JESD **Journal of Environment and Sustainable Development**

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UNDERSTANDING THE PREDICTORS OF STUDENTS' ECOLOGICAL BEHAVIOUR: EVIDENCE FROM GHANA

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Article Info

Article history:
Received: 14 January 2023
Revised: 24 February 2023
Accepted: 24 March 2023
Published: 5 June 2023

DOI:
https://doi.org/10.55921/TDAN9912

Abstract

Purpose — This study examines the factors influencing the adoption of ecological behaviour among first year students at the University of Environment and Sustainable Development in Ghana.

Methods — The study employed a questionnaire survey design. Data was collected from 103 students enrolled into programmes offered by the School of Sustainable Development and the School of Natural and Environmental Sciences. Inferential analysis was computed using regression.

Findings — Results show that students' demographic characteristics, particularly their current and past academic programmes, year of completion of senior high school and household size, positively influence their environmental knowledge and ecological behaviour.

Conclusion & Recommendation — The study concludes that social values and environmental knowledge contribute significantly to promoting students' ecological behaviour. The study therefore recommends the need for an inclusive and multistakeholder approach to integrating environmental education and social values into existing and future curricula and academic programmes.

Keywords — Tertiary students, environmental education, pro-environmental behaviour, environmental knowledge, social value

Introduction

Climate change with its associated global warming has become a major ecological issue of global concern (Boakye, 2015). Human behaviour is established as one of the major drivers of ecological problems (Amoah & Addoah, 2021; Nkaizirwa et al., 2022; Onokala et al., 2018). Global efforts in addressing the problem has therefore drawn attention to diverse methodologies among which is education (Anderson, 2010; Cherry, 2011; Sharma, 2012; Stanford University, 2011). According to the United Nations Education, Scientific and Cultural Organisation (UNESCO), education is central to achieving the Sustainable Development Goals (SDGs). It is also emphasised that educational initiatives capable of championing pro-environmental

behaviour is critically needed in contemporary societies, particularly in developing economies to boost sustainable development and address environmental challenges including climate change (UNESCO, 2015). This is because education has the potential to alter the attitude and actions of students to act innovatively and pro-environmentally.

Climate change education has gained significant attention in global educational systems. It seeks to equip people; especially the youth who have more years to live, with requisite knowledge, skills and attitudes in exhibiting environmental concerns and responsive ecological behaviour in order to sustain the environment. However, effective implementation of climate change education requires better understanding of ecological behaviour to inform the contents and scope of climate change education, hence the need to investigate the predictors of students' ecological behaviour. This contends with the assertion that having knowledge may not correspond to attitude and behaviour (Emanuel & Adams, 2011; Heeren et al., 2016). In consonance with Whitley et al. (2018), while climate change education is instrumental in shaping behaviour for environmental conservation and preservation, other non-education factors, such as social values and norms, also have immense roles in promoting pro-environmental behaviour.

A number of existing studies have contributed to the understanding of ecological behaviour in different contexts (Amoah & Addoah, 2021; Boiyo et al., 2015; Onokala et al., 2018; Simiyu et al., 2022). For instance, in comparing the predictors of pro-environmental behaviour among students in the United States and China, Onokala et al. (2018) found a couple of factors such as social norms, intention to act, information need and situational factors, to commonly affect and shape students pro-environmental behaviour in these two countries. In China, an additional factor of environmental awareness was also reported to shape the nature of pro-environmental behaviour of students.

Similar studies have been conducted to provide insights into the factors influencing ecological behaviour of students in Africa. In Kenya, for instance, Simiyu et al. (2022) found that social influence and environmental knowledge are significant predictors of pro-environmental behaviour among students. Boiyo et al. (2015) also noted that attitudes are essential in predicting pro-environmental behaviour among Kenyan students. This is consistent with the argument that ecological behaviour is pinned on the attitudes of people (Kaiser et al., 1999), be it students, households or farmers. Intuitively, attitude has an important role to play in driving pro-environmental behaviour in different contexts. It is therefore quite intriguing to understand whether any of these factors or others predict pro-environmental behaviour of Ghanaian students.

In Ghana, Amoah & Addoah (2021) argued that environmental knowledge is positive and highly significant in determining environmental behaviour of households in urban communities. Contrastingly, Owusu et al. (2020) also found no significant impact of climate change information on it adoption by household heads in Ghana. Their study however revealed that household heads decision to adapt to climate change behaviour were rather dependent on factors such as household size, household members in farmer organisations and perception on climate variability, which is consistent with other studies (Asare-Nuamah & Botchway, 2019; Asare-Nuamah & Mandaza, 2020).

Even though previous studies have contributed immensely to the understanding of environmental behaviour in Ghana, their emphasis is limited to households and smallholder farmers without paying attention to students who play a critical role in environmental stewards. This is problematic as Ghana is currently experiencing the impact of climate change, which requires robust and inclusive strategies including climate change education among the general public, to remedy its adverse impact on households and the economy. It is therefore important to equip students, particularly those in Higher Education Institutions, with the requisite skills, knowledge, mindset and attitudes to contribute substantially to addressing climate and environmental change (Boakye, 2015). These existing studies have also failed to examine the relevance of social values in environmental behaviour in the Ghanaian context. It is against this background that this study seeks to investigate the predictors of students' ecological behaviour from a Ghanaian University. The study seeks to address the following research questions i) To what extent do students' demographic

characteristics influence their environmental knowledge and ecological behaviour? b) Does students' ecological behaviour depend on their social values and environmental knowledge?

The subsequent sections of the paper focus on a review of the extant literature on ecological behaviour, particularly the determinants of ecological behaviour from educational perspectives and context, the application of the value-belief-norm theory in this study and the methods employed in the collection and analysis of data. The other sections of the paper include findings from the data, the discussion of the results in relation to existing studies and policy implications as well as the conclusion and recommendations.

Empirical review: Social values and environmental knowledge as determinants of ecological behaviour

To date, education has been the most prevalent strategy for bringing about behavioural change. Issues of the environment are intertwined with the sustainable development of human societies and environmental sustainability is becoming pressing. The amount of knowledge students acquire, or to a certain extent, the usefulness with which the information presented impacts their attitudes and subsequent actions, has a big impact on improving their sense of responsibility and modifying their behaviour (Al-Rabaani & Al-Shuili, 2020). While Axelrod & Lehman (1993) define ecological behaviour as the "actions which contribute towards environmental preservation and/or conservation", Martinez-Martinez et al. (2019) define the concept of environmental knowledge as "the use of knowledge management strategies, tools and techniques to create, share and reuse tacit and explicit knowledge resources related to the environment and its protection". The purpose of this study is to learn what controls students' behaviour and perceptions of environmental sustainability concerns. It's worth mentioning that educational institutions are a potent force that could be harnessed to develop a generation of environmental stewards. Developing countries, particularly those in Africa, have gotten little research attention despite the fact that they are the spots of the majority of these environmental challenges and their implications (Amoah & Addoah, 2021). Similarly, Whitley et al. (2018) conjecture that in spite of the fact that university students are expected to have a substantial impact on the future state of the environment, there is a dearth of academic research on environmental behaviour.

The COVID-19 pandemic, according to Servant-Miklos (2022), is a critical aspect in environmental education's potential to advance socio-ecological resilience. The study adds to knowledge of how environmental education might facilitate how students cope with interruptions in their everyday activities. The author interviewed students in the Netherlands about their perceptions of COVID 19 using a two-step participatory thematic study as a segment of the reflection stage of the Educational Action Research cycle. Environmental education, according to the study, can help students shift their perceptions of education's purpose from instrumental to social-transformative, thereby motivating some students to make behavioural changes.

Amoah & Addoah (2021) identified that environmental knowledge (EK) is a crucial driver of pro-environmental behaviour (PEB), where they explained PEB as any human behaviour that enhances or preserves the environment rather than harming it. To deal with the issues of environmental management that are typical in developing countries, their research employed environmental knowledge as a forecaster of varied pro-environmental behaviour among Ghanaian homes. The main purpose of their study was to determine both domestic and peripheral factors that influence a home's PEB from a developing country point of view using data from households. Environmental knowledge (internal factors) and socioeconomic (external) factors were found to be accountable for changes in PEB according to their research.

One of the ultimate purposes of education, according to Dalida et al. (2018), is to produce knowledge transmission systems in which students understand the relevance and uses of the subject matter in their life. Janmaimool & Khajohnmanee (2019) looked into how environmental system knowledge influences PEB among university students in Thailand. They identified environmental system knowledge to include political ecology, sustainable development, environment and ecology as well as environmental situations. Despite the lack of a significant difference in direct effect PEB participation between students who completed an

environmental course (Environment and Development) and those who did not, their study found a major disparity relating to environmental beliefs and implied effect of PEB participation among students who completed an environmental course and those who did not. They postulate that a variety of other factors, such as infrastructure, inclination, sense of duty, and shared norms, impact students' determination to be environmentally responsible, and that it may take time for them to put what they've learned in the classroom into practice.

Ghazali et al. (2019) established that earlier studies on PEB have paid attention to only restricted forms of PEB such as recycling while ignoring the linkages between several forms of PEBs. By means of social norms as an extension of the value-belief-norm (VBN) theory, they examined the experiences and linkages of six PEBs - activist, avoider, green consumer, green passenger, recycler, and utility saving- among Malaysian Malays and Chinese to predict their PEBs. Their study recommends that social norms should be added to the VBN theory because it enhances the predictability of PEB. They ascertain that persons who have previously engaged in PEB were more likely to do so again. The authors argued that, despite the fact that the Chinese were more interested in PEB, the two ethnic groups had fewer disparities and hence could not be categorised as entirely homogeneous ethnic groups, as earlier studies had assumed.

Using the VBN theory, Liu et al. (2018) studied the impact of the collection of socio-psychological predicting variables on public sphere PEB (PSPB) of Mongolian students in college while taking cognizance of the participation of the students regarding the sustainable development of the Inner Mongolia Autonomous Region (IMAR) of Western China. Noting that the VBN theory is a valuable tool in determining the diverse forms of PEB but had been employed in few studies in the minority communities in Western China. Their study emphasised the importance of values within the VBN theory to predict environmental sentiments among the youth in China's minority communities. As such the study recommend that to encourage PSPB among university students, academic curricula should be aligned and made relevant to societies' well-being.

Oe et al. (2022) used text mining qualitative tools to explore the potential for community-oriented learning opportunities in improving consciousness of the environment as well as promote healthful lifestyles changes of students in the university and locals in Okayama and Tokyo, Japan based on UNESCO's education for sustainable development (ESD) model. They looked into two community-based learning programs that are at the forefront of ESD policy in the two cities. Despite the fact that students found the programs engaging and lively, their findings imply that the programs' drivers and instructors recognised the significance of ESD but were more focused on \its blueprint and curricula. They establish that encouraging mutual and interactive learning activities that engage local communities to improve environmental awareness and inspire behavioural change increases participant willingness to be taught and advance ESD in communities through social education.

Stern et al. (1999) theory of value-belief-norm (VBN) is one of the most current environmental psychology theories to gain traction in the last two decades, and it is employed in this study to investigate the elements that influence students' sustainable ecological behaviour and knowledge. Only a few studies have attempted to apply the theory to non-western countries (Karimi, 2019). The VBN theory explains an individual's environmentally meaningful behaviour by establishing a continuous relationship between value orientation, belief, and norm. The theory has effectively demonstrated the backdrop of the elements of pro-environmental activity, as well as modelling, elucidating, predicting, and relating factors of pro-environmental behaviour and establishing its range (Canlas et al., 2022).

The VBN theory begins with values, which serve as a foundation for beliefs, which in turn create the norms for individuals' behavioural standards. This indicates that one's willingness to recognise that one's actions have an impact on the environment differs based on one's values. The VBN theory incorporates a large number of cause-and-effect variables to provide a more thorough explanation of the human-environment

interaction and how these interactions can affect one another (A. Akintunde, 2017). The theory proposes that, pro-environmental personal norms and beliefs influence values on environmental behaