precondition for a person's behavior (Frick, Kaiser and Wilson, 2004). Environmental knowledge is vital in understanding the impact of human behaviours on the environment as well as in shaping attitude and changing behaviour for the purpose of protecting the environment (Elder, 2003; Rahman, 2016). Krosnick & Petty (1995) asserted that knowledge is a structural property of attitudes that is a function of the number of beliefs and experiences linked to the attitude in memory and the strength of the associative links between the beliefs or experiences and the attitude. Although some studies (Pooley and O'Connor, 2000; Akintunde, 2017) showed that increased level of knowledge did not significantly influence attitude and behaviour, one reason researchers have been interested in knowledge is that it has long been assumed that increases in knowledge are associated with greater influence of attitudes on behavior. Several studies have supported this assumption. For example, in assessing attitudes toward protecting the environment and measuring attitude-relevant knowledge using an open-ended knowledge listing task, it was found that attitudes based on high amounts of knowledge were more predictive of environment-related behavior than were attitudes based on low amounts of knowledge (Kallgren and Wood, 1986; Fabrigar, Petty, vSmith & Crites, 2006)

The main focus of environmental education programs has been to change environmental behavior through increasing environmental knowledge (Pooley and O'Connor, 2000). Evers (1976) first studied in details the sources of environmental knowledge. 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 (Evers, 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).

Traditional knowledge education is the avenue through which the society gradually absorbs or socializes its youths into its norms, religious beliefs and moral values as well as the collective opinions of the whole society (Callaway, 1975; Agbola and Mabawonku, 1996). Agbola (1996) conducted a study in Nigeria's largest city of Ibadan. The aim was to argue and substantiate empirically, the relevance of the indigenous knowledge systems (IKS) to solving Nigeria's environmental sanitation problems. Warren et al. (1996) defined IKS as the systematic body of knowledge acquired by local people through the accumulation of experiences, informal experiments and intimate understanding of the environment in a given culture. IKS rests on a validated assumption that an indigenous community is guided by those principles and practices which they have developed from many years of experiences and from generation to generation, often based on the oral tradition (ISDR, 2008). It could also be defined as local knowledge that is unique to a given culture or society. It is the information base for a society, which facilitates

communication and decision making (Warren et al., 1996; Makinde, 2016). This study thus seeks to identify and evaluate sources of environmental knowledge, assess indigenous knowledge and its effectiveness in solid waste management and ascertain the relationship between the knowledge of respondents about the content of Environmental Education (EE) and their waste management practices.

Methodology:

The study employed primary and secondary data. The primary sources included key informant interviews and questionnaire that addressed the five stages of environmental literacy (awareness, knowledge, understanding, attitude and skills) as well as solid waste management within the borders of reduce, reuse and recycle. The outcome of the survey provided information on socioeconomic and demographic characteristics of respondents, the content of environmental literacy (EL) in solid waste management practices, waste management practices and factors responsible for such practices. Questionnaire and interview guides were the major instruments employed for data collection. The reliability co-efficient of the instrument was 0.87.

A multistage sampling technique was adopted for data collection in the study. Firstly, Senatorial districts in the state capital were purposively selected. This was followed by the selection of the Local Government Areas within the senatorial districts and then the wards. Using the Jos Metropolitan Development Board (JMDB) 2006 data on the classification of Plateau State three residential densities were identified: high, medium and low out of which a total of 1230 respondents were drawn through a random sampling. A total of 420 respondents were selected in Jos North, and 405 respondents each from Jos South and Jos East.

Data obtained through the use of questionnaire were coded, entered, tested and analyzed using SPSS, the NVIVO and Microsoft Office 2013 applications. Descriptive statistics were used to generate the frequency distributions and other measures of central tendency. A Pearson moment correlation test was used to determine the relationship between the knowledge of respondents about the content of environmental education and their waste management practices.

Discussion:

The issue of the sources of environmental knowledge was first studied in details by Eyers in 1976. Several studies have since been conducted across the world (Hungerford and Volk, 1990; Wahab, 1996; Coyle, 2005; WEEF. 2011; Wahab B. and Ogunlola B. 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). On knowledge levels, Figure 1 indicates that over 79% of the respondents had heard of composting and 91% had heard of recycling, while 21% and 9% had never heard of these methods of waste management respectively.

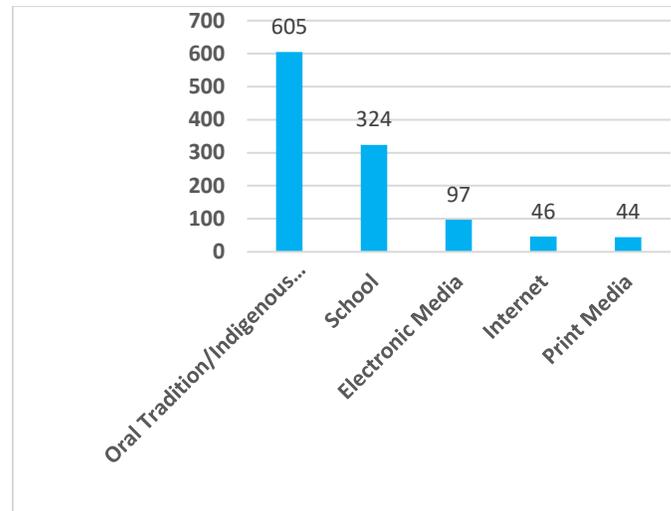


Figure 1: Major Sources of Municipal Solid Waste Management Knowledge²

Despite the 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 IK is part of the people and their development. It represents a people's creativity, ingenuity, novelty, technology and skill. He stated further that Indigenous Knowledge System (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 1. This finding is important because it could 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.

Considering municipal solid waste management knowledge across the various residential densities (Table 1), findings showed that in the three residential densities, schools and indigenous sources were the major sources of waste management information with a wide difference over the print and electronic media, the internet inclusive. In the medium density areas, 60.4% of the respondents relied on indigenous knowledge more than 52.6% and 46.5% respondents in high and low density areas respectively, who depended on the indigenous knowledge. School knowledge was most impactful in the low density area, 38.1% over high and medium density areas who recorded 29.6% and 25.2% respectively.

Across age groups, in the high density areas, those between the age cohorts of 18 – 24 years and 25 – 34 years showed a relatively higher reliance on the school sources of information, with the former depending more on this source. Respondents from 35 years and above indicated that their major sources of waste management knowledge were indigenous sources. 75% respondents within the 55 – 64 age bracket depended highest on indigenous sources of waste management knowledge in the high density area. The print and electronic media proved relatively least important in providing waste management knowledge to citizens in the high density area. This

² Source: Author's Field Work (2017)

places a demand on the reading attitude of people in these areas and the availability and quantity of waste management information in the media contents consumed in the area.

In the medium density area, across all the age groups, respondents indicated indigenous sources as their major sources of waste management knowledge. However, a relatively few number of respondents, 35%, 29% between the ages of 18 – 24 years and 25 - 34 years respectively, obtained waste management knowledge from their schools. Also notable are respondents who are older than 65 years of age. This group of respondents recorded the highest frequency of those who obtained their waste management information from the electronic media. This is not unexpected as one characteristic of citizens in the medium density areas within this age group, is how they are almost inseparable from their transistor radios which they rely upon for news and information almost throughout the day.

Table 1: Sources of Waste Management Information across Residential Densities and Age Groups³

