

## Research Article

# Impact of Environmental Education on the Knowledge and Attitude of University of Benin Students towards Waste Segregation

Norris Igbinosa Erhabor<sup>1</sup>

1. University of Benin, Nigeria

The aim of this study was to determine the impact of environmental education on the knowledge and attitude of students from the Health, Safety and Environmental Education (HSE) and Human Kinetics Departments of the Faculty of Education, University of Benin, Benin City. The quasi-experimental research design was adopted for the study. The simple random sampling technique was used, and a sample size of 200 respondents was selected, with 100 respondents each from both the HSE and HKS departments, which made up the experimental group and control group of the study respectively. Data obtained for the study through a validated instrument were subjected to analytical tools such as frequency and percentage tables, and the t-test for testing the null hypothesis (Ho) at a 0.05 level of significance, on the relationship between environmental education and knowledge and practice of waste segregation in solid waste management between the two study groups.

Findings from the study show that there is a significant difference in knowledge and attitude towards waste segregation among students exposed to environmental education, compared to those not treated or exposed to the same, hence emphasising the impact and relevance of environmental education to waste segregation practices. Segregation was found to be an essential part of waste management, and involves the collection of wastes in different types/colours of bins or bags, sorting according to the different material components and separating wastes into useful and useless items at the point of collection. The benefits include a clean and healthy environment, conversion of disposed materials to reusable items, and management of solid waste.

## Introduction

Municipal waste is becoming a worsening issue, and the global annual municipal waste generation is expected to rise from the current 2.01 billion to 3.40 billion tons by 2050. However, at least 33 percent of that is not currently managed in an environmentally safe manner (Kaza; Yao, Bhada-Tata; Van- Woerden, 2018). Both developed and developing countries have taken measures to improve management by segregating and possibly recycling materials, saving land used in landfills, and improving environmental hygiene. Measures adopted include the provision of infrastructure, and other technological and social measures to reduce generation, facilitate segregation and minimisation. Both voluntary and mandatory separation of waste at source has been found to be effective, on different scales, at promoting management, recycling, and utilisation of wastes (Pires, 2011).

Well-organised waste management is an essential part of sustainable development. The saving of resources and energy is everyone's concern, and environmental education is vital to guarantee a sustainable lifestyle in the long run. Effective and efficient waste management is an essential part of sustainable development (Morrissey & Browne, 2004). On a global scale, a range of strategies to deal with waste are suggested and in use (European Commission (EC), 2011; Pires, 2011). On the societal level, education, especially regarding knowledge and awareness about environmental waste matters, is vital to help achieve a more sustainable lifestyle in the long run.

Solid waste management, as a core environmental health function, has persistently caused challenges to many policymakers, professionals, and societies in developing countries, including Nigeria. Several factors have been attributed to this menace of public health importance. These include factors such as inadequate involvement of trained professionals such as environmental scientists/educators, environmental health officers, and environmental engineers in the process, human attitudes towards solid waste management, poor funding of solid waste management programmes, inadequately trained personnel, lack of political will on the part of policymakers, and apathy of trained professionals (Amadi, 2011).

Waste segregation is the process by which waste is separated into different elements. Waste segregation can occur manually at the household and collected through curbside collection schemes, or be automatically separated in materials recovery facilities or mechanical biological treatment systems. Hand sorting was the first method used in the history of waste segregation (Lemann, 2008).

Waste segregation also implies the grouping of waste into different categories, where they can be recovered, recycled, and reused.

Adequate knowledge and awareness of waste segregation is an essential ingredient in the successful management of municipal wastes. Ovoh (2015) is of the opinion that a certain level of environmental education is an indispensable prerequisite towards the building and development of sufficient awareness on the relevance of segregation for appropriate municipal waste management among students of higher institutions.

On a societal level, education about environmental waste matters is vital to help achieve a more sustainable lifestyle in the long run. The tertiary level of education is essential for education in general and environmental education in particular (Farmer, Knapp, & Bontoon 2007). The knowledge and attitudes of students towards waste management, especially solid waste, are judged to be dependent on the level of environmental education accessible to them. To achieve substantial and sustainable levels of separation of municipal waste, it is essential to engage students, as they are important drivers of change and will have a major influence on the future of the world (Liao & Lui, 2019).

Nigeria, as a developing nation, has put in a lot of effort aimed at managing solid waste. For instance, Environmental Education has become a very vital aspect of tertiary education across higher institutions of learning. However, the question is whether the content of the National Minimum Standards offered to the students of these institutions adequately equips them with the knowledge and the right attitudes to effectively carry out the teaching and learning of environmental concepts, such as solid waste management processes segregation? (Malakahmad, & Nasir, 2010).

Human behaviour is complex and humans will change their behaviours when sufficiently enlightened. Waste segregation behaviour can be defined as the behaviour of separating waste according to the waste type in order to reduce the contamination of wastes which have potential value for recycling (Malakahmad, & Nasir, 2010). In the present context, efforts towards fostering waste segregation knowledge can be described as the component that is likely to encourage people to segregate their wastes and thus foster their waste segregation attitudes.

Babayemi (2010) is of the opinion that education is a major factor in making young people aware of environmental problems, particularly their knowledge and attitudes towards solid waste management activities such as segregation and its importance, and should be a vital part of their learning process. Hence, the knowledge gained from environmental education should be a major influence on attitudes

and behaviour towards environmental problems such as waste management and the relevance of segregation in the entire process.

Students with adequate environmental knowledge and attitudes should be examined in order to understand their behaviour and how to encourage waste separation and recycling at waste generating sources. Most recyclers are more likely to get one or more sources of information, for example, friends, newspapers, television, etc. Various sources of recycling knowledge coming from public education and information through public campaigns are expected to show a positive correlation with the recycling rate (Nixon & Saphores, 2009).

In relation to this present study, Arora and Agarwal (2011) conducted a study targeting students of a selected hostel in Rajasthan University. The study focused on the variables comprising waste management knowledge, attitude, and practices. The findings indicated low knowledge, less favourable attitudes, and moderate practices; there was no correlation between knowledge and attitude, but a substantial correlation was found between practice and knowledge. Another study by Karout and Altuwaijri (2012) on waste product management and disposal revealed extensive knowledge about diseases and health risks associated with waste accumulation among the group that attended the training and education programmes. They demonstrated a positive attitude towards managing waste and improved waste handling practices, which included recycling household waste.

Attitude refers to the ways in which one thinks or feels about something or someone; it is a feeling or way of thinking that affects a person's behaviour towards their feelings about recycling, as well as any preconceived ideas they may have towards it. According to nationwide studies in developing countries, many community members have a poor attitude towards solid waste management (Kagwala, 2016). In a study by Chin-Chance (2007), households were asked what they thought about solid waste separation in their homes. Forty percent said it was a good idea, while 60% did not support it because they considered it time-wasting and a dirty job, and therefore, believed it should be done at the collection points or at the landfill. The environmental attitude of young people appears to be crucial as they ultimately play a direct role in providing knowledge-based solutions to incoming environmental problems (Bradly et al., 1999; Eagles and Demare, 1999). Furthermore, school environmental programmes, although addressed to students, can also influence the environmental knowledge, attitude, and behaviour of adults (parents, teachers, and local community members) through the process of intergenerational influence (Gallagher et al., 2000).

Awopetu et al. (2013) focused on public attitudes towards reducing, reusing, and recycling solid waste in the Makurdi Metropolitan area of Nigeria. The majority revealed that they would not waste their time collecting and disposing of waste instead of engaging in income-generating activities (Giusti, 2009). Some revealed that they would not even waste time engaging in village meetings aimed at garbage management, as many said they would rather go boozing. Eneji et al. (2016) conducted a study on waste disposal and waste management. The implication of the results is that the residents of Calabar South have a very negative attitude towards waste management and disposal, while the second hypothesis tested also showed a significant influence of indiscriminate disposal of waste on the health status of the residents of Calabar South Local Government Area. The study concluded that because of the negative attitude the residents of Calabar South have towards the management and disposal of their waste, it has some significant influence on their health status. Barloa (2016) conducted a study to establish the effect of attitudes, practices, and knowledge on waste management among 2528 Polytechnic university students. The findings indicate that 73.4% of the students indicated knowledge to be satisfactory, 71.4% attitude on strategic waste management issues; while around 43.1% depicted satisfactory levels in practice. The relationship depicted a significant interaction between knowledge and attitude and an  $r^2 = 0.11$ ;  $p$ .

A study by Erhabor and Don (2016) was conducted to assess students' level of knowledge and attitude towards the environment. The survey was conducted on 130 respondents who were full-time students of environmental education in a federal university in Edo state, Nigeria. The result revealed a high level of knowledge and positive attitude towards the environment among the students. Also, it was observed that the relationship between their knowledge and attitude towards the environment is negative, with little or no relationship. It was concluded that environmentally literate students, especially in tertiary institutions, are being nurtured to foster EE in Nigeria.

Consequently, it is expected that adequate knowledge on waste segregation should be a determinant of attitudes and practices, especially among students. This study thus seeks to assess the impact of environmental education on the knowledge and attitude of students of the University of Benin on waste segregation.

## Research Questions

The following research questions were raised to guide the study:

1. What is the level of knowledge of waste segregation among students in the experimental group (environmental education) and the control group (Human Kinetics)?
2. What are the attitudes towards waste segregation among students in the experimental group (environmental education) and the control group (Human Kinetics)?
3. Is there a difference in the knowledge of waste segregation between the experimental and control group?
4. Is there a difference in the attitudes towards waste segregation between the experimental and control group?

## Hypotheses

1. There is no significant difference in the knowledge of waste segregation between the experimental and control group.
2. There is no significant difference in the attitude towards waste segregation between the experimental and control group.

## Purpose of the Study

The purpose of this study is to assess the impact of environmental education on knowledge and attitudes among students of the University of Benin regarding waste segregation.

## Theory of Planned Behaviour (TPB)

The TPB has been widely used in research on pro-environmental behaviours, including many studies on waste separation. The TPB has also been applied to research on young people (Kanyimba, 2014). Thus, relationships between attitudes, subjective norms, perceived behavioural control, intentions, and behaviour have been studied in various contexts. This work draws on this body of research and is based on hypotheses derived from the basic TPB model.

Environmental attitude is defined as a psychological tendency expressed by evaluating the natural environment with some degree of favour or disfavour (Tonglet, 2004). Karim; Rusli; Diak; & Idris, 2013) and Zhang; Huang; Yin, Gong & Tchounwou, 2015) found that attitude is the strongest predictor of waste separation intention or behaviour. Here, it is hypothesised that participation intention would depend on the awareness of environmental issues.

A subjective norm is defined as an individual's perceived pressure from essential others around them (Sidique, 2010). It implies that pressure from significant others (e.g., family members, neighbours, and work colleagues) can have a significant impact on individuals' recycling behaviour. Most of the previous studies have confirmed that subjective norm is an important motivation for practising segregation (Sidique, 2010), and this is particularly true in secondary schools because the prevailing collectivist culture means that people are strongly influenced by significant others such as teachers or peers. The theory also suggests that subjective norms influence young students' intention to practise segregation in waste management (Shi; Wang & Zhao, 2017).

Perceived behavioural control (PBC) is defined as the perceived ease or difficulty an individual feels towards a specific behaviour. The results of the relationship between PBC and behavioural intention are diversified. Knussen et al. (2004) reported that PBC predicted intention to segregate in an area with inadequate segregation facilities, but others have found that PBC did not predict recycling behaviour (Shi et al., 2017). Hence, the study is based on TPB, which predicted that the stronger an individual's intention to undertake a given behaviour, the higher the likelihood that they will take action. Most studies have found the intention to segregate waste to be a reliable indicator of segregation behaviour (Zhang, 2015).

## Methodology

The research design adopted for this study was the post-test only experimental design. It aimed at documenting a field survey of the impact of environmental education on the knowledge and attitude of students of the University of Benin on waste segregation. The population of the study consisted of students from the Faculty of Education, University of Benin. Two course areas were selected: environment-related and non-environment-related areas. Thus, the population of year three and four students in the 2018/2019 academic session was 219 for Environmental Education and 108 for Human Kinetics (non-environmental education). A sample size of 200 respondents constituted the study sample. The purposive sampling technique was adopted for the study. Two course areas (Environmental Education and Human Kinetics) were purposely selected for the study. From these course areas, 100 respondents each were selected from the class list of year three and four.

The instrument for this research consisted of a structured questionnaire with two sections: A and B. The first section (A) contained data on the personal information of the respondents and measured variables such as age, gender, class of study, and religion. The second section (B) contained questions

aimed at gathering data on the opinions of respondents regarding the variables of the study (impact of environmental education on knowledge and attitude of students of the University of Benin, Benin City).

The instrument was constructed by the researchers and its contents were validated by the experts in the Department of Health, Safety and Environmental Education, Faculty of Education, University of Benin. Their observations, comments, and corrections were effected on the instrument accordingly. This helped to ensure that the instrument was equipped enough to achieve the purpose of the study. Data collected through the instrument was analysed using descriptive statistical tools - frequency tables, and simple percentages.

## Results

- **Research question one: What is the knowledge of waste segregation among students (environmental education students and non-environmental education students - Post-test)?**

S/N	Level of Knowledge	Percentage (%)
1	LOW	2
2	MODERATE	24
3	HIGH	74
<b>TOTAL</b>		<b>100</b>

**Table 1.** Frequency and Percentage of the Level of Knowledge of the Experimental Group

*\*A score of 0-10 indicates low knowledge; a score of 11-15 indicates moderate knowledge; a score of 16-20 indicates high knowledge.*

The table above reveals the level of knowledge of the experimental group at the post-test for waste segregation. 2% of the population had low knowledge of waste segregation, 24% had moderate knowledge, and 74% had high knowledge.



S/N	Level of Knowledge	Percentage (%)
1	LOW	34
2	MODERATE	49
3	HIGH	17
<b>TOTAL</b>		100

**Table 2.** Frequency and Percentage of the Level of Knowledge of the Control Group

*\*A score of 0–10 indicates low knowledge; a score of 11–15 indicates moderate knowledge; a score of 16–20 indicates high knowledge.*

The study shows the following results for the control group (HKS), as shown in Table 2 above: 49% of the control population had moderate knowledge of waste segregation, 34% had low knowledge, and just 17% had high knowledge.

- **Hypothesis One:** There is no significant difference in the knowledge of waste segregation between the experimental and control groups.

Group	Pre Mean	Post Mean	Std. Deviation	t-value	Sig.
experimental group	11.24	17.78	1.31487	16.78	0.00
control group	10.98	12.21	2.09617		

**Table 3.** Independent Sample Test on the Difference in the Knowledge of Waste Segregation Between the Experimental and Control Groups

From the table above, N represents the number of cases, the mean performance, the standard deviation, and the estimated standard error of the mean. Of greatest interest here are the mean

performance scores for the experimental and control groups regarding the students' knowledge of waste segregation. The performance score for the experimental group, in terms of their knowledge of the segregation process of solid waste management, is 17.78, while the performance score for the control group, in terms of their knowledge of segregation, is 12.21. As seen in the table, the t-value is 16.78 and the level of significance is 0.00, which is less than the set alpha level of 0.05. Thus, the null hypothesis, which states that there is no significant difference in the knowledge of waste segregation between the experimental and control group, is rejected. This shows that there is a difference in the knowledge of waste segregation between the experimental and control group. That is, environmental education has an effect on the knowledge of waste segregation, especially given the fact that the experimental group had a higher mean on their knowledge of waste segregation than the control group.

- **Research Question 2- What are the students' attitudes towards waste segregation (posttest)?**

Items	SA (%)	A (%)	D (%)	SD (%)
Solid waste segregation at the source is necessary for solid waste management in the university community and outside	30 (30%)	70 (70%)	-	-
Through solid waste segregation practices, I can guarantee a clean and healthy environment	24 (24%)	73 (73%)	3 (3%)	-
Solid waste segregation at the source enhances waste minimization and resource maximization	35(35%)	47(47%)	12 (12%)	-
Segregation is very important in solid waste management	36 (36%)	60(60%)	4(4%)	-
From my knowledge in waste management, I now ensure I segregate my waste during deposit and for easy collection and management	62(62%)	37(37%)	1(1%)	-
Sorting garbage e.g. scrap metals, plastics, papers, organic etc. during collection and before disposal has made waste management more efficient for me	66 (66%)	32 (32%)	2 (2%)	-

**Table 4.** Attitudes of students (environmental education) towards waste segregation – Experimental group

(Strongly Agree = SA, Agree =A, Disagree =D, Strongly Disagree = SD)

Table 4 presents data on the attitudes of respondents from the **experimental group** towards waste segregation. It can be seen that 30% of respondents strongly agree that solid waste segregation at the source is necessary for solid waste management in the university community and outside, and 70 (70%) agreed with the statement. Also, 24% strongly agree that through solid waste segregation practices, they can guarantee a clean and healthy environment, 73% agree and 3% disagree. The data also displayed that 35% and 47% strongly agree and agree respectively that solid waste segregation at the source enhances waste minimisation and resource maximisation. In the same vein, 60% of respondents agree that segregation is very important in solid waste management. The study also showed that 62% of respondents strongly agreed that from their knowledge of waste management, they now segregate waste during deposit for easy collection and management. Furthermore, data from the above table showed that 66% of respondents from the experimental group strongly agree that sorting rubbish, such as scrap metals, plastics, papers, organic materials during collection and before disposal has made waste management more efficient. It can therefore be inferred that the respondents have a favourable attitude towards waste segregation.

Items	SA (%)	A (%)	D (%)	SD (%)
Solid waste segregation at the source is necessary for solid waste management in the university community and outside	40 (40%)	40 (40%)	16(16%)	4(4%)
Through solid waste segregation practices, I can guarantee a clean and healthy environment	24 (24%)	63 (63%)	13 (13%)	-
Solid waste segregation at the source enhances waste minimization and resource maximization	25(25%)	40(40%)	20 (12%)	15(15%)
Segregation is very important in solid waste management	36 (36%)	60(60%)	4(4%)	8(8%)
From my knowledge in waste management, I now ensure I segregate my waste during deposit and for easy collection and management	52(52%)	37(37%)	10(10%)	1(1%)
Sorting garbage e.g. scrap metals, plastics, papers, organic etc. during collection and before disposal has made waste management more efficient for me	46 (66%)	32 (32%)	12 (12%)	10(10%)

**Table 5.** Attitudes of students (human kinetics) towards waste segregation - control group

(Strongly Agree = SA, Agree =A, Disagree =D, Strongly Disagree = SD)

Table 5 presents data on the attitudes of students (control group) towards waste segregation. The table reveals that 40% of respondents strongly agree that solid waste segregation at the source is necessary for solid waste management in the university community and outside, and 40% agree, 16% disagree, and 4% strongly disagree. Also, 24% strongly agree that through solid waste segregation practices, they can guarantee a clean and healthy environment, 63% agree, and 13% disagree. Meanwhile, 25% and 40% strongly agree and agree respectively that solid waste segregation at the source enhances waste minimisation and resource maximisation, while 20% disagree and 15% strongly disagree. From the study, 36% of respondents strongly agree that segregation is very important in solid waste management, 46% agree, 10% disagree, and 1% strongly disagree. The data show that 52% of the respondents strongly agree that from their knowledge of waste management,

they segregate waste during deposit for easy collection and management. Also, the table shows that 46% of respondents from the control group strongly agree that sorting rubbish, such as scrap metals, plastics, papers, organic materials during collection and before disposal, has made waste management more efficient. From the above, it can be inferred that the respondents have a fairly favourable attitude towards waste segregation.

- **Hypothesis two: There is no significant difference in the attitude towards waste segregation between the experimental and control groups.**

Group	Pre Mean	Post Mean	Std. Deviation	t-value	Sig.
Attitude					
Experimental group	14.24	21.30	2.72475	8.94	0.00
Control group	13.83	17.30	3.54908		

**Table 6.** Independent sample t-test on the difference in the attitude towards waste segregation between the experimental and control groups.

The performance score for the experimental group in terms of attitude towards waste segregation is 21.00, while that of the control group is 17.30. However, we cannot conclude on the basis of the foregoing information that one group performs better than the other by merely comparing the figures. This warranted the use of the **t-test** to determine whether any real difference (statistical significance) actually exists or if the difference is due to chance. It can be seen in the table that the t-value is 8.94 and the level of significance is 0.00, which is less than the set alpha level of 0.05. Thus, the null hypothesis, which states that there is no significant difference in the attitude towards waste segregation between the experimental and control group, is rejected. This shows that there is a significant difference in the attitude towards waste segregation between the experimental and control group. That is, environmental education has an effect on the attitude towards waste segregation, with the environmental education students having a more favourable attitude. The implication is that the null hypothesis (Ho) of no significant differences in population variances is rejected, and the alternate

hypothesis (H1) of a significant difference in the impact of environmental education on the attitudes of students towards waste segregation is accepted.

## Discussion of Findings

The findings of the study from the data analysed are presented according to the research questions below. It was observed that the majority of the respondents in the experimental group (environmental education students) had high knowledge of waste segregation, while the majority of the respondents in the control group (HKS students) had moderate knowledge of waste segregation. This average knowledge the HKS students possess might be due to their experience as science students in secondary school education (EE is integrated into various subjects in the secondary school curriculum in Nigeria) and campaigns. This is contrary to the study by Arora and Agarwal (2011), who reported low knowledge of waste management. However, Barloa (2016) stated that 73.4% of the students indicated their knowledge to be satisfactory towards waste management.

The hypothesis tested on the difference in knowledge of waste segregation between the experimental and control groups showed that there is a significant difference in the knowledge of waste segregation between the experimental and control groups. This indicates that environmental education has an impact on the knowledge of waste segregation among students. This is corroborated by Erhabor and Don (2016), who concluded that environmentally literate students, especially in tertiary institutions, are being nurtured to foster Environmental Education (EE) in Nigeria.

Comparing data analysed from the two groups on respondents' opinions on the impact of environmental education on students' attitudes towards waste segregation shows some differences in areas such as the relevance of waste segregation in solid waste management. Here, 100% of the experimental group agreed, whereas 80% of the control group agreed and 20% disagreed. Also, 82% of the experimental group agreed that solid waste segregation at source enhances waste minimisation and resource maximisation, compared to 65% of the control group. 99% of respondents from the experimental group segregate their wastes before or during deposit for easy collection and management, compared to 89% of the control group. Findings also show that 98% of respondents from the experimental group agree that sorting rubbish during collection and before disposal has made waste management more efficient, while 78% of the control group agreed and 22% disagreed. Comparing this to literature findings, the hypothesis tested showed that there is a significant difference in the attitude towards waste segregation between the experimental and control groups.

