



# Pre-service teachers' disposition and attitude to environmental literacy in sanitation and waste management in a Nigerian university

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## Abstract

Environmentally literate teachers are indispensable to sustainably addressing the challenge of poor sanitation and waste mismanagement in less-industrialized countries. In Nigeria, efforts at stemming the trends of urban waste management problems through stringent environmental regulations of the military in the 1980s have since yielded ways to programs of information, communication and education embedded in environmental education under current civilian dispensation. This study analyzed attitudes and dispositions of 125 graduating pre-service teachers, drawn from a Nigerian public university, towards environmental sanitation and waste management within the context of environmental literacy (EL). The student-teachers were aware of the adverse effects of unsanitary practices. However, they had not embraced environmental sanitation practices as part of daily routines or a way of life. While gender and age were not found to be significantly related to pre-service teachers' EL knowledge and attitude, subject specialization correlated with knowledge just as family background did with attitude. The study concluded that the current information-sharing approach is not enough to actualize the action-oriented nature of EL and calls for curricular review to infuse environmental education (EE) concepts, activities, and methods for addressing the existing gaps in teacher education programs in Nigeria.

**Key words:** environmental literacy, environmental education, pre-service teachers, environmental sanitation, waste management

## 1. Introduction

Environmental sanitation and waste management are among the most intractable problems of urban centers in less-industrialized countries including Nigeria. Unoccupied lands, roads, waterways, house surroundings, shops and markets in towns and cities are littered with waste while heaps of waste dumps make the urban environments filthy and unsanitary (ACCP, 2019; Ferronato & Torretta, 2019; Ugwu et al., 2021; Pona et al., 2021; UNIDO, 2021; World Bank, 2018). Past efforts at curbing these and other environmentally unfriendly practices appeared ineffective, given the renewed advocacy for environmental literacy (Babalola & Olawuyi, 2021; Jannah et al., 2013; Van Katwijk et al., 2021). Teacher education is indispensable to the success of environmental literacy (EL).

The challenge of producing environmentally literate teachers dated back to the Tbilisi Conference of 1977 at which teacher education was first recognized as critical to translating the core messages of environmental education (EE) into problem-solving activities within the classrooms as well as in the communities (Bourn & Soysal, 2021; Fien & Tilbury, 1996; UNESCO-UNEP, 1990). Research in the 1980s and 1990s focused on understanding the general EE knowledge, beliefs and practices of teachers with less emphasis on the problem-solving dimensions which EL demanded and still demands (Sosu et al., 2008; Swanepoel et al., 2002). With the increasing global concerns about "Environmental Education for Sustainability" (Tilbury, 1995; Hadjichambis & Reis, 2020), there is the need for a greater attention to optimizing the EL potential of initial, beginning, prospective or pre-service teachers as "a way to future-proof teachers" (Van Katwijk et al., 2021, p. 1).

In Nigeria, as in other less-industrialized countries, competent teachers are needed to drive the environmental education goals of producing environmentally literate citizens of the 21st century; citizens who understand the dynamics of human-environment relationships and actively work for addressing the challenges arising therefrom at the community, national, regional and global levels (Hadjichambis & Reis, 2020). To effectively perform their roles as facilitators of environmental citizenship, EL teachers must be well grounded in both the theory (content) and the practice (pedagogy) of EE (Hadjichambis & Paraskeva-Hadjichambi, 2020). Therefore, Nigerian teacher education institutions (colleges and universities) should produce environmentally literate teachers who possess relevant knowledge, skills and values that predispose them to addressing the pervasive environmental problems including unsanitary practices and waste mismanagement.

In 1984, the Nigerian military government introduced a mandatory nation-wide environmental sanitation exercise on the last Saturday of every month during which there were no movements between the hours of 7a.m and 10a.m in entire country. The monthly sanitation exercise was made an integral part of the military's War Against Indiscipline (WAI) designed to address social, economic and environmental problems facing the country. By and large, Nigerians complied with the compulsory sanitation and waste management law (Decree) for as long as it was enforced by security agents. They however switched to their pollution-causing and unsanitary habits once the elements of force were removed or slackened (Ogunyemi & Ifegbesan, 2011; Babalola & Olawuyi, 2021).

The WAI approach was reviewed when Nigeria returned to civil rule in 1999. The 36 sub-national governments and the Federal Capital Territory (FCT) tried to 'democratize' the environmental sanitation and waste management processes by shifting to moral persuasion and

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behavior modification through public information, communication and education (PIEC). Environmentally-related decrees were transformed into Acts of Parliament while civil society organizations and community-based groups such as artisan guilds, youth clubs and market associations were brought into the public mobilization networks. In addition, the “compulsory monthly” exercise was stopped in some states of the federation, particularly Lagos, following court’s declaration that the policy infringed on citizens’ right to freedom of movement (Ogunyemi & Ifegbesan, 2011). With the formulation of the National Solid Waste Management Policy (FRN, 2020), governments at the federal, state and council levels are enjoined to prioritize capacity building through education in waste management. The policy declares that: “The FMEEnv (Federal Ministry of Environment) in conjunction with the Federal Ministry of Health and Federal Ministry of Education shall take steps to ensure that SWM (solid waste management) issues are sufficiently and appropriately addressed within educational curricula, particularly National University Commission (NUC), WAEC, NECO and other relevant stakeholders.” (FRN, 2020, p. 64).

