

Students' attitudes to solid waste management in a Nigerian university

Implications for campus-based sustainability education

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Abstract

Purpose – Waste management is a critical element of the campus sustainability movement in which Nigerian universities are yet to actively participate. The purpose of this study was to investigate prevalent waste management practices and the disposition of undergraduate students in a Nigerian University.

Design/methodology/approach – Data collection involved the use of a questionnaire, focus group discussion and participative observation. Respondents consisted of 840 students drawn from four academic faculties of the university. Descriptive and inferential statistics were used to address the research questions raised to guide the investigation.

Findings – Indiscriminate littering, open dumping of waste, weedy and overgrown lawns, proliferation of power generating sets, uncollected refuse sites and defaced walls with postings were the major observed environmental challenges. Open burning of refuse was found to be the single most prevalent way of managing large volumes of waste generated on the university campus. Although the problems were widespread, only 40.5 per cent of the students expressed serious concern for the solid waste practices. Also, while the students were positively disposed to innovative ways of addressing the challenge of waste management in the university, there were significant differences in students' awareness and disposition according to sex, age, academic level and faculties.

Research limitations/implications – The implications of the findings for campus-based sustainability education are discussed.



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The authors declare that there are no conflicts of interest.

Originality/value – This study is an original research article which interrogated the students' attitudes to solid waste management in a Nigerian University. It used a combination of both qualitative and quantitative techniques, such as questionnaire, focus group discussion and participative observation.

Keywords Nigerian universities, Attitudes to waste, Campus-based sustainability education, Waste management practices

Paper type Research paper

Background to the study

Solid waste management is a critical element of campus sustainability. The campus sustainability movement is “a movement dedicated to transforming our campuses into living laboratories for the demonstration and practice of environmental sustainability” (Sharp, 2009, p. 1). Starting from the 1990s (Davis, 2012; Dyer, 2012), the movement underscores “the need for campuses to incorporate all sorts of innovations to reduce overall environmental impacts”. Among the commonly identified features of sustainable campuses are:

[. . .] green buildings, renewable energy systems, local organic food, organic landscaping, enriched native biodiversity, low-pollution transportation systems, bicycle paths, onsite rainwater-storage tanks, grey and black water-treatment systems, socially invested endowments, green chemistry practices, zero solid waste laboratories, green cleaning products and low greenhouse gas (GHG) emitting campus utilities, along with many more ideas (Sharp, 2009, p. 1).

However, many researchers (Alshuwaikhat and Abubakar, 2008; Abd-Razak *et al.*, 2012) agree with Smyth, Fredeen and Booth (2010) that reducing the burden of solid waste and managing it effectively and efficiently is the first step towards “greening” a university or campus sustainability.

Accumulated evidence indicates that an increasing number of universities have actively joined the sustainable campus movement by introducing programs that, among other things, address waste management attitudes and practices (Zhang *et al.*, 2011; Finlay and Massey, 2012; Khan, 2013; ISCN Secretariat, 2014). In Europe and America, such campus-based activities are rooted in major declarations and resolutions such as the Tallories Declaration on Sustainable Universities (1990) and the Luneburg Declaration on Higher Education for Sustainable Development (2001). Universities in Africa, and particularly Nigeria, are just coming up in this respect. For instance, in 2009, Nigerian universities joined others in Africa, through the platform of the Association of African Universities (AAU) to make the Abuja Declaration where, in part, they promised to:

Embark on a revision of the educational system to effectively achieve Higher Education for Sustainable Development in Africa (HESDA), and adopt the inter- and trans-disciplinary approaches to teaching and research and operationalize this by emphasising programme integration and synergy to promote staff and student exchanges”. In addition, the universities also pledged to “Commit themselves to greening the campuses while contributing to the sustainable needs of university communities (AAU, 2009).

However, available reports suggest that many of the African universities are yet to fully match their actions with the spirit and letters of the Abuja and other related declarations (Offiong, 2011; Adetunji, 2015; Mbeki, 2015). A collaborative baseline survey of the Global University Network for Innovation (GUNi), International Association of Universities (IAU) and Association of African Universities (AAU) (2011) acknowledged that many universities on the continent are already implementing some of the strategies involved in promoting sustainability in their campuses. However, the report equally noted that “Involvement in

sustainable development initiatives is [. . .] still significantly small in most universities” and encouraged African universities “to target mainstreaming sustainability in structures that influence the functioning of the whole university, for example, written policy statements to ensure that sustainability becomes a university-wide initiative” (GUNI *et al.*, 2011, pp. 10-11).

Students constitute an essential pool of actors in promoting campus sustainability with particular reference to waste management. Their awareness and disposition towards solid waste management practices could possibly explain the effectiveness or otherwise of a campus-based sustainability policy (if any) as well as give direction on what modes of intervention to either improve on existing programs or introduce new initiatives. Indeed, whether a policy exists or not, the relevance of campus-based sustainability education (CBSE) is beyond debate (Ingwe *et al.*, 2010; Anijah-Obi *et al.*, 2013; Khan, 2013). Hence, this case study set out to investigate prevalent attitudes of students towards waste management practices at the Olabisi Onabanjo University, Nigeria, with a view to proposing a sustainability campus education program for improving the situation.