Residential Density			Source of Information					Total
			Print Media	Electronic Media	Internet	School	Indigenous source	
High	Age Group	18 years - 24 years	3(2.3%)	11(8.3%)	8(6.0%)	56(42.1%)	55(41.4%)	133(100%)
		25 years - 34 years	10(4.0%)	26(10.4%)	11(4.4%)	88(35.2%)	115(46.0%)	250(100%)
		35 years - 44 years	9(6.4%)	10(7.1%)	6(4.3%)	32(22.7%)	84(59.6%)	141(100%)
		45 years - 54 years	4(6.3%)	6(9.5%)	2(3.2%)	7(11.1%)	44(69.8%)	63(100%)
		55 years - 64 years	1(2.8%)	4(11.1%)	0(0.0%)	4(11.1%)	27(75.0%)	36(100%)
		65 years and above	1(5.6%)	2(11.1%)	0(0.0%)	3(16.7%)	12(66.7%)	18(100%)
	Total		28(4.4%)	59(9.2%)	27(4.2%)	190(29.6%)	337(52.6%)	641(100%)
Medium	Age Group	18 years - 24 years	4(6.7%)	6(10.0%)	1(1.7%)	21(35.0%)	28(46.7%)	60(100%)
		25 years - 34 years	4(2.8%)	5(3.4%)	8(5.5%)	42(29.0%)	86(59.3%)	145(100%)
		35 years - 44 years	1(1.4%)	7(9.6%)	1(1.4%)	15(20.5%)	49(67.1%)	73(100%)
		45 years - 54 years	1(3.1%)	3(9.4%)	0(0.0%)	6(18.8%)	22(68.8%)	32(100%)
		55 years - 64 years	3(15.8%)	3(15.8%)	0(0.0%)	0(0.0%)	13(68.4%)	19(100%)
		65 years and above	0(0.0%)	1(25.0%)	0(0.0%)	0(0.0%)	3(75.0%)	4(100%)
	Total		13(3.9%)	25(7.5%)	10(3.0%)	84(25.2%)	201(60.4%)	333(100%)
Low	Age Group	18 years - 24 years	1(2.5%)	4(10.0%)	2(5.0%)	13(32.5%)	20(50.0%)	40(100%)
		25 years - 34 years	1(2.0%)	3(6.0%)	3(6.0%)	23(46.0%)	20(40.0%)	50(100%)
		35 years - 44 years	0(0.0%)	5(16.7%)	3(10.0%)	10(33.3%)	12(40.0%)	30(100%)
		45 years - 54 years	1(6.7%)	1(6.7%)	0(0.0%)	3(20.0%)	10(66.7%)	15(100%)
		55 years - 64 years	0(0.0%)	0(0.0%)	0(0.0%)	3(42.9%)	4(57.1%)	7(100%)
		65 years and above	0(0.0%)	0(0.0%)	1(50.0%)	0(0.0%)	1(50.0%)	2(100%)
	Total		3(2.1%)	13(9.0%)	9(6.3%)	52(36.1%)	67(46.5%)	144(100%)

In the low-density area, similar to the high-density areas, the major sources of waste management information were schools and the indigenous sources. Respondents between 18 and 24 years (50%), indicated indigenous sources as their major media for obtaining waste management knowledge against the 32.5% who relied on schools. On the other hand, it was a reversal for the 46% of respondents between 25 and 34 years of age, to whom the school was their highest source of waste management knowledge, closely followed by the 40% who indicated theirs was the oral tradition and indigenous source. Respondents who were between the ages of 35 and 64 years pointed out that indigenous sources proved most important in providing waste

³ Source: Author’s Field Work (2017)

management information. Worthy of note in the low-density area, is the 50% of respondents who were older than 65 years that depended on the internet for their waste management information. This is largely because these older citizens from the low-density area recorded the highest educational level and by implication readily have knowledge and access to the internet for surfing information on waste management information.

In the high-density area, findings showed the highest level of education where respondents obtained waste management information from indigenous sources was at the primary school level (75%), 53% at the secondary level and 37.2% at the tertiary level. The latter depended more (38.4%) on school sources of information than any other form and level of education. Those involved in vocational education indicated that the electronic media was the most instrumental source of WM information, while a vast majority of respondents who had no formal education (84.3%) indicated that they depended more on indigenous sources for their waste management information (Table 2).

Table 3: Sources of Waste Management Information across Residential Densities and Educational Qualifications⁴

Residential Density			where information was obtained					Total
			Print Media	Electronic Media	Internet	School	Indigenous source	
High	Educational Level	Primary	1(1.6%)	3(4.8%)	1(1.6%)	9(14.5%)	48(77.4%)	62(100%)
		Secondary	13(4.8%)	23(8.5%)	4(1.5%)	79(29.0%)	153(56.3%)	272(100%)
		Tertiary	12(5.0%)	26(10.7%)	21(8.7%)	93(38.4%)	90(37.2%)	242(100%)
		Vocational	2(14.3%)	5(35.7%)	0(0.0%)	4(28.6%)	3(21.4%)	14(100%)
		No Formal Education	0(0.0%)	2(3.9%)	1(2.0%)	5(9.8%)	43(84.3%)	51(100%)
	Total			28(4.4%)	59(9.2%)	27(4.2%)	190(29.6%)	337(52.6%)
Medium	Educational Level	Primary	2(5.4%)	0(0.0%)	0(0.0%)	3(8.1%)	32(86.5%)	37(100%)
		Secondary	7(4.5%)	8(5.2%)	2(1.3%)	27(17.5%)	110(71.4%)	154(100%)
		Tertiary	3(2.3%)	15(11.4%)	8(6.1%)	54(40.9%)	52(39.4%)	132(100%)
		Vocational	0(0.0%)	1(33.3%)	0(0.0%)	0(0.0%)	2(66.7%)	3(100%)
		No Formal Education	1(14.3%)	1(14.3%)	0(0.0%)	0(0.0%)	5(71.4%)	7(100%)
	Total			13(3.9%)	25(7.5%)	10(3.0%)	84(25.2%)	201(60.4%)
Low	Educational Level	Primary	0(0.0%)	1(7.1%)	0(0.0%)	3(21.4%)	10(71.4%)	14(100%)
		Secondary	0(0.0%)	3(7.9%)	2(5.3%)	12(31.6%)	21(55.3%)	38(100%)
		Tertiary	3(3.4%)	9(10.2%)	6(6.8%)	37(42.0%)	33(37.5%)	88(100%)
		No Formal Education	0(0.0%)	0(0.0%)	1(25.0%)	0(0.0%)	3(75.0%)	4(100%)
	Total			3(2.1%)	13(9.0%)	9(6.3%)	52(36.1%)	67(46.5%)

Furthermore, in the medium density areas, respondents who had their highest educational qualifications at the primary and secondary levels indicated that their major sources of WM information were indigenous sources (86.5% and 71.4% respectively). Similar to respondents in the high-density areas, respondents who had tertiary educational qualifications indicated that the school/ institution provided most of their waste management information. Respondents who were engaged in vocations (car and generator repairs, barbers and hair stylists) indicated that both electronic media and indigenous sources provided most of their WM information (33.3% and 66.7% respectively). Respondents who had no formal education depended on indigenous sources, print media and the electronic media, 71.4%, 14.3% and 14.3% respectively. In low density areas, 71% of those with primary school qualifications relied mainly on indigenous sources for waste management information, while those with secondary education depended more on both the

⁴ Source: Author’s Field Work (2017)

schools and indigenous source (31.6% and 56.3% respectively). Unlike residents in the high and medium density areas, tertiary degree holders in low density areas indicated that the print media, electronic media, internet, school and oral tradition all played vital roles as shown in Table 3. Respondents without formal education, like the high and medium density areas, depended most on indigenous sources (75%) for their waste management information; the remaining 25% depended on the internet. These results again reflect the assertions of Wahab (2006) that there is an urgent need to formulate a policy that would promote the integration of indigenous knowledge in the Nigerian educational system. On the basis of this, the learning contents of educational institutions should have cultural and societal reference (Titilola et al., 1994; Wahab, 1996).

Indigenous Strategies for Waste Management:

According to Wardhaugh (2000), taboo is the prohibition or avoidance in any society of behavior believed to be harmful to its members in that it would cause them anxiety, embarrassment, or shame. These taboos often provide viable indigenous strategies for managing waste. Traditional cultures and the environmental and scientific knowledge possessed and utilized is essential to the future of environmental education in Africa (Atchia, 1982). This study found a number of taboos held by the respondents that were geared towards solid waste management and preservation of the environment. Findings showed that 46% (483) of the respondents held on to such beliefs, and 54% (573) did not identify with such assertions.

Certain indigenous beliefs ancillary to municipal Solid waste management were identified. Some of them are highlighted below:

- After 6pm you cannot sweep; if a woman sweeps after that time she will give birth to (*Yan Ruwa*) a mermaid. – People are already resting after work, it will cause cough, catarrh and other infections
- When you sweep at night, your material possessions and destiny will gradually be swept away. Also, you do not sweep at night else evil spirits will pack your blessings and only spirits sweep in the night.- Maintaining and cleaning the environment should be done early in the day, when it is still visible enough to clean all nooks and crannies.
- Never walk on refuse in order not to anger the spirits since the spirits live on refuse heaps. – It is unhygienic to get carelessly in touch with refuse due to infections that could be contracted.
- Leaving dirt to sleep over night in your room makes you have bad dreams – you must sweep your surrounding every day and empty the thrash daily.
- Keeping a lot of refuse and dump will constitute a dwelling place for evil spirit- *you must empty your thrash every day.*
- If breeze blows dirt around you it is demonic omen– Do not dispose solid waste carelessly and indiscriminately
- Picking dirt with bare hands will make your hand wrinkled, rough and sometimes weak like that of an old man. - Bare hands should not have contact with dirt and waste since they could transfer some infections especially since people may not be careful enough to wash those hands before handling edibles.
- Carrying dirt with the bare hands will make you dull.- same reason as above
- If you pack dirt with your hands you would not find husband to marry- same as above

- If you sweep at night you might go blind: sanitation and cleaning the surroundings should be done early in the day where everywhere is visible and not when people are resting and relaxing in the night.
- If you sweep in the night evil spirit will enter such person (Angas bu tribe)- *same as above*
- When you sweep in the night, there will be hunger in the house (Berom)- *same as above*

Some of these indigenous beliefs were held by some respondents despite not knowing the reasons for such beliefs, as echoed by a female respondent:

“We do not sweep at night, we know it is not good and we practice it even though we know not for what reason”.

In reality, however, the reason for not sweeping at night is so as not to misplace some valuable items.

Affirming the submissions of Awoniyi (1979), no education system stands apart from the society which establishes it, be it traditional or formal. Similarly, findings from this study showed the invaluableness of indigenous knowledge, particularly in the subject of municipal waste and its management. Wahab (1996) explained that IK is extremely relevant to all human activities as it promotes the full and active participation of local people in their own affairs in all ramifications. IK can help people learn to live in harmony with nature and the entire human settlement. IK has the ability to promote greater understanding of various forces shaping the built environment, the consequences of human activities and the indigenous methods or approaches to achieve sustainable development.

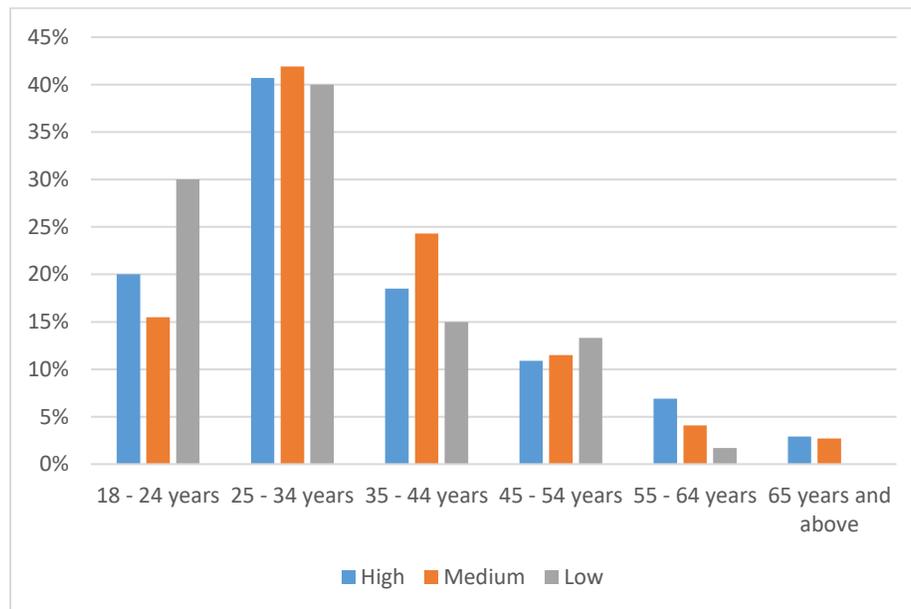


Figure 3: Taboos Geared towards MSWM across residential densities and age groups⁵

⁵ Source: Author’s Field Work (2017)

In the high-density area, findings showed that taboos and beliefs geared towards MSWM were most popular among the younger population (18 – 44 years), the age group holding the highest of such beliefs (40.7%) being those between 25 – 34 years (Figure 3). In medium density areas, trends similar to what obtains in the high density areas are observed, with 41.9% of those between 25 – 34 years being aware of some taboos and indigenous strategies for waste management. In the low density areas, such beliefs were most popular between the age groups of 18 – 44 years and 25 -34 years (30% and 40% respectively). Additional details are presented in Table 4.

Table 4: Taboos Geared towards MSWM across Residential Densities and Age Groups⁶

Residential Density			Age Group						Total
			18 - 24 years	25 - 34 years	35 - 44 years	45 - 54 years	55 - 64 years	65 years and above	
High	Existence of taboos geared towards MSWM	Yes	55(20.0%)	112(40.7%)	51(18.5%)	30(10.9%)	19(6.9%)	8(2.9%)	275(100%)
		No	89(21.7%)	155(37.8%)	96(23.4%)	39(9.5%)	18(4.4%)	13(3.2%)	410(100%)
	Total		144(21.0%)	267(39.0%)	147(21.5%)	69(10.1%)	37(5.4%)	21(3.1%)	685(100%)
Medium	Existence of taboos geared towards MSWM	Yes	23(15.5%)	62(41.9%)	36(24.3%)	17(11.5%)	6(4.1%)	4(2.7%)	148(100%)
		No	42(20.1%)	95(45.5%)	39(18.7%)	20(9.6%)	13(6.2%)	0(0.0%)	209(100%)
	Total		65(18.2%)	157(44.0%)	75(21.0%)	37(10.4%)	19(5.3%)	4(1.1%)	357(100%)
Low	Existence of taboos geared towards MSWM	Yes	18(30.0%)	24(40.0%)	9(15.0%)	8(13.3%)	1(1.7%)	0(0.0%)	60(100%)
		No	24(24.5%)	32(32.7%)	24(24.5%)	10(10.2%)	5(5.1%)	3(3.1%)	98(100%)
	Total		42(26.6%)	56(35.4%)	33(20.9%)	18(11.4%)	6(3.8%)	3(1.9%)	158(100%)

In high density areas, pro-MSWM taboos were most popular among those who had secondary school qualifications (45.8%). Those with primary and tertiary degrees equally indicated its existence among them but at a much lower frequency (10.5% and 36.7% respectively).

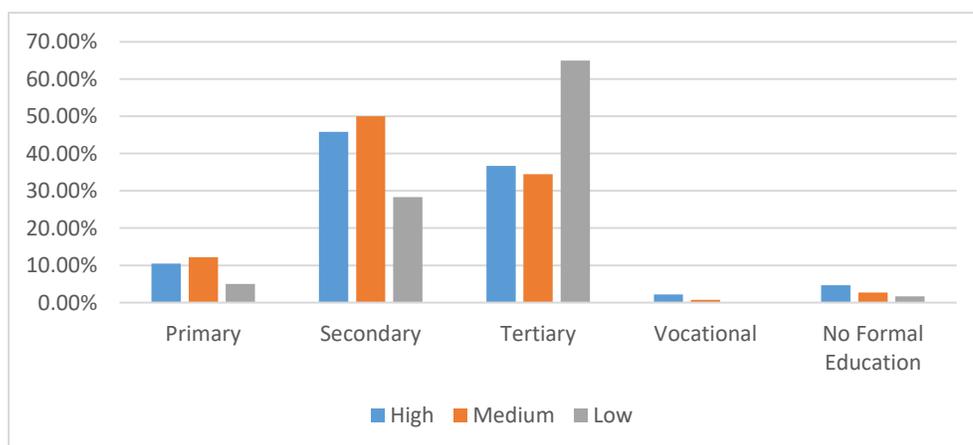


Figure 4: Taboos Geared towards MSWM across Residential Densities and Educational Status⁷

⁶ Source: Author’s Field Work (2017)

⁷ Source: Author’s Field Work (2017)

In medium density areas, results were much similar to the high-density areas. Respondents with secondary school qualifications held the highest frequency of pro MSWM taboos, then followed by those with tertiary degrees and primary school degrees (Table 4). Contrary to the findings in the high and medium densities, in the low density areas, pro-MSWM taboos and beliefs were held more by residents with tertiary education qualification (65%). This is followed by 28.3% with secondary school qualification and 5% of those with primary school qualifications. In all the three residential densities, however, taboos were not prominent among respondents involved in vocations like road side mechanics car and generator repairs, barbers and hair stylists. (Table 4). A significant relationship was found to exist between the knowledge of respondents about the content of Environmental Education and their waste management practices, despite being a low relationship, R: 0.362, the relationship proved significant with $P: 0.030 < 0.05$. This reaffirms the importance of knowledge of respondents about the content of Environmental Education (EE) in MSWM (Table 5).

Table 5: Relationship between knowledge and waste management practice⁸

		Knowledge about EE content	Waste management practice
Waste management practice	Pearson Correlation	1	.362*
	Sig. (2-tailed)		.030
	N	1230	1230

Learning is continuing and cumulative over time. If the wrong knowledge is acquired in any phase; be it as a child, teenager and adult, such knowledge is likely to be carried on through life unless there is a dis-teaching or reorientation from that wrong knowledge. 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 5).

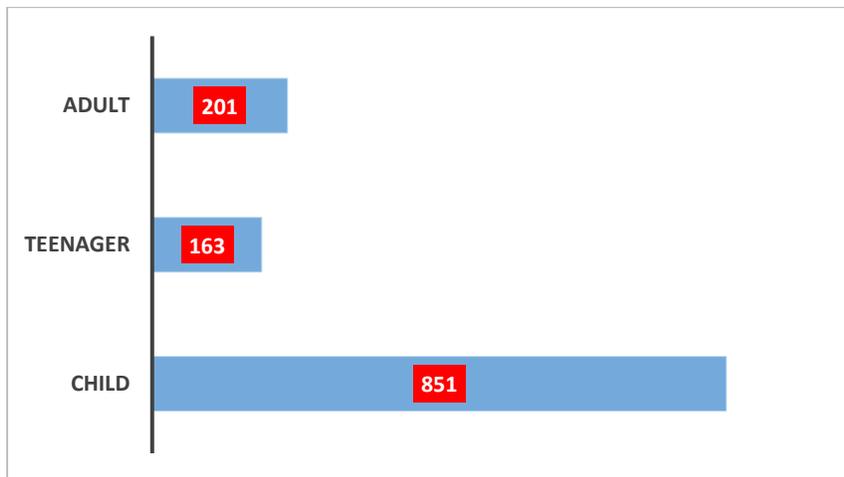


Figure 5: Stage in life when waste knowledge was acquired⁹

⁸ Source: Author’s Field Work (2017)

⁹ Source: Author’s Field Work (2017)

Conclusion:

Knowledge of EE content and its use has significant impact on waste management practices. Early childhood knowledge acquisition is vital in the waste management knowledge upheld when children become adults. The indigenous sources of waste management knowledge, if empowered with quality information, is capable of influencing a large portion of the citizenry, transforming their knowledge into action and producing an environmentally sensitive population.