Despite the efforts by successive governments, the Nigerian situation appears not to have significantly changed from when the military launched its WAI strategy to address the unsanitary environment and poor waste management practices in the 1980s. Recent reports (e.g., Bassey & Adekola, 2021; Nwankpa & Scandrett, 2020; Pona et al., 2021) support the earlier conclusion that “Nigerians needed and still need to imbibe basic environmental sanitation habits” (NEST, 1991, p. 235). The present study was predicated on the assumption that pre-service teachers are potential change agents for promoting “basic environmental sanitation habits” on a sustainable basis if well trained in environmental literacy. So far, little is known about the participation of pre-service teachers in Nigeria’s emergent PIEC approach to environmental sanitation and waste management. Consequently, this study was designed to make some contributions in this direction.

Nigeria’s journey towards integrating EE into teacher education began in the 1990s in response to its environmental management crisis and global movements in EL teacher development (Erhabor & Don, 2016; Muhammed et al., 2018; Ogunyemi & Ifegbesan, 2011). The report of a national workshop in 1996, tagged the Calabar Accord, proposed that Nigerian universities should develop an EE programme that would be housed in the Faculty/Department/Institute of Education; and that the content of any teacher education programme in EE must address four themes, namely, ecological foundations, human environment and development, environmental changes and impact as well as sustainable development (Lawal & Mohammed, 1997). Close to three decades after the Accord, less than 10 per cent of target Nigerian universities have introduced active programs in the model proposed at the 1996 workshop, and the status of environmental literacy among pre-service teachers in Nigeria remains largely unassessed (Egbonyi et al., 2020; Jekayinfa & Yusuf, 2020; Olatunde & Ogunode, 2021; Muhammed et al., 2018).

The ongoing formal, non-formal and informal efforts at promoting EE in Nigeria since Nigeria’s return to civil rule in 1999 gave another impetus for investigating the EL status of graduating teacher education students in a Nigerian university as done presently. This is with a view to assessing their knowledge and disposition towards sanitation and waste management practices for possible remediation intervention. Therefore, this study set out to answer the following questions:

1. To what extent are pre-service teachers aware/knowledgeable about environmental sanitation and waste management as a major challenge in urban Nigeria?
2. What is the general attitude of pre-service teachers towards environmental literacy as a mechanism for addressing the problem of environmental sanitation and waste management?
3. Are there significant differences in pre-service teachers’ levels of awareness, knowledge and attitude according to gender, age, subject of specialization, and parental educational background?

## 2. Literature review

To various extents, the need to respond to unnecessary, unwanted, or undesirable byproducts of human efforts at eking a living within their environment has remained a challenge from the earliest times (Chen et al. 2020; UNEP 2015; Zhang 2020). While it is on record that some forms of landfill activities were practised in ancient Greek city-states, however, it was only after the industrial revolution of the 18th century that waste generation and disposal began to receive serious attention in western societies. Before then, large cities were few and far between; making it possible for generated wastes to be buried or deposited in open spaces away from the dwelling places. This oldest form of landfill gave way to coordinated arrangements with rapid increase in the generation of household and industrial wastes during the industrial revolution. In the United Kingdom, the “Era of Sanitation” began in 1842 with the publication of *The Sanitary Condition of the Labouring Population* report of Edwin Chadwick. In 1946, the *Nuisance Removal and Disease Prevention Act* was enacted to regulate waste generation and disposal in the city of London. This was followed by the *Public Health Act* of 1875, which introduced the idea of mandatory “dust bin” for every household and the adoption of “moveable receptacle” for disposal. In the United States, the practice of modern solid waste management did not commence until the 1890s. By the 1930s, most American cities were involved in some form of solid waste management practices including incineration, landfills, and water and ocean disposal for domestic and industrial wastes (Aulston, 2010; Cooper, 2010).



Phenomenal rise in human population, advancement in technology innovation, increased industrial production and global movement of capital, as well as accelerated growth in towns and cities since the World War II have accentuated the problems of waste generation, waste collection and waste management across the globe (Singh et al., 2014; O'Neill, 2001). In the continued search for more life-enhancing ways of handling wastes, the industrially advanced societies of Europe and America have progressed from the traditional linear approach of 'take, make, and dispose' through the 3Rs of 'Reuse, Reduce and Recycle' to a high level of clean production and circular economy characterised by the 7Rs (or sometimes 8Rs) - Regulation, Reducing, Reusing, Recycling, Recovering, Rethinking and Renovation with the goal of zero pollution (El-Haggag, 2007; Kurien & Qureshi, 2018; US Department of Energy, 2019).

Nikolaou et al. (2021) reported that several theoretical approaches share relationships, similarities, and differences about circular economy and sustainability at the micro, meso, and macro-levels, especially in engineering and the sciences. So far, participation in circular economy among low- and middle-income countries (LMICs) is almost non-existent, as many of the countries still operate at the linear model of waste management (Wright et al., 2019). In the low and low-middle income countries, including Nigeria, wastes are disposed without sorting, and it is common to find illegal waste pickers at dumpsites searching for reusable and recyclable materials (Asibor & Edjere, 2017; Nyathi et al., 2018). The activities of these scavengers may superficially suggest an onset of participation in circular economy. In practical terms, however, the health risks of this practice far outweighs the supposed economic benefits to the individuals, and it exemplifies extreme cases of environmental illiteracy among the concerned citizens. This ugly trend could be reversed with an effective teacher education in environmental literacy.

Consistent with the Tbilisi Declaration, the literature presents environmentally literate citizenship as the ultimate in attaining the five-part goal of environmental education: environmental awareness, environmental knowledge, pro-environment attitude, environmental management skills, and environmental participation / behavior. In other words, an environmentally literate citizen is someone who participates in actions for improving environmental health and quality of life at the micro (household/community) and macro (national/global) levels (Jannah et al., 2013). The University of Georgia's Environmental Literacy Committee proposes a model of EL which underlines people's ability to comprehend and critically evaluate, among others, the consequences of human activity on local, regional, and global natural systems; impact of changes within natural systems of life, health, and welfare; and cultural, economic, and political forces – both past and present – that affect environmental attitudes and decision-making (Moody, Akaff, Garrison, & Gollery, 2005).

The California's Environmental Literacy Task Force (2015) defines the goal of EL as "developing the knowledge, skills, and understanding of environmental principles to analyze environmental issues and make informed decisions" (p. 11). The Task Force highlights "lived experiences", "experiential education", and "outdoor learning" as some strategies for actualizing EL to show that EL demands a disposition towards (or actually) addressing specific problems of a given people such as environmental sanitation and waste management as evident in the reports of Chileshe and Namafe (2017) in Zambia, Islam (2021) in Bangladesh, and Wu et al., 2022 in China among others.

Achieving the goals of EL/EE through formal (school/classroom-based learning), non-formal (adult literacy programs) and informal education (co-curricular, home-based, and outdoor activities), to a great extent, depends on the availability of competent and motivated teachers/facilitators. Pre-service teachers who possess functional knowledge, skills and values about human-environment interactions constitute an indispensable resource pool for this process because environmental literacy has become an "obligatory part of pre-service and in-service teacher education" (Beckford, 2008, p. 55). Therefore, Oztas and Kalipci (2009) counsel that "the design of pre-service programs should take into account the characteristics of the student population which are the outcome of their social, cultural, and physical environments" (p. 185).

Decades after the Tbilisi report, the evidence suggests that more research is needed to understand the level of pre-service teachers' involvement in the dynamics of environmental literacy (Ardoin et al., 2013; Scott, 2007). Tuncer et al. (2009) evaluated the relationship of pre-service teachers' environmental knowledge, attitude, and concerns of their interests in environmental problems in Turkey. The issues investigated included the involvement of the respondents in outdoor events and their parents' interest and involvement in environmental activities. The results showed that the environmental background of pre-service teachers was positively related to their environmental literacy and attitudes as well as gender. However, another study in Turkey by Karakaya, Avcin and Yilmaz (2017) found no significant difference in pre-service teachers' environmental attitude, behavior and perceptions in terms of gender and longest-lived place. Nevertheless, the study reported a statistically significant difference in the three environmental domains in respect of student-teachers' exposure to environmental education lessons, academic field and grade level.

The experiment of Dada, Eames and Calder (2017) concerning the impact of an environmental literacy course on preservice teachers in New Zealand, using a pretest-posttest control design, found little improvement in the post-test pre-service teachers' environmental literacy level. However, the study reported a significant increase in the participants' confidence to teach environmental education in schools and there were significant correlations between the student-teachers' environmental knowledge and their affective dispositions. On the contrary, the study by Chileshe and Namafe (2017) in Zambia identified a gap between knowledge and values, on the one hand, and behavioral action of the respondents, on the other. It was found that the respondents' professed knowledge of the benefits of living in clean and sanitary environments did not correlate with their activities in terms of environmentally-friendly behavior. Thus, the study concluded that "giving people information alone may be too limited to bring about desired environmental behaviour" (Chileshe & Namafe, 2017, p. 106).



A more recent report on sanitation and waste management attitude and behavior among 434 university students in China by Wu et al. (2022) revealed that, even though the direct effect of the students' attitude was not statistically significant, their waste management behavior was predicted by four key variables: subjective norms, perceived behavioral control, personal norms, and environmental knowledge. In addition, the study's inference that "perceived behavioral control served as a mediator between the relationship of personal norms and waste management behavior" contradicted an earlier conclusion by Muniandy and Anuara (2020) that perceived behavioral control had an insignificant effect on recycling behavior and that the attitude played a mediating role in the relationship between environmental belief and recycling behavior of academicians. Attempts to explain and/or predict the relationship between environmental knowledge and attitude vis-à-vis environmental behavior and action on sanitation and waste management by researchers in Nigeria (e.g., Ugwu, et al., 2021; Bassey & Adekoya, 2021) have equally presented mixed findings as reported in other climes. Hence, further research among Nigerian pre-service teachers is required as done presently.

The reviewed literature indicates that increasing rates of waste generation since the industrial revolution era calls for continued capacity building for improved management of wastes to support better health for the citizenry and the promotion of environmental sustainability. While it is globally acknowledged that teacher education is a potent mechanism for achieving the goal of effective environmental literacy, much of the existing reports in Nigeria and other low-income countries present mixed results about pre-service teachers' awareness, knowledge, and attitude towards environmental sanitation within the framework of environmental education. The present study was, therefore, designed to provide some useful data in clarifying this seemingly confused situation at the level of a Nigerian university.

### 3. Methodology

The study was conceived as a preliminary survey among final year students at the Faculty of Education, Olabisi Onabanjo University, Nigeria. The respondents involved 125 pre-service teachers randomly selected among a list of 780 students who were completing the bachelor's degree programme in Education at the institution by July 2022 representing about 16% of the target population. The pre-service teachers' areas of subject specialization varied from social sciences (23.2%) through sciences (20.8%), management (48.0%), educational guidance and counselling/languages (8.0%). 60% of the student-teachers were females while the remaining 40% were males. The majority (56%) of the respondents were within the 26-30 age bracket, followed by 21-25 (37.6%) and 20 and below (6.4%). About 73% of the pre-service teachers were admitted into the bachelor's degree program through the "direct" entry (that is, after initial training at lower teacher education or related academic institutions), while the remaining 30% were admitted through the University Matriculation Examination (UME) on leaving the secondary (high) school. The respondents were mostly from literate homes, with over 60% of either their fathers or mothers completing secondary education (high schools).

The instrument for data collection was a researcher-designed questionnaire titled Pre-Service Teachers' Environmental Literacy Questionnaire (PTELQ). The PTELQ has a total of 31 items divided into three broad sections. The first section focused on background data of the respondents while section two explored their awareness and knowledge on two pressing EL issues in Nigeria – environmental sanitation and waste management. The third section, with a total of 17 items, probed the respondents' attitudes and views on these issues. The first 14 items in this section adopted a five-point Likert scale model – 'Strongly Agree' (SA), 'Agree' (A), 'Undecided' (UD), 'Disagree' (D) and 'Strongly Disagree' (SD). The remaining three items were open-ended ones, which required the respondents to freely express their opinions and make suggestions on the issues at stake. A test-retest process was carried out among 30 pre-service teachers in another university, not involved in the main study, within a two-week interval. The analysis of the data obtained from the two tests, using the Pearson Product Moment Correlation (PPMC), gave a reliability coefficient ( $r$ ) of 0.81. This suggested that the instrument was strong enough for use in the study. As part of the validation process, the draft research instrument was initially given to a team of five researchers for critique in terms of expression and wording of the items. All the observations and suggestions made were used in reviewing the final version of the instrument.

The data collected were analyzed using both descriptive and inferential statistics with the aid of the Statistical Package for the Social Sciences (SPSS) version 23.0. The first research question was addressed using frequency count and simple percentage. In addition to frequency counts and percentages, the mean and standard deviation (SD) were also used for addressing research question 2. To address question 3, correlation matrix was employed.

### 4. Results and discussion

The major findings of the study are summarized in Tables 1-4 in line with the research questions.

**Research question 1:** To what extent are pre-service teachers aware/knowledgeable about environmental sanitation and waste management as a major challenge in urban Nigeria?

**Table 1: Awareness of environmental sanitation and waste management problems**

Items on Questionnaire	Response Options	F	%
How serious is the problem of environmental sanitation in Nigerian towns and cities?	Don't know	3	2.4
	Serious	49	39.2
	Very serious	73	58.4
Who should be blamed for environmental sanitation problems?	Don't know	1	0.8
	The people	8	6.4
	Government	10	8
	Both government/The people	106	84.8
How often should the residents of a community carry out environmental sanitation?	Don't know	1	0.8
	Monthly	29	23.2
	Weekly	50	40
	Daily	45	36
What is your assessment of wastes generated during the monthly sanitation exercise?	Don't know	5	4
	Poorly managed	50	40
	Fairly well managed	51	40.8
	Very well managed	19	15.2
Healthy disposal of refuse or effective waste management practice is the responsibility of	Don't know	2	1.6
	Government	15	12
	Individual people	27	21.6
	Both government/The people	81	64.8

Table 1 indicates that the pre-service teachers were highly aware of the magnitude of the environmental sanitation problem in Nigerian towns and cities. More than half (58%) of the respondents said the problem is very serious, while another 39% described the problem as serious. The pre-service teachers further demonstrated their understanding of the problem by blaming both the government and the people (84.8%) for the crisis. However, it seems that the student-teachers had not cultivated the habit of sanitation as a way of life; given that about 23% of them opted for sanitation as a monthly affair while as much as 40% believed that it should be done weekly. Less than half of the respondents saw environmental sanitation as a daily activity. Nevertheless, an overwhelming majority of the pre-service teachers (80.8%) agreed that domestic, industrial and community wastes are poorly managed in Nigeria. Again, the pre-service teachers concluded that both government and the people should be blamed for this ugly trend.

The findings on awareness and knowledge of the two EL issues among the respondents may suggest some modest success of the ongoing public education, information and communication with the return to civilian administration in the country (Ogunyemi & Ifegbesan, 2011). It appears that the PIEC earlier explained in this study is making some impact in terms of raising consciousness about environmental sanitation and waste management. This is in line with the conclusions of Dada et al. (2018) who found that environmental literacy did not only improve the confidence of pre-service teachers in New Zealand to handle the subject matter, but also reported a correlation between their environmental knowledge and affective disposition. Similar findings were also reported in a study by Wu et al. (2022) among university students in China, whereby waste management behaviour was predicted by subjective norms, perceived behaviour control, personal norms and environmental knowledge.

However, it must be noted that being aware is not enough; there is the additional need to translate awareness and understanding into action through informed and conscious choices that reflect the issues in their list of priorities (Chileshe & Namafe, 2017). This ramification gives EL its action-oriented character and those who claim to be knowledgeable must strive to solve practical problems such as sanitation and waste management. That many of the pre-service teachers did not see environmental sanitation as a daily affair in this study betrays a low disposition towards EL activism and a possible curriculum gap in their teacher education program. These twin-challenge must be expeditiously addressed to avert further degeneration of the situation.

**Research question 2:** What is the general attitude of pre-service teachers towards environmental literacy as a mechanism for addressing the problem of environmental sanitation and waste management?



**Table 2: Attitude towards environmental sanitation and waste management**

	Items on Questionnaire	SD	D	UD	A	SA	Mean*	SD
1	Sanitation is the greatest environmental problem in Nigerian towns and cities today	8 (6.4)	7 (5.6)	1 (0.8)	45 (36.0)	64 (51.2)	4.20	1.13
2	There is sanitation problem because people are not responsible	6 (4.8)	18 (14.4)	6 (4.8)	69 (55.2)	26 (20.8)	2.27	1.09
3	There is sanitation problem because people lack relevant knowledge, skills and orientation	4 (3.2)	7 (5.6)	4 (3.2)	64 (51.2)	46 (36.8)	4.12	.95
4	There is sanitation problem because there is no adequate law	2 (1.6)	20 (16.0)	3 (2.4)	52 (41.6)	48 (38.4)	2.01	1.09
5	There is sanitation problem because government is not enforcing laws and providing facilities	3 (2.4)	16 (12.8)	6 (4.8)	51 (40.8)	49 (39.2)	4.02	1.08
6	Waste management is government business	15 (12.0)	30 (24.0)	10 (8.0)	45 (36.0)	25 (20.0)	2.72	1.34
7	What people do with wastes they generate is their problem	30 (24.0)	33 (26.4)	23 (18.4)	26 (20.8)	13 (10.4)	3.33	1.32
8	Waste management is the business of everyone including the government	1 (0.8)	8 (6.4)	9 (7.2)	45 (36.0)	62 (49.6)	4.27	.91
9	A responsible citizen should play an active role in promoting a healthy and sound environment	2 (1.6)	2 (1.6)	3 (2.4)	30 (24.0)	88 (70.4)	4.60	.76
10	The teacher has great roles in promoting environmental literacy on sanitation and waste management	-	8 (6.4)	2 (1.6)	61 (48.8)	54 (43.2)	4.28	.79
11	My training as a teacher gave me good foundation in promoting environmental literacy	1 (0.8)	9 (7.2)	14 (11.2)	51 (40.8)	50 (40.0)	4.12	.92
12	Parents can promote environmental literacy better than teachers	1 (0.8)	13 (10.4)	18 (14.4)	51 (40.8)	42 (33.6)	2.04	.98
13	There is no room for environmental literacy in the school curriculum in my field of specialization	14 (11.2)	26 (20.8)	18 (14.4)	38 (30.4)	29 (23.2)	2.66	1.33
14	Environmental literacy about sanitation and waste management is a waste of time	69 (55.2)	24 (19.2)	11 (8.8)	13 (10.4)	8 (6.4)	4.06	1.28

The responses of the pre-service teachers to the attitude items, as summed up in Table 2, give further insight into their disposition towards environmental literacy. As could be gleaned from the Table, the pre-service teachers associated active participation in promoting a healthy and an ecologically balanced environment with becoming responsible citizens. They equally recognized their roles as change-agents in promoting environmental literacy with focus on sanitation and waste management. However, the respondents' claim that their teacher education program gave them sufficient foundation for promoting environmental literacy looks debatable because it is contradictory for the student-teachers to lay claim to competency in EL when their present disposition does not reflect daily practical involvement (Chileshe & Namafe 2017; Wu, Zhu & Zhai 2022). It is noteworthy, however, that the pre-service teachers acknowledged that there were gaps for environmental literacy in existing school curricula (including teacher education) and that EL is not a waste of time. This corroborates earlier reports that called for prioritization of teacher education to drive home the practical nature of EL (Tilbury, 1995; Ogunyemi, 2005; Van Katwijk et al., 2021).

**Research question 3:** Are there significant differences in pre-service teachers' levels of awareness, knowledge and attitude according to gender, age, subject of specialization, and parental educational background?

**Table 3: Correlation among variables of pre-service teachers' environmental literacy, knowledge and attitudes**

	1	2	3	4	5	6	7	8
1. Mode of entry	1							
2. Gender	-0.088	1						
3. Age	-0.025	-.085	1					
4. Subject of specialization	-.113	.042	.122	1				
5. Father's educational background	-.075	.297(**)	-.049	.043	1			
6. Mother's educational background	.023	.164	.053	.060	.822(**)	1		
7. Knowledge	-.052	-.032	.112	.204(*)	.055	.096	1	
8. Attitudes	-.102	.112	.109	.144	.250(**)	.196(*)	.255(**)	1

(Note: \*Significant at .05 one-tail; \*\*Significant at .05 two-tail)





The third research question was addressed using the data provided in Table 3. The Table reveals that the pre-service teachers' attitudes correlated with parental educational background and knowledge. This implies that the higher the educational background of pre-service teachers' parents, the more likely they would be favorably disposed to adopting a lifestyle that supports EL. From this finding, it could be inferred that those who were favorably disposed to promoting EL were also likely to be more knowledgeable about EL issues in view of the intricate relationship between attitude and knowledge, which is in line with Wu, et al. (2022) findings. Viewed from the perspective of the theory of planned behaviour (TPB), people tend to change their behavior when they fully appreciate the need for it. At the same time, a positive disposition could also yield a further desirable result of wanting to learn more about the environmental phenomena of interest (Islam, 2021; Muniandy & Anuar, 2020). What this suggests therefore is that there are prospects for effective environmental literacy among the pre-service teachers if their current attitudes and family variables are leveraged upon.

Another significant finding from Table 3 is that there was correlation between pre-service teachers' awareness/knowledge and their areas of specialization; those in the social sciences appeared most conscious of the enormity of the environmental sanitation and waste management challenge, followed by those in sciences, educational guidance and counselling/languages and management sciences in that order. Earlier studies (e.g., Jekayinfa & Yusuf, 2020; Ogunyemi & Ifegbesan, 2011) had indicated that environmental education themes (including sanitation and waste management) are more prevalent in the sciences and social sciences-related fields. However, it remains a puzzle that even students in these fields did not demonstrate a high level of interest in practically addressing the problem contrary to the earlier conclusion of Erhabor and Don (2016) that "environmental literate students especially in tertiary institutions are being nurtured to foster EE in Nigeria." (p. 5367). Hence, further studies are needed to fully explain the relationship between subject specialization and participation in environmental sanitation-related activities as thrown up in this study.

## 5. Conclusion and recommendations

The first conclusion of this study is that creating awareness about environmental problems is not enough to prepare student-teachers as change-agents at the community level. The gap between pre-service teachers' awareness/knowledge of the problem vis-à-vis participating in addressing the challenge of poor sanitation and waste mismanagement calls for practical field experiences, such as volunteering in pro-environmental activities, to inculcate relevant behavior and practices. Therefore, apart from integrating environmental education in teacher education curricula as proposed in the Calabar Accord of 1996, field activities are urgently needed to make the teaching and learning of environmental education less theoretical at the Olabisi Onabanjo University and other Nigerian universities which are currently in the similar situation.

Another conclusion from this study is that the challenge of environmental sanitation and waste management exemplifies the slogan: 'Think globally, but act locally'. While awaiting the development of the Benchmark Minimum Academic Standard (BMAS) on EE by Nigeria's National Universities Commission (NUC) as envisaged by the National Solid Waste Management Policy (FRN, 2020), University Senates/Academic Boards of teacher education institutions should seize the initiative by infusing relevant EL elements and activities in their respective institution-wide General Studies (GES) courses in line with some previous recommendations (e.g., Ofodum & Okere, 2016; Ogunyemi & Ifegbesan, 2011). It is believed that, when taught using indoor and outdoor approaches, the EE/EL elements could improve the attitude and behavior of pre-service teachers towards addressing local and national environmental problems such as sanitation and waste management.

The seeming unpreparedness to embrace sanitation as a way of life by pre-service teachers in this study reflects the limited success, if not failure, of the public information, education and communication model of the current civilian government in Nigeria. Therefore, efforts should be intensified to fully implement the policy on waste management (FRN, 2020) especially its formal, non-formal and informal education components at all levels. For a more sustainable impact, experiential learning strategies (site visits, service-learning, etc.) should be emphasized to make the target beneficiaries appreciate the necessity of their participation in solving the sanitation and waste problem which has become a major national crisis. It is envisaged that increased mobilization and participation of civil society organizations would be helpful in achieving the goals of the SWM policy.

Finally, as could be gleaned from responses to the open-ended questions in the research instrument, the pre-service teachers expressed interest in learning more about recycling, circular economy, green economy, population growth, government policies of the environment, climate change, public and private partnership (PPP) in waste management, forest resource conservation, and environmental sustainability. Apart from confirming the needs and gaps in their training program, the issues raised by the pre-service teachers in this preliminary survey are fertile grounds for teacher education curriculum review and imperative innovation by emergent sustainability challenges at the local and global levels.