That is, environmental education has an effect on the attitude towards waste segregation, with the environmental education students having a more favourable attitude. Kagawa (2007) stated that environmental education strongly influences environmental knowledge in students, and the basic aim of environmental education is to induce pro-environmental intention and behaviour. However, recent studies have shown that for environmental education, it is more important to acquire environmental attitudes than just achievement in behaviour, which was in accordance with the disclosure of UNESCO 1978. It is generally recognised that environmental education influences environmental knowledge, especially in the case of young students. The intensity of students' environmental education strongly influences their environmental knowledge (Kagawa, 2007), as found in this study.

## **Conclusion**

The results of this study show that waste segregation is a practicable and sustainable approach for more effective solid waste management in communities, especially in the university environment, fostering a cleaner environment. However, this practice of waste segregation is dependent on the level of knowledge and attitude of residents towards waste segregation as part of solid waste management. The study identified environmental education as a major predictor or determinant of knowledge and attitude towards waste segregation among residents of the university community, among other factors. Hence, environmental education can be used as a veritable tool for change in attitude and practice in waste segregation.

## **Recommendations**

On the basis of the study findings, the following recommendations are proffered:

1. Incorporation of environmental education as a major part of the academic curriculum in institutions of higher learning, to address the challenges of solid waste management, with emphasis on waste segregation and its benefits.
2. Increased community-based public awareness programmes should be undertaken on the importance of segregation to the process of solid waste management.
3. Provision of facilities for the demonstration of the segregation process in waste management in institutions of higher learning is indispensable for achieving the goals and benefits of environmental education.

4. Other forms of teaching aids and instructional materials that could enhance effective teaching by illustration should be sufficiently provided.
5. Provision of bags and coloured waste bins by the government as a motivational incentive for waste segregation at the source in the successful management of urban solid waste is expedient.
6. Encourage community participation in the waste segregation process.

## References

- Akinbote, O. (2007). Some Nigerian primary school pupils' knowledge, attitude and practices on water pollution. *The Social Science*, 2(1), 283-286.
- Akoni, J. (2007). *Municipal Solid Waste Management in Abuja*. Abuja, Nigeria: Abuja Environmental Protection Board.
- Allen, F., & Bassey, N. (2012). Making Policies Work: Between Environmental Policies and Environmental Protection. Nigeria: Oilwatch.
- Ayodeji, I. (2010). Exploring secondary school students' understanding and practices of waste management in Ogun State, Nigeria. *International Journal of Environmental and Science Education*, 5(2), 201-215.
- Ball, S. J., Bowe, R., & Gewirtz, S. (1996). School choice, social class and distinction: The realization of social advantage in education. *Journal of Education Policy*, 11, 89-112.
- Ballarintyne, R., Connell, S., & Fien, J. (2006). Students as catalysis of environmental change: A framework for researching intergenerational influence through environmental education. *Environment Education Research*, 12(3-4), 413-427.
- Ballantyne, R., Fien, J., & Packer, J. (2001). School environmental education programme impacts upon student and family learning: A case study analysis. *Environmental Education Research*, 7, 23-37.
- Baud, I., Grafakos, S., Hordijk, M., & Post, H. (2001). Quality of life and alliances in solid waste management: Contributions to urban sustainable development. *Cities*, 18, 3-12.
- Best, H. & Mayerl, J. (2013). Values, beliefs, attitudes: An empirical study on the structure of environmental concern and recycling participation. *Social Science Quarterly*, 94, 691-714.
- Boliver, V., & Swift, A. (2011). Do comprehensive schools reduce social mobility? *The British Journal of Sociology*, 62, 89-110.



- Chi-Chung, K. A., & Chi-Kan, L. J. (2003). Teachers perceptions of teaching environmental issues within the science curriculum: A Hong Kong perspective. *Journal of Science Education and Technology*, 12(3), 187-204.
- Cribb, J., Jesson, D., Sibiet, L., Skipp, A., & Vignoles, A. (2013). *Poor grammar: Entry into grammar schools for disadvantaged pupils in England*. London: The Sutton Trust.
- Crozier, G., Reay, D., James, D., Jamieson, F., Beedell, P., Hollingworth, S., & Williams, K. (2008). White middle-class parents, identities, educational choice and the urban comprehensive school: Dilemmas, ambivalence and moral ambiguity. *British Journal of Sociology of Education*, 29, 261-272.
- Department for Environment, Food and Rural Affairs (DEFRA). (2006). *Evaluation of the household waste incentives pilot scheme* (Rep. No. AEAT/ED51362/Issue 1).
- Department for Environment, Food and Rural Affairs (DEFRA). (2014). *Statistics on waste managed by local authorities in England in 2013-2014*. Retrieved January 17, 2015, from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/375945/Statistics](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/375945/Statistics).
- Ebong, R. D. (2002). Appraisal of knowledge and attitude of the 'Akwa Iboms' toward a sustainable environment in Nigeria. *Environmental Health Perspectives*, 110(4), 211-212.
- Edgerton, E., McKechnie, J., & Dunleavy, K. (2009). Behavioral determinants of household participation in a home composting scheme. *Environment and Behavior*, 41, 151-169.
- Eguabor, V. O. (2006). Some suggestions on resources for teaching environmental education in secondary schools. In: Nzewi, U. (Ed.), *47th Annual Conference Proceedings of the Science Teachers' Association of Nigeria*. Ibadan, Nigeria: Heinemann Educational Books (Nigeria) Plc. pp. 207-210.
- Erol, G. H., & Gezer, K. (2006). Primary students' teachers' attitudes towards the environmental issues. *International Journal of Environmental Science Education*, 1(1), 65-77.
- European Commission (EC). (2011). *Sustainable development in the European Union. 2011 monitoring report of the EU sustainable development strategy*. Luxembourg: Publications Office of the European Union.
- European Commission (EC). (2012). *Guidance on the interpretation of key provisions of directive 2008/98/EC on waste*. Brussels: Directorate-General Environment.
- European Parliament and European Council. (2008). *Directive 2008/98/EC on waste (Waste Framework Directive)*. Retrieved December 12, 2014, from <https://ec.europa.eu/environment/waste/framework/>
- Eurostat. (2015). *Municipal waste*. Retrieved January 1, 2015, from <http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/database>

- Ezeah, C. (2010). *Design of a Municipal Solid Waste Management Strategy for the City of Wolverhampton* (M.Sc. Thesis, University of Wolverhampton). Available from: <http://www.wlv.ac.uk>. [Last accessed on 2017 Jun 19].
- Farmer, J., Knapp, D., & Benton, G. M. (2007). An elementary school environmental education field trip: Long-term effects on ecological and environmental knowledge and attitude development. *The Journal of Environmental Education*, 38, 33-42.
- Gordon, P., & Lawton, D. (2003). *Dictionary of British education*. London: Woburn Press.
- Hanushek, E. A., & Woessmann, L. (2006). Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries. *The Economic Journal*, 116, C63-C76.
- Harris, R., & Rose, S. (2013). Who benefits from grammar schools? A case study of Buckinghamshire, England. *Oxford Review of Education*, 39, 151-171.
- Ibrahim, F. M., & Babayemi, O. F. (2010). Knowledge and attitude of a group of Nigerian undergraduates towards environmentalism. *Global Journal of Environmental Research*, 4(1), 47-53.
- Iannelli, C. (2013). The role of the school curriculum in social mobility. *British Journal of Sociology of Education*, 34, 907-928.
- Jerry, A. N. (2015). *Solid Waste Management*. New York: Encyclopedia Britannica, Inc.
- Kaciak, E., & Kushner, J. (2009). Determinants of residents' recycling behaviour. *International Business & Economics Research Journal*, 8, 1-12.
- Kazdin, A. E. (Ed.). (2003). Methodology: Why is it so important. In *Methodological Issues and Strategies in Clinical Research*. Washington, D.C: American Psychological Association.
- Kibert, N. C. (2000). *An Analysis of the Correlations between the Attitudes, Behavior and Knowledge Components of Environmental Literacy in Undergraduate University Students* (M.Sc. Dissertation, University of Florida). Retrieved from <http://www.cce.ufl.edu/Nicole-kibert-thesisformatted.Pdf>.
- Kofoworola, O. F. (2007). Recovery and recycling practices in municipal solid waste management in Lagos, Nigeria. *Waste Management*, 27(9), 1139-1143.
- Lee, J. C. K., & Williams, M. (2001). Researching environmental education in the school curriculum: An introduction for students and teacher researchers. *International Journal of Research in Geographical and Environmental Education*, 10(4), 218-244.
- Leton, T. G., & Omotosho, O. (2004). Landfill operations in the Niger Delta region of Nigeria. *Engineering Geology*, 73(1-2), 171-177.

- Lima, M. L. (2004). On the influence of risk perception on mental health: Living near an incinerator. *Journal of Environmental Psychology*, 24, 71–84.
- Lima, M. L. (2006). Predictors of attitudes towards the construction of a waste incinerator: Two case studies. *Journal of Applied Social Psychology*, 36, 441–466.
- Magda, M. S., Hesham, M. N., & Rim, A. H. (2009). Environmental education and its effect on the knowledge and attitudes of preparatory school students. *Journal of Egyptian Public Health Association*, 84(3-4), 344–367.
- Manning, A., & Pischke, J. S. (2006). *Comprehensive versus selective schooling in England and Wales: What do we know?* London: Centre for the Economics of Education.
- Momoh, J. J., & Oladebeye, D. H. (2010). Assessment of awareness of attitude and willingness of people to participate in household solid waste recycling programme in Abo-Eketi, Nigeria. *Journal of Applied Science in Environmental Sanitation*, 14, 1–12.
- Morris, J. R., Phillips, P. S., & Read, A. D. (1998). The UK landfill tax: An analysis of its contribution to sustainable waste management. *Resources, Conservation and Recycling*, 23, 259–270.
- Morrissey, A. J., & Browne, J. (2004). Waste management models and their application to sustainable waste management. *Waste Management*, 24, 297–308.
- Nabegu, A. B. (2010). An analysis of municipal solid waste in Kano Metropolis, Nigeria. *Journal of Human Ecology*, 31(2), 111–119.
- National Population Commission (NPC). (2008). *2007 Population Census Figures*. Retrieved from <http://www.population.gov.ng>.
- Pires, A., Martinho, G., & Chang, N. B. (2011). Solid waste management in European countries: A review of systems analysis techniques. *Journal of Environmental Management*, 92, 1033–1050.
- Popplewell, M., Gostick, J., Mills, P., Cleghorn, D., Marks, H., Munro, A., & Moorton, E. (2006). *Reducing the reliance of landfill in England*. London: Department for Environment, Food and Rural Affairs.
- Price, J. L. (2001). The landfill directive and the challenge ahead: Demands and pressures on the UK householder. *Resources, Conservation and Recycling*, 32, 333–348.
- Pulkkinen, K. (2006). Teacher Thinking and Practice in Environmental Education: Finnish Northcaselian Primary School Teachers as Environmental Educators. In *Sustainable Development through Education*. Proceedings of the International Conference on Environmental Education, Helsinki (pp. 143–154). U.S.A: McGraw-Hill Publishing Company.

- Rinmak, R.H.L. (2010). *Attitudes of Women Towards Environmental Degradation in Plateau State: Implication for Environmental Education*. (Unpublished Ph.D. Thesis, University of Jos). Retrieved from <http://www.unijos.edu.ng>.
- Robottom, I., Malone, K., & Walker, R. (2000). *Case Studies in Environmental Education: Policy and Practice*. Geelong: Deakin University Press.
- Sama, E. (2003). Teacher candidates' attitudes towards environmental issues. *Gazi University Journal of Education*, 23(2), 99–110.
- Schratz, M. (2016). Austria: Overcoming a bureaucratic heritage as a trigger for research on leadership in Austria. In H. Anlesing, C. Day, & O. Johansson (Eds.), *A Decade of Research on School Principals: Cases from 24 Countries* (pp. 307–329). Dordrecht, Netherlands: Springer.
- Schmidt, J. H., Holm, P., Merrild, A., & Christensen, P. (2007). Life cycle assessment of the waste hierarchy – a Danish case study on waste paper. *Waste Management*, 27, 1519–1530.
- Steedman, J. (2012). Longitudinal survey research into progress in secondary schools, based on the national child development study. In G. Walford (Ed.), *Doing sociology of education* (pp. 177–206). Oxon, New York: Routledge.
- Sullivan, A., Parsons, S., Wiggins, R., Heath, A., & Green, F. (2014). Social origins, school type and higher education destinations. *Oxford Review of Education*, 40, 739–763.
- The Sutton Trust. (2005). *Rates of eligibility for free school meals at the top state schools*. Retrieved January 17, 2015, from <http://www.suttontrust.com/wp-content/uploads/2005/10/>
- United Kingdom Without Incineration Network (UKWIN). (2014). *Incinerators in the UK*. Retrieved January 20, 2015, from <http://ukwin.org.uk/>
- United Nations Environmental Programme (UNEP). (2011). *Towards a green economy: Pathway to Sustainable Development and Poverty Eradication*. Nairobi: United Nations.
- Walford, G. (1994). A return to selection? *Westminster Studies in Education*, 17, 19–30.
- Waste Watch. (2015). *Recyclezone: Education resources from waste watch*. Retrieved January 17, 2015, from [http://www.recyclezone.org.uk/home\\_iz.aspx.html](http://www.recyclezone.org.uk/home_iz.aspx.html)
- World Bank. (2000). Infrastructure–urban development. In: *The Proceedings of African Regional Conference of Cop Grading Urban Slums* (pp. 3–5, October 2000). Johannesburg, South Africa. Retrieved from <http://www.worldbank.org>. Accessed on June 19, 2017.
- Zhang, N., Williams, I. D., Kemp, S., & Smith, N. F. (2011). Greening academia: Developing sustainable waste management at Higher Education Institutions. *Waste Management*, 31, 1606–1616.

## **Declarations**

**Funding:** No specific funding was received for this work.

**Potential competing interests:** No potential competing interests to declare.