Recommendations:

This study advocates for the inclusion of indigenous knowledge in environmental education. At both the primary and secondary levels, IK may not be made a separate subject, rather various IK and practice as relate to the subjects such as science, social studies, physical and health education, religious studies, literature, agriculture, family living, language, history, be taught in very simple and clear language with emphasis on local examples. At the tertiary level, apart from incorporating IK in the contents of relevant courses including General Studies (GS) courses, students should be encouraged to undertake studies and research on topics that will have IK component. Furthermore, age groups and residential densities should be duly considered in the media used for environmental education as these affect type and effectiveness of media employed. There is also a strong need to have ICT integrated into waste management process.

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References

- Agbola, T. and Mabawonku, A.O. (1996). Indigenous knowledge systems and the human settlements: Towards integration into education curriculum. In D. M. Warren, L. Egunjobi, & B. Wahab (Eds.), *Indigenous knowledge in education* (pp. 78-94). Ibadan: Indigenous Knowledge Study Group, University of Ibadan.
- Akintunde E.A. (2017). Environmental Literacy and Sustainable Solid Waste Management in Plateau State, Nigeria. An unpublished PhD Thesis submitted to the Department of Environmental Management, Pan African University, Institute of Life and Earth Sciences, University of Ibadan, Nigeria.
- Atchia M. (1982). Environmental Education in the Africa School Curriculum. In Michael Atchia. *African Curriculum organization (ACO), Environmental Education in the Africa School Curriculum*. ACO series on curriculum development. No 2 Ed.
- Coyle, K. (2005). Environmental Literacy in America What Ten Years of NEETF/Roper Research and Related Studies Say About Environmental Literacy in the U.S. The National Environmental Education & Training Foundation (NEETF)

- Eyers, V.G. (1976). Environmental Knowledge and beliefs among grade 10 students in Australia. Ph.D dissertation, Oregon State University. In Michael Atchia. *African Curriculum organization (ACO), Environmental Education in the Africa School Curriculum*. ACO series on curriculum development. No 2 Ed.
- Fabrigar, L.R., Petty, R.E., Smith, S.M., & Crites, S.L. (2006). Understanding knowledge effects on attitude-behavior consistency: the role of relevance, complexity, and amount of knowledge. *Journal of personality and social psychology*, 90 4, 556-77.
- Frick, J., Kaiser, F.G. and Wilson, M. (2004) Environmental Knowledge and Conservation Behavior: Exploring Prevalence and Structure in a Representative Sample. *Personality and Individual Differences*, 37, 1597-1613. <http://dx.doi.org/10.1016/j.paid.2004.02.015>
- Hungerford, H. & Volk T. (1990). Changing learner behaviour through environmental education, *Journal of Environmental Education*, 21(3), 8-22.
- Krosnick, J. A., & Petty, R. E. (1995). Attitude strength: An overview. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 1–24). Mahwah, NJ: Erlbaum
- Makinde, O. O. (2016). Evaluating indigenous environmental consciousness with residents of Ogbomoso in Nigeria. *Journal of Geography and Regional Planning*, 9(5), 87-103.
- Pooley, J.A., & O'Connor, M. (2000). Environmental educations and attitudes: emotion and beliefs are what is needed. *Environment and Behavior*, 32(5): pp. 711-723.
- Rahman, N.A. (2016). Knowledge, Internal, And Environmental Factors on Environmental Care Behaviour among Aboriginal Students in Malaysia. *International Journal of Environmental and Science Education*, 11(12), 5349-5366.
- Wahab, W. B. (1996). Indigenous knowledge systems and the human settlements: Towards integration into education curriculum. In D. M. Warren, L. Egunjobi, & B. Wahab (Eds.), *Indigenous knowledge in education* (pp. 63-77). Ibadan: Indigenous Knowledge Study Group, University of Ibadan.
- Wahab B. and Ogunlola B. (2014). The nature and challenges of street sweeping in Ado-Ekiti. *African Journal for the Psychological Study of Social Issues*. Vol. 17 No.3 P. 145 – 167
- Wardhaugh, R. (2000). *An Introduction to Sociolinguistics* (Third edition). Oxford: Blackwell Publishers Ltd.
- WEEF. (2011). Wisconsin's Plan to Advance Education for Environmental Literacy and Sustainability in PK-12 Schools November 2011 Wisconsin Environmental Education Foundation, Bulletin No. 02040