## References:

- ACCP (2019). Africa solid waste data management book 2019. Japan: African Clean Cities Platform Secretariat.
- Ardoin, N.M., Clark, C., & Kelsey, E. (2013). An exploration of future trends in environmental education research. *Environmental Education Research, 19* (4), 499-520. doi: 10.1080/13504622.2012.709823
- Asibor, I.G. & Edjere O. (2017). Assessment of the activities of scavengers and their economic impacts in waste recovery in Warri metropolis, Delta State Nigeria. *International Research Journal of Public and Environmental Health, 4*(2), 22-29.
- Aulston, N. J. (2010). *United States waste management*. United States of America: Urban Planning 260.
- Babalola, A. & Olawuyi, D.S. (2021). Advancing environmental education for sustainable development in higher education in Nigeria: Current challenges and future directions. *Sustainability, 13*(19), 10808; <https://doi.org/10.3390/su131910808>.
- Bassey, R.E. & Adekola, G. (2021). Assessment of the influence of environmental adult education on solid waste management in South-South federal universities, Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS), 5*(12). Retrieved 28 January, 2022 from <https://www.rsisinternational.org/virtual-library/papers/assessment-of-the-influence-of-environmental-adult-education-on-solid-waste-management-in-south-south-federal-universities-nigeria/>
- Beckford, C. (2008). Re-orienting environmental education in teacher education programs in Ontario. *Journal of Teaching and Learning, 5*(1), 55-66.
- Bourn, D. & Soysal, N. (2021). Transformative learning and pedagogical approaches in education for sustainable development: Are initial teacher education programmes in England and Turkey ready for creating agents of change for sustainability? *Sustainability, 13*, 8973. doi:10.3390/su13168973
- Chen, D. M-C., Bodirsky, B. L., Krueger, T., Mishra, A., & Popp, A. (2020). The world's growing municipal solid waste: Trends and impacts. *Environmental Research Letters, 15*(07), article 4021. doi:10.1088/1748-9326/ab8659
- Chileshe, B. & Namafe, C.M. (2017). Applying Ajzen's theory of planned behaviour to the 'Keep Zambia Clean and Healthy' programme. *International Journal of Humanities Social Sciences and Education (IJHSSE), 4*, (5) 106-115.
- Cooper, T. (2010). Recycling modernity: Waste and environmental history. *History Compass, 8* (9), 1114-1125.
- Dada, D.O., Eames, C. & Calder, N. (2018). Impact of environmental education on beginning preservice teachers' environmental literacy. *Australian Journal of Environmental Education, 33*(3), 201-222. doi 10.1017/ae.2017.27.
- Egbonyi, E.E., Enu, D.B., & Omoogun, A.C. (2020). Green policy awareness and secondary school teachers' perception of interdisciplinary approach to teaching environmental education in Cross River State, Nigeria. *Interdisciplinary Journal of Environmental and Science Education, 16*(1), 1-5.
- El-Haggag, S.M. (2007). *Sustainable Industrial Design and Waste Management Cradle-to-cradle for Sustainable Development*. USA & UK: Elsevier Academic Press.
- Environmental Literacy Task Force. (2015). A blueprint for environmental literacy. A Report by State Superintendent of Public Instruction Tom Torlakson's Environmental Literacy Task Force – 2015. Retrieved 28 January 2022 from <https://www.cde.ca.gov/pd/ca/sc/documents/envronliteracyblueprint.pdf>
- Erhabor, N.I. & Don, J.U. (2016). Impact of environmental education on the knowledge and attitude of students towards the environment. *International Journal of Environmental & Science Education, 11*(12), 5367-5375.
- Fien, J. & Tilbury, D. (1996). Learning for a sustainable environment: An agenda for teacher education in Asia and the Pacific. UNESCO: Bangkok.
- Ferronato, N. & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. *International Journal Environmental Research and Public Health, 16*, 1-28; 1060. doi:10.3390/ijerph16061060.
- FRN (2020). *National policy on solid waste management*. Abuja: Federal Republic of Nigeria.
- Goldman, D., Hansmann, R., Činčera, J., Radović, V., Telešienė, A., Balžekienė, A. & Vávra, J. (2020). Education for environmental citizenship:





- the pedagogical approach. In A.C. Hadjichambis, P.Reis, D. Paraskeva-Hadjichambi, J. Činčera, J. Boeve-de Pauw, N. Gericke, & M.-C. Knippels (Eds.). *Conceptualizing environmental citizenship for 21st century education, environmental discourses in science education*, pp.115-138. Switzerland: Springer Open.
- Hadjichambis, A.C. & Reis, P. (2020). Introduction to the conceptualisation of environmental citizenship for twenty-first-century education. In A.C. Hadjichambis, P.Reis, D. Paraskeva-Hadjichambi, J. Činčera, J. Boeve-de Pauw, N. Gericke, & M.-C. Knippels (Eds.). *Conceptualizing environmental citizenship for 21st century education, environmental discourses in science education*, pp. 1-16. Switzerland: Springer Open.
- Islam, M.T. (2021). The role of theory of planned behavior (TPB) explaining recycling behavior: An emerging market perspective. *European Journal of Business and Management Research*, 6 (1), 51-56.
- Jannah, M., Halim, L., Meerah, T.S.M., & Fairuz, M. (2013). Impact of environmental education kit on students' environmental literacy. *Asian Social Science*, 9(12), 1, 1195-1215. doi:10.5539/ass.v9n12p1
- Jekayinfa, A.A. & Yusuf, A.R. (2020). Teachers' opinions on the incorporation of environmental education in the Nigerian primary school curriculum. *International Journal of Education Research and Reviews*, 8(8), 1-5.
- Karakaya, F., Avgin, S. S., & Yilmaz, M. (2017). Environmental literacy dimensions of pre-service teachers. *Üniversitepark Bültlen*, 6(1), 95-108.
- Kaza, S., Yao, L., Bhada-Tata, P., Van Woerden, F. (2018). What a waste 2.0: A global snapshot of solid waste management to 2050. Washington, D. C.: International Bank for Reconstruction and Development / The World Bank. Retrieved from <https://doi.org/10.1596/978-1-4648-1329-0>
- Kurien G. P. & Qureshi, M.N. (2018). House of sustainable waste management: an implementation framework. *International Journal of Sustainable Manufacturing*, 4(1), 79-96.
- Lawal, M.B. & Mohammed, A.A. (Ed.) (1997). *Popularising environmental education in Nigerian universities*. Lagos: Nigerian Conservation Foundation.
- Moody, G., Akaff, H., Garrison, D. & Gollery, F. (2005). Assessing the environmental literacy requirement at the University of Georgia. *The Journal of Environmental Education*, 36(4), 3-9.
- Muhammed, S.N., Abdullahi, I.K., Bello, N.I., & Abdullahi, A.S. (2018). The need for implementation of environmental education in Nigeria - A review. *Dutse Journal of Pure and Applied Sciences*, 4(1), 280-288.
- Muniandy, G. & Anuar, M.M. (2020). Determinants of academicians recycling behaviour. *Management Science Letters*, 10, 1597-1606.
- NEST. (1991). *Nigeria's threatened environment: A national profile*. Ibadan: Nigerian Environmental Study/Action Team. Ibadan, Nigeria.
- Nikolaou, I.E., Jones, N., & Stefanakis, A. (2021). Circular economy and sustainability: The past, the present and the future directions. *Circular Economy and Sustainability*, 1, 1-20. doi:10.1007/s43615-021-00030-3
- Nwankpa, S. & Scandrett, E. (2020). History and contexts of municipal solid waste management in Aba – Recounting the stories of residents. *Journal of Environment and Earth Science*, 10(9), 61-74.
- Nyathi, S., Olowoyo, J. O., & Oludare, A. (2018). Perception of scavengers and occupational health hazards associated with scavenging from a waste dumpsite in Pretoria, South Africa. *Hindawi: Journal of Environmental and Public Health*, 1-7 doi:10.1155/2018/9458156.
- Ofodum, C.M. & Okere, K.J. (2016). Environmental education: A sine-qua-non for building a sustainable future through General Studies in tertiary institutions. Mgbakoigba, *Journal of African Studies*, 6(1), 1-14.
- Ogunyemi, B. (2005). Mainstreaming sustainable development into African school curricula: Issues for Nigeria. *Current Issues in Comparative Education*, 7(2), 94-113.
- Ogunyemi, B. & Ifegbesan, A. (2011). Environmental literacy among preservice social studies teachers: A review of the Nigerian experience. *Applied Environmental Education and Communication*, 10(1), 7-19.
- Olatunde, A. & Ogunode, N.J. (2021). Shortage of professional science and environmental education teachers in Nigeria. *Asian Journal of Science Education*, 3(1), 1-11.



- O'Neill, K. (2001). The changing nature of global waste management for the 21st century: A mixed blessing? *Global Environmental Politics*, 1(1), 77-98.
- Oztaş, F. & Kalıpçı, E. (2009). Teacher candidates' perception level of environmental pollutant and their risk factors. *International Journal of Environmental & Science Education*, 4(2), 185-195.
- Pona, H.T., Xiaoli, D., Ayantobo, O.O., Tetteh N.D. (2021). Environmental health situation in Nigeria: Current status and future needs. *Heliyon*, 7, March. Retrieved 12 February, 2022 from <https://www.sciencedirect.com/science/article/pii/S2405844021004357>
- Scott W. (2007). Environmental Education Research: Thirty years on from Tbilisi. Keynote Address to the 4<sup>th</sup> World Environmental Education Congress, Durban, Retrieved 16 January 2022 from <http://www.bath.ac.uk/cree/resources/scottweec2007.pdf>
- Singh, J., Laurenti, R., Sinha, R. & Frostell, B. (2014). Progress and challenges to the global waste management system. *Waste Management & Research*, 32(9), 800-812.
- Sosu, E.M., McWilliam, A., & Gray, D.S. (2008). The complexities of teachers' commitment to environmental education: A mixed methods approach. *Journal of Mixed Methods Research*, 2(2), 169-189.
- Swanepoel, C.H., Loubser, C.P., & Chacko, C.P.C. (2002). Measuring the environmental literacy of teachers. *South African Journal of Education*, 22(4), 282 - 285.
- Tilbury, D. (1995). Environmental education for sustainability: Defining the new focus environmental education in the 1990s. *Environmental Education Research*, 1(2), 195-212.
- Tuncer, G., Tekkaya, C., Sungur, S., Cakiroglu, J., Ertepinar, H., & Kaplowitz, M. (2009). Assessing pre-service teachers' environmental literacy in Turkey as a mean to develop teacher education programs. *International Journal of Educational Development*, 29, 426-436.
- Ugwu, C.O., Ozoegwu, C.G, Ozor, P.A., Agwu, N., & Mbohwa, C. (2021). Waste reduction and utilization strategies to improve municipal solid waste management on Nigerian campuses. *Fuel Communications* 9, 100025. Retrieved on 28 January 2022 from [www.sciencedirect.com/journal/fuel-communications](http://www.sciencedirect.com/journal/fuel-communications)
- UNEP (2015). Global waste management outlook. Nairobi & Vienna: United Nations Environmental Programme & International Solid Waste Association.
- UNESCO-UNEP (1990). Environmentally educated teachers: The priority of priorities? CONNECT: UNESCO-UNEP ENVIRONMENTAL EDUCATION NEWSLETTER, XV, 1, March. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000153574>
- UNIDO (2021). Study on Plastics Value-Chain in Nigeria Under the Project "Study On Available Sustainable Alternative Materials to Plastics and Innovative Packaging and Recycling Technologies that Meet Market Needs in Africa to Reduce Plastics Leakages to the Environment". United Nations Industrial Development Organisation (UNIDO). Retrieved from <https://open.unido.org/projects/M2/projects/190137>
- US Department of Energy (2019). Waste-to-energy from municipal solid waste. USA: Office of Energy Efficiency and Renewable Energy.
- Van Katwijk, L., Jansen, E., & Van Veen, K. (2021): Pre-service teacher research: A way to future-proof teachers? *European Journal of Teacher Education*. doi: 10.1080/02619768.2021.1928070
- Wright, C.Y., Godfrey, L., Armiento, G., Haywood, L.K., Roula Inglesi-Lotz, R., Lyne, K. & Schwerdtle, P.N. (2019). Circular economy and environmental health in low- and middle-income countries. *Globalization and Health*, 15(65), 1-5.
- Wu, L., Zhu, Y., & Zhai, J. (2022). Understanding waste management behavior among university students in China: Environmental knowledge, personal norms, and the theory of planned behavior. *Frontiers in Psychology*, 12, article 771723. doi: 10.3389/fpsyg.2021.771723
- Zhang, T. (2020). *Landfill earth: A global perspective on the waste problem*. Master Thesis. Universitat de Barcelona.