Literature review

Research evidence, mostly from North America and Europe, has shown that universities have important roles to play in moulding their students’ lifestyles as environmental actors by incorporating sustainability issues into the curricula and operations of their campuses. Sharp (2009) reported that, as at 2007, American higher education sector had approximately 285 sustainable campus-based projects underway. By this time, the institutions had realised “the need to go beyond show-case-project successes” and were beginning to apply more pressure and push “for larger public commitments, dedicated staffing investments, and some kind of specific sustainability governance structure, typically in the form of a university committee with staff, student, and faculty representation” (Sharp, 2009, p. 2). Information from the account of Dyer (2012) revealed that, as at November 2010, the Association for the Advancement of Sustainability in Higher Education had 1,100 institutional members (800 universities and colleges) and had attracted 2,200 participants to its 2010 conference. In addition, more than 113 new academic degree programmes in sustainability (not counting new certificate programmes) had been established. Also, more than 1,100 inter-disciplinary degree programmes focusing on various environmental themes by then existed while campus sustainability staffing was on the rise, adding about 400 new positions each year (Dyer, 2012). Waste management practices are central to all these innovative campus sustainability programmes and activities.

Globally, the increased focus on waste has largely been associated with the threat poor waste management poses to human survival and the health of the environment. It has been estimated that about 11.2 billion tonnes of solid waste are generated annually, 20 to 50 million tonnes of which are e-waste. In addition, 5 per cent of greenhouse gases are traceable from decomposed organic solid waste, of which some can include hazardous substances from e-waste (UNEP and UNU, 2009). In the same vein, the outbreak of diseases like diarrhoea, dysentery, typhoid, hepatitis, cholera, malaria and yellow fever has been linked to improper waste disposal and management. Also, dumpsites composed of various types of waste which, when openly burnt, cause air pollution and leakage of hazardous substances such as leachate and gas (WHO, 2010; UN-Habitat, 2009, 2010; World Bank, 2012).

Wastes are generated in every sector of the society and education is not an exception. Schools, colleges and universities are microcosms of societies made of people and human activities that may impact the environment negatively. University campuses cover large expanse of land with numerous buildings, facilities and open spaces. Many universities are daily increasing in numbers of students and staff which demand increasing resources and

activities that are not limited to teaching, research and learning but extending also to business development and outreach programmes which directly and/or indirectly impact the society and the environment (Alshuwaikhat and Abubakar, 2008; Zhang *et al.*, 2011; Ioja *et al.*, 2012). Therefore, as major waste generators, universities cannot afford to ignore the challenge of effective management of campus wastes.

In particular, solid waste management involves strategies for reducing the amount of waste to be disposed-off. Indeed, poor solid waste management destroys environmental aesthetics, poses danger to public health, causes traffic obstruction, contaminates ground and surface water, increases air pollution, projects neighbourhoods badly and may create sites of fire disaster (UN-Habitat, 2009, 2010; World Bank, 2012). With specific respect to developing countries, UNEP (2005, p. 3) calls for improvements in respect of:

[. . .] the efficient design of collection routes, modifications in the collection vehicles, reductions in equipment downtime, and public education, (e.g., education and communication leading to the production of less waste and the reduction of litter).

Ehrampoush and Moghadam (2005) investigated 230 medical sciences students' knowledge, attitude and practices of solid waste disposal. The cross-sectional study found that the difference between the knowledge of males and females was significant ($P < 0.016$). However, 66 per cent of the students did not have a correct idea about separation and recycling of solid wastes. The study recommended that all students must take part in formal and informal education classes to promote their knowledge in this regard. In the same vein, the report of Bator *et al.* (2001) revealed inadequate knowledge of the recycling procedure among Environmental Studies students of Waterloo University who were expected to be more environmentally grounded than the rest of the campus. It was concluded that, as a whole, the students at the University of Waterloo were the same or less knowledgeable on recycling procedure. To increase knowledge on campus waste management, it was recommended that more diversified sources of educating the students were needed. In contrast, Asuamah *et al.* (2012) investigated students' attitude towards solid waste recycling and the strategies for recycling in Sunyani Polytechnic, Ghana. The research found students' knowledge and attitude towards solid waste recycling management to be good and positive.

Studies by the United Nations Environmental Programme (UNEP) have shown that there are differences in categories of solid waste between the advanced industrialized societies and less-industrialized countries of the world. For example:

Wastes generated in countries located in humid, tropical, and semitropical areas usually are characterised by a high concentration of plant debris; whereas those generated in areas subject to seasonal changes in temperature or those in which coal or wood are used for cooking and heating may contain an abundance of ash (UNEP, 2005, p. 2).

Similarly, the characteristics of campus solid wastes may be significantly different from municipal solid waste (MSW). Tiew *et al.* (2010) study of the composition and characteristics of the solid waste produced at the Universiti Kebangsaan Malaysia campus found that 96 per cent of the waste consisted of organics (43), plastics (36) and paper (17 per cent). Saadat *et al.* (2012) who also conducted their study on the status of solid waste generation at the Jahangirnagar University campus found that about 4,757 kg of solid waste were generated per day from different locations with and dumped openly within residential units, student hostels and from commercial places constituting major sources. The waste composition was found to be 75.5 per cent organic wastes (food wastes) and 17 per cent (plastics, glass, and tin), 7.1 and 0.5 per cent non-combustible and hazardous waste, respectively.

In their own study, [Chepchieng et al. \(2006\)](#) compared waste management practices in public and private universities in Kenya and reported significant differences in the attitudes toward campus environment between the two categories of students. Students in private universities demonstrated more positive attitude toward their campus environment than those in public universities irrespective of gender. [Orajekwe \(2011\)](#) also conducted a study on the waste disposal habits of on-campus students of Nwafor Orizu College of Education, Nsugbe, in Nigeria. Findings emanating from this study revealed that students in this college generally demonstrated negative waste disposal habits. However, a significant difference was found between male and female students in their waste disposal habits.

Much of the research on wastes and waste management in Nigeria have focused on knowledge, attitudes and practices in the households, communities and industries ([Olufayo and Omotosho, 2007](#); [Oyaide, 2007](#); [Oluwasola and Ogunsola, 2008](#); [Momoh and Oladebeye, 2010](#)) and only few dwelt on the educational institutions, and fewer still on post-secondary institutions particularly universities ([Daniel and Ibok, 2013](#); [Deborah et al., 2014](#)). Yet empirical evidence from recent studies on waste management practices in Nigerian and other campuses of higher educational institutions suggest that the environmental education approach may yield more positive results than the traditional information provision and law enforcement approach. For example, conclusions from [Smyth et al. \(2010\)](#), [Gakungu et al. \(2012\)](#) and [Deborah et al.\(2014\)](#) all agree with the submission of [Desa et al. \(2012\)](#) that environmental awareness and education is the key to effective solid waste management in higher educational institutions. While this conclusion appears unassailable, it may also be true that an assessment of the baseline practices and disposition of students to those practices should be the starting point for any meaningful educational intervention strategy. It was within this context that the present study was conceived.

Statement of the research problem

If the Abuja Declaration of 2009 is anything to go by, then Nigerian universities should have joined the league of sustainable campuses with the students playing active roles as change agents. However, information on current status of students' attitudes (awareness and disposition) towards key indicators of campus sustainability such as waste management is scanty. Consequently, there is urgent need to investigate the attitudes of students towards waste management practices in Nigerian universities with a view to charting possible pathways for the promotion of campus-based sustainability education on the campuses. Hence, this study was designed as a case study at the Olabisi Onabanjo University, Nigeria, with three objectives in mind: assess university students' awareness and disposition towards wastes and waste management practices; compare the demographic variables of the students with reference to their awareness and attitudes towards waste and waste management; and investigate the relationship between awareness/attitude and waste management practices among the target university students.

Research questions

In specific terms, the study was guided by the following questions:

RQ1. What are the major campus-based environmental problems in the university?

RQ2. What are the major manifestations of solid wastes on the university campus?

RQ3. What is the general disposition of the students to observable solid waste management practices in the university?

RQ4. Are there significant differences in the awareness and disposition of students towards waste management practices according to gender, academic faculty, study level and age?

Methods and procedures

The study location

The study was conducted at the Olabisi Onabanjo University, Ago-Iwoye (OOUA), located in the southwestern part of Nigeria. The OOUA, established by the Ogun State Government in 1982, is one of the oldest among the 40 state-owned universities in Nigeria (www.nuc.edu.ng). The university operates a multiple campus system with the Main Campus in Ago-Iwoye. Three other campuses of the university are located in three other geo-political zones, namely, Aiyetoro (Yewa Division), Ibogun (Egba Division) and Ikenne/Sagamu (Remo Division). However, this study was conducted on the main campus of the university which houses five academic faculties – Education, Law, Science, Arts and Social Sciences and Management. As at the time of the study (2014), the five faculties housed about two-thirds of the student population who lived off campus. It should be noted, however, that plans to introduce on-campus accommodation in the 34-year-old institution were at an advanced stage while this study was under way.

The design

The research was conducted by means of a case study with a mixed methods approach for data collection. Quantitative data were obtained through questionnaires that used the Likert scale model. In addition, qualitative data were gathered through focus group discussion (FGD) with clusters of some student volunteers. Also, the participative observation approach was used to lend additional weight to data obtained through the other two sources to achieve triangulation.

Sample and sampling technique

Data for the study were collected between September and December 2014 through the purposive and cluster sampling techniques. In all, 1000 questionnaires were administered across the five faculties at main campus of the university of which 904 were returned, representing a 90.4 per cent response rate. However, 64 questionnaires that were not properly completed were eliminated. Thus, 840 questionnaires from the students were eventually used in the analysis. There were 382 male and 458 female respondents. From the total number of respondents, 12 were at first year (100 level), 14.2 at second year (200 level), 33.2 at third year (300 level), while 40.6 per cent were at fourth year (400 level) of their academic study, respectively. Also, 424 of the respondents or 50.5 were in the age group of 18-24 years old, while 382 or 45.5 were in the 25-30 years' bracket with 4 per cent falling within age bracket of 30 years and above. In addition, 20.6 were in the Faculty of Education, 26.1 in Social and Management Sciences, 21.2 in Arts, 10 in Law and 22.1 per cent in the Physical Sciences.

The study questionnaire

A researcher-designed questionnaire was the main instrument used for data collection. The questionnaire had three sections. The first section focused on the demographic background of the respondents with reference to faculty, gender, age, course of study and academic level. The second section contained 18 items following the Likert scale model of Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD). The items in this

section were meant to explore the awareness and disposition of the students towards wastes and waste management practices on their campus. The third section of the instrument raised six additional questions designed to explore personal opinions and suggestions of students on how to address the challenges of waste in their university.

The validity of instrument was ensured through the assistance of three expert researchers in social studies and environmental education at the Faculty of Education, Olabisi Onabanjo University, Ago-Iwoye who reviewed the items in terms of content and aligned with the objectives of the study. The instrument was also pilot-tested among 30 fourth year students in the social studies programme from another university that was not involved in the study. The obtained Cronbach's alpha for the reliability of the instrument was 0.87.

The focus group discussion

In addition to the survey sample, two FGD sessions (one male, one female) were conducted among volunteer students in each of the five academic faculties, making a total of ten FGDs that were conducted. The primary objective of these discussions was to generate qualitative data to complement the survey data on the perception of respondents to the issues at stake. Each FGD session consisted of five to six participants and lasted for between one hour and one hour fifteen minutes. Deliberations at the FGD sessions were tape recorded and excerpts from the transcribed texts were used to complement findings from the quantitative data.

Participative observations

Interactive visits were made to students' centres, lecturers' offices as well as lecture halls. The significance of these visits was to find out how well the staff and students were using the bins and see if the bins were collected and disposed-off. Observations were also made of the major dumpsites and the use of notice boards and other places for posting notices, releases, academic briefs and such other information documents at academic and administrative offices and departments. In addition to the visits, interviews were also conducted with Directors of the Directorate of Physical Planning and Directorate of Students' Affairs, respectively, to obtain their views on existing policies and awareness creation or education programmes.

Data analysis

The quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) with descriptive and inferential statistics such as percentage, means, standard deviation, *t*-test, analysis of variance (ANOVA) and multiple regression analysis. Tapes of recorded FGD sessions were replayed and analyzed using themes like waste generation, waste transfer, waste processing, waste burning, environmental degradation, environmental awareness, environmental education, environmental sustainability and university environmental policy to guide the texts used for the report.

Findings and discussion

The major findings of this study are as presented with reference to the questions below.

Awareness about campus environmental problems

A summary of the respondents' concerns and awareness about campus-based environmental problems is presented in [Table I](#). When asked "How interested are you in environmental problems on campus?" 6.5 chose "very interested", 30 "interested", 36.2 "not

Awareness of campus waste management problems	Very interested	Interested	Not interested	Do not know
How interested are you in environmental problems on campus?	81 (9.6)	329 (39.2)	260 (31.0)	170 (20.2)
How concerned are you about waste management on campus?	Very concerned 252 (30.5)	Moderately concerned 84 (10.0)	Not concerned at all 470 (55.9)	Do not know 34 (4.0)
How much knowledge do you think you have with regards to environmental issues on campus?	Very high knowledge 41 (4.9)	Moderate knowledge 161 (19.2)	Low knowledge 310 (36.9)	No knowledge 328 (39.1)
How serious do you see the problem of waste and waste management in your university?	Very serious 281 (33.5)	Serious 151 (18.0)	Not serious 365 (43.5)	Do not know 42 (5.0)
Are you satisfied with the manner wastes are managed on your campus?	Very satisfied 122 (14.5)	Satisfied 317 (37.7)	Dissatisfied 324 (38.6)	Very dissatisfied 76 (8.6)
How often do you discuss about environmental problems on your campus with colleagues?	Very often 73 (8.7)	Seldom 285 (33.9)	Sometimes 147 (17.5)	Never 197 (23.5)
Are you aware of the Talloires declaration on sustainable campus?	Yes 210 (25.0)	No 495 (58.9)	Do not know 133 (15.9)	
Do you know whether your university is a signatory to the declaration?	65 (7.7)	492 (58.6)	283 (33.7)	
Do you know what happened to your waste after being disposed?	785 (93.5)	55 (6.5)	-	
Are you aware of some health and aesthetic effects of poor waste management?	181 (21.5)	659 (78.3)	-	
Does the university have an environmental policy?	126 (15.0)	641 (81.0)	13 (1.5)	

Note: *In parenthesis are percentages of responses

Table I.
Awareness about campus environmental problems and waste management
(N = 840)

interested” and 26.8 per cent “don’t know”. On “how concerned” they were about waste management on campus, the responses ranged from 30.5 being “very concerned”; 10 “moderately concerned”, 56.5 “not concerned at all” and 4.0 per cent “don’t know”. The students’ response pattern was not too different when asked “How serious” they saw the problem of waste, with 33.5 of them seeing it as “very serious”, 18 “serious”, 43.5 “not serious” and 5 per cent “don’t know”.

Only 14.5 per cent per cent of the sampled students were very satisfied with the waste management practices on their campus with 37.7 “satisfied”, 38.6 “dissatisfied” and 8.6 per cent “very dissatisfied”. On the question “How often do you discuss about environmental problems on campus with colleagues?” 8.7 said “very often”, 33.9 “seldom”, 17.5 sometimes, while 23.5 per cent “never did”. Only 21.5 per cent of the students had any idea of the health and aesthetic implications of poor waste management practices; the remaining 78.5 per cent claimed to be unaware. The implication is that the health hazards of poor waste management practices on campus are unknown to the students. When asked if they were aware of any environmental policy in the university, 81 per cent of the respondents said “No”, while only 15 said “Yes” and 1.5 per cent “don’t know”. This implies that, even if the university had an environmental policy, it was not to the knowledge of the students. Investigation at the office of physical planning of the university revealed that, in reality, the institution did not have any environmental policy to guide waste management on the campus.

Comments at the focus group discussion sessions indicate that some of the students recognize the importance of effective waste management practices on the campus. However, it appears that they do not see any link between their education and waste management, environmental problems or the need for a sustainable campus in general. For example, one female student (Education) has remarked in the following manner:

A clean environment is very important for good health. To be honest, I have not been interested in the problem of waste or its management on campus. I come to campus to attend my lectures and leave afterwards. My education has nothing or very little to do with getting a clean environment on the campus. It is the responsibility of the university.

The respondents were given a generated list of campus environmental problems and requested to indicate how common they were. [Table II](#) depicts their response patterns. These results show that the university is facing serious environmental problems. Prominent among these include open burning of waste, soil erosion, uncollected garbage, poor sewage disposal and untidy open spaces. Others include indiscriminate littering, indiscriminate pasting and fallen off posters, noise pollution and unkempt lawns and hedges.

Submissions at the focus group discussion sessions lend additional weight to data from the survey questionnaire on this subject. The views of one male student (Social and Management Sciences) succinctly portrays some of the existing environmental management challenges:

I will say noise is one of the environmental problems on campus. You see students while waiting for lectures talk themselves away. Some talk at the top of their voices; they don’t know whether they are disturbing. Even more, the toilets are inadequate and dirty. They also lack regular water supply.

Further investigation revealed that, although the university has engaged the services of some contract staff to clean the faculty premises and lecture halls, these cleaners are in short supply, poorly equipped and not well supervised. Officials of the Physical Planning Directorate attributed the general poor quality of the environment to inadequate funding at the university. Nevertheless, underfunding of a university does not justify the lack of an Environmental Policy or a programme of awareness creation and education on the environment.

Campus environmental problems	Very common	Common	Not common	Not common at all	Mean	Rank
Noise pollution	391 (46.5)	295 (35.1)	128 (15.2)	26 (3.1)	1.74	Tenth
Air pollution	250 (29.8)	230 (27.4)	282 (33.6)	78 (9.3)	2.21	Seventh
Indiscriminate littering	254 (30.2)	244 (29.0)	271 (32.3)	71 (8.5)	2.17	Eighth
Untidy open space	223 (26.5)	241 (28.7)	299 (35.6)	77 (9.2)	2.24	Fifth
Unkempt lawns and hedges	365 (43.7)	114 (13.6)	254 (30.2)	107 (12.2)	1.84	Ninth
Uncollected garbage	272 (32.4)	147 (17.5)	283 (33.7)	138 (16.4)	2.34	Third
Soil erosion	185 (22.0)	207 (24.6)	324 (38.6)	124 (14.8)	2.45	Second
Poor sewage disposal	247 (29.4)	184 (21.9)	293 (34.9)	116 (13.8)	2.30	Fourth
Indiscriminate pasting and fallen off posters/defaces wall	281 (33.5)	176 (21.0)	286 (34.0)	97 (11.5)	2.23	Sixth
Burning of waste openly	192 (22.9)	195 (23.2)	280 (33.3)	173 (20.6)	2.51	First

Table II.
Campus environmental problems identified by students ($N = 840$)

Manifestation and characteristics of campus wastes

Four major dump sites on the campus were visited for an estimation of the composition of campus wastes. It was found that much of the solid waste generated was inorganic. These include papers and newspapers, plastic bottles of soft drink and bottled water and water sachets. A preliminary analysis of samples from the visited sites revealed the compositions and characteristics of the campus wastes as: biodegradable (10.3), plastics/nylons (26) and paper (62.7 per cent). The huge volume of paper and paper products component of the campus solid waste is understandable in view of the ongoing academic and research activities as well as lack of functional intranet/internet facility through which hitherto printed internal memos could be circulated.

Based on information obtained through the various discussions held with the students and direct observations by the researchers, it was discovered that the only effective measure towards waste management on the campus was through open burning. It was also observed that each faculty building had at least one dumpsite for dumping and burning of refuse. The administrative buildings, Students' Centre and the Commercial Motor Park area also had dumpsites near them.

It was further observed that the university had no central waste collection and processing unit; wastes were neither separated nor carted away from the campus. Below are some of the comments of one of the students:

The environment can be described as green and in actual fact it is green. The greenness is because there is still lot of natural and uncultivated forest around. However, in terms of waste management, there is still lot of work to be done. There is no official designated point for temporary waste storage. Every faculty has one or two dumpsites beside them. The attitude of staff and students toward the environment is not good. They indiscriminately litter the campus because there are no waste bins provided on the sideway" (Male respondent, FGD).

Disposition towards waste management

As [Table III](#) shows, about 34 per cent of the students agreed that the burning of waste is a harmful way of disposing garbage, while 46 per cent disagreed. A critical look at [Table III](#) shows that only 6 of the 15 items – "It is alright to litter anywhere around the campus", "It concerns me if I see garbage scattered around the campus", "Segregating garbage would do good to me and other people on the campus", "For a healthful campus, we should all be concerned about waste management", "Students should be encouraged to get actively involved in environmental activities on campus" and "I'm ready to make changes to my lifestyle choices in order to help keep the campus environment healthy" – had mean scores above the critical value of 3.00.

It is striking to note that 68.3 agreed, 25 disagreed and 6.8 per cent were undecided on the question of being concerned about the health of the campus. The students were also asked if "every student needs to learn environmental sustainability" to which 50 agreed, while 43.8 per cent disagreed. Again, on whether or not they get angry whenever they see garbage on the campus, 48 of the students disagreed and 39.3 agreed, while 12.6 per cent of the respondents were undecided. Also, whereas more than half of the students (55.9 per cent) strongly agreed/agreed that "Students should be educated on how to recycle/reuse solid waste", less than 50 per cent (43.8 per cent) saw any need to "learn about environmental sustainability". The views of three participants at the FGD sessions below possibly explain the trend better:

The attitudes of everybody (on this campus), not just the students, towards the environment are bad. Everybody is guilty of the environmental problems on campus. Students, staff, transporters and those who own stores/shops where they sell foods or provide photocopy and other services

Student's disposition towards waste management	SA	A	NS	D	SD	Mean	SD
A healthy student needs a healthy campus environment	285 (33.9)	83 (9.9)	79 (9.4)	144 (17.1)	249 (29.6)	2.96	1.69
Burning of waste products is a harmful way of disposing garbage	229 (27.3)	150 (11.8)	152 (18.1)	153 (18.2)	156 (18.6)	2.79	1.41
I get angry whenever I see garbage on the campus	128 (15.2)	276 (32.9)	106 (12.6)	221 (26.3)	109 (13.0)	2.89	1.31
It is normal to litter anywhere around the campus	304 (36.2)	270 (32.1)	57 (6.8)	54 (6.4)	155 (18.5)	3.61	1.48
It concerns me if I see garbage scattered around the campus	239 (28.8)	280 (33.3)	67 (8.0)	198 (23.6)	56 (6.7)	3.53	1.30
Waste segregation is a waste of time	232 (27.6)	149 (17.7)	125 (14.9)	173 (20.6)	161 (19.2)	2.86	1.50
Segregating garbage would do good to me and other people on the campus	354 (42.1)	270 (32.1)	57 (6.8)	54 (6.4)	105 (12.5)	3.71	1.48
For a healthful campus, we should all be concerned about waste management	304 (36.2)	270 (32.1)	57 (6.8)	54 (6.4)	155 (18.5)	3.61	1.48
Every student needs to learn about environmental sustainability	307 (36.5)	61 (7.3)	49 (5.8)	222 (26.0)	201 (23.9)	2.94	1.66
Students should be educated to get actively involved in environmental activities on campus	229 (27.3)	127 (23.6)	60 (7.1)	259 (30.8)	165 (19.6)	3.00	1.53
I'm ready to make changes to my lifestyle choices to help keep the campus environment healthy	72 (8.6)	198 (23.6)	104 (12.4)	315 (37.5)	151 (18.0)	3.33	1.25
Students should be made to sign a statement of commitment to the protection of environment	316 (37.6)	131 (15.6)	91 (10.8)	205 (24.4)	97 (11.5)	2.57	1.48
I correct colleagues if I see them indiscriminately littering the campus or dropping garbage/refuse in unauthorized places	242 (28.8)	156 (18.6)	91 (10.8)	244 (29.0)	107 (12.7)	2.78	1.45
Students and staff should pay penalty for degrading the environment	252 (30.0)	196 (23.3)	98 (11.7)	178 (21.2)	116 (13.8)	2.65	1.44
Students should be educated on how to recycle/reuse their waste	280 (33.3)	190 (22.6)	62 (7.4)	42 (5.0)	260 (31.0)	2.87	2.04

Note: *In parenthesis are the percentage of responses

Table III.
Disposition of students towards waste management (N = 840)

are all guilty. People just throw things indiscriminately around. If you go to the “Motion Ground”, you hear noise from generators and see waste littering the place (FGD, female participant, Faculty of Arts).

The concern for the environment is secondary to both staff and students here. What people are interested in is their academic work. They are not interested in the cleanliness of campus per se. If they are, how will you explain the lack of toilet facilities at the faculties and lecture halls for the convenience of the students and staff? Those that are available are not well maintained. (FGD, male participant, Faculty of Social and Management Sciences).

If only the university management can establish a mini recycling centre especially for paper, nylon (cellophane) and plastics, we will not have anything to burn. Faculties will have no need to have dumpsite around their building. Or have a programme where the wastes can be carted away from the campus to dumpsites elsewhere, the university will be much neater (FGD, female participant, Faculty of Law).

Differences in students’ attitudes

Table IV presents the results of the *t*-test analysis to determine whether significant differences existed in the awareness about and disposition of students to waste management practices according to gender. The table reveals that there was no significant difference in the awareness levels between male and female students, whereas the dispositions of the two groups differed significantly with female respondents reflecting a more positive disposition towards waste management than their male counterparts.

Table V depicts the findings of the one-way analysis of variance (ANOVA) to determine whether significant differences existed or not in students’ awareness and disposition towards waste management practices according to age group, academic faculties and study levels. The result indicates that statistically significant differences existed among age groups regarding environmental perception ($F(2, 209) = 11.5, p < 0.00$) as well as academic levels ($F(2, 209) = 3.15, p < 0.04$).

For the student groups that differed significantly, follow-up (post-hoc) tests were performed to determine which level(s) differed within the groups. Scheffe’s post hoc analysis yielded statistically significant difference for the perception between participants’ aged 18-22 years and participants aged 28-32 years and also between participants aged 23-27 years and participants aged 28-32 years. The Scheffe post hoc value regarding participants’ perception and study levels revealed statistically significant differences between participants at second year (200) and third year (300) academic levels.

Multiple regressions were conducted to determine the impact of students’ characteristics on their awareness and disposition towards waste management on campus. The results are presented in Table VI. The four independent variables of gender, age, academic faculty and study level were used for the analysis. It was found out that four background variables of the students explained 28 per cent of the variance on awareness of waste and waste

Table IV.
Comparison of waste management awareness and attitude by sex

	Sex	N	Mean	SD	T	Significance
Awareness	Male	382	17.52	3.05	2.236	0.022
	Female	458	17.05	2.96		
Disposition	Male	376	49.49	12.52	3.754	0.000
	Female	458	46.25	12.34		

Faculty		Sum of squares	Df	Mean square	F	Significance
Awareness	Between groups	101.561	3	33.854	3.776	0.010
	Within groups	7,495.767	836	8.966		
	Total	7,597.329	839			
Disposition	Between groups	2,321.495	3	773.832	5.009	0.002
	Within groups	128,214.284	830	154.475		
	Total	130,535.779	833			
Study level	Between groups	200.573	3	66.858	7.556	0.000
	Within groups	7,396.755	836	8.848		
	Total	7,597.329	839			
Disposition	Between groups	9,310.514	3	3,103.505	21.249	0.000
	Within groups	121,225.265	830	146.055		
	Total	130,535.779	833			
Age	Between groups	69.373	2	34.687	3.857	0.022
	Within groups	7,527.955	837	8.994		
	Total	7,597.329	839			
Disposition	Between groups	344.266	2	172.133	1.099	0.334
	Within groups	130,191.513	831	156.668		
	Total	130,535.779	833			

Table V.
ANOVA Test of differences in awareness and disposition about waste and waste management

	Awareness				Disposition			
	B	β	t	P	B	β	t	P
(Constant)	19.533		27.186	0	56.699		15.686	0
Sex	-0.428	-0.071	-2.01	0.045	-3.207	-0.128	-3.639	0.01
Study level	-0.42	-0.14	-3.932	0.01	-0.431	-0.035	-0.96	0.337
Age	-0.028	-0.005	-0.147	0.883	0.332	0.015	0.426	0.67
Faculty	0.097	0.034	0.987	0.324	0.048	0.004	0.117	0.907
		$R = 0.169$				$R = 0.140$		
		$R^2 = 0.028$				$R^2 = 0.020$		
		Adjusted $R^2 = 0.023$				Adjusted $R^2 = 0.014$		

Table VI.
Regression of awareness and disposition towards waste management and socio-demographic variables

management ($R = 0.169$ and adjusted $R^2 = 0.28$). The impact was significant ($F(5,828) = 4.841, p < 0.001$).

The result in Table VI also indicates that the four background variables of the students explained 20 per cent of the variance on disposition toward waste management ($R = 0.140$, adjusted $R^2 = 0.14$). So the impact was significant ($F(5,828) = 3.309, p < 0.005$). Furthermore, among all the background variables, only gender predicted the students' disposition towards waste management on campus. Gender ($\beta = -0.128, t = -3.64, p \leq 0.00$) was found to be a significant negative predictor of students' disposition towards waste management on campus; that is, as students' disposition on wastes decreases, their orientation towards waste management also decreases.

Summary, discussion and implications of findings

The main goal of this case study was to shed light on students' awareness and disposition towards campus waste management at the Olabisi Onabanjo University in Nigeria. This case study has revealed several interesting findings on students' awareness and dispositions

towards their campus environment generally and waste management practices in particular. The major findings of this case study can be summarized as follows:

- The major campus-based environmental problems identified by the students cluster around increased solid waste generation and its mismanagement such as indiscriminate littering, open burning of wastes as well as uncollected garbage.
- Much of the solid wastes generated on the campus were inorganic, consisting mainly of papers, plastics, cellophanes and nylons with relatively small components of biodegradables. The widespread method of waste disposal on the campus was open burning.
- While almost 70 per cent of the students agreed that everyone should be concerned about the health of the campus environment, only about 50 per cent of the respondents realized the need for formal education on campus sustainability. This carefree attitude is possibly accentuated by the fact that the university currently has no campus-based environmental policy which could have provided the much-needed framework for environmental sustainability education.
- There was no significant difference regarding the awareness levels between male and female students. However, the dispositions of the two groups differed significantly with respect to female respondents, thus reflecting a more positive disposition to waste management than their male counterparts. In addition, there were significant differences in the students' awareness and disposition towards solid waste management according to age, academic level and faculties. On the other hand, however, gender was found to be the single most significant factor that predicted students' disposition towards campus waste management.

The findings from this study, as highlighted above, relate similarly to the conclusions from some of the previous studies on campus environmental problems and waste management practices in Nigerian higher educational institutions (Orajekwe, 2011; Banga, 2013), and divergent issues in students' attitudes towards campus sustainability (Gakungu *et al.*, 2012; McNamara *et al.*, 2014; Njoroge *et al.*, 2014), thus justifying the introduction of a campus-based sustainability education in universities (Grindsted, 2011; Khan, 2013; ISCN Secretariat, 2014). The students were conceived as an important stakeholder group through which knowledge of sustainability can be channeled to the wider university community and beyond. Their increased awareness about the health hazards of poor waste management and their disposition towards changing practices are essential ingredients in moving the university towards maximized sustainability. However, much intervention is required in laying the required foundation for campus sustainability at the institution under examination.

The intent of this research was to shed light on students' awareness and disposition towards campus wastes and waste management at the Olabisi Onabanjo University.

Expectedly, paper and paper products represented a huge component of solid wastes generated on the campus because of the ongoing academic and research activities. However, the paper consumption in the university could be reduced through the use of intranet and internet facilities to circulate information among staff and students, including the processing of students' results. Also, the recycling of used papers should be encouraged either by installing such facility on campus or through linkage with relevant industrial outfit. It is also suggested that the university authorities should promote the use of refillable cups instead single-use beverage and water containers.

Indiscriminate posting of information or posters on walls and doors should be discouraged. Large information boards should be erected for staff and students use. This will complement the university's official website which should be made more interactive.

Conclusion: towards sustainability education and policy

The most salient implication of this study is the need for a student-focused sustainability education. We have chosen to call this a campus-based sustainability education (CBSE). Education has long been recognized as the key to changing human behaviour. Research has shown that education is the primary factor for meaningful engagement in environmental behaviours and sustainable living (AAU, 2009; Khan, 2013). As students become aware of environmental issues, they can begin to change their lifestyles and behave in more friendly ways towards the environment. The thesis is that, until their environmental profile rises to the point of active environmental citizenship (Ogunyemi and Ifegbesan, 2011), they may not fully appreciate the importance of efficient waste management or any other element of campus sustainability. Integrating the core values of environmental education into their programme curricula and non-formal activities such as students' associations and orientation weeks could create a deeper understanding of the relationship between effective solid waste management practices on campus and sustainable human settlements for the health of students, staff and the environment. The skills, knowledge and disposition that could be gained through such formal and semi-formal educational interventions would help in increasing their awareness levels and changing negative disposition of students and transforming the current campus waste mismanagement situation into a more desirable greener campus on their campus. For example, an environmentally conscious students' union government could promote the formation of cells of a students' environmental sanitation and promotion committee across the university campus. Therefore, the Olabisi Onabanjo University requires a comprehensive programme of sustainability education borrowing from international best practices (Khan, 2013; ISCN Secretariat, 2014). However, the details of the proposed CBSE was beyond the scope of this study.

Finally, the study has revealed that there was no clearly specified environmental policy to guide waste management practices and the move towards environmental sustainability. Therefore, there is an urgent need for the formulation and implementation of an environmental policy for the university to address this gap. The proposed campus-based sustainability education should also be brought within the ambit of the environmental policy. In addition, the policy should highlight the role and importance of conducting annual solid waste audits. This will help to monitor progress achieved and provide new insights towards attaining a sustainable campus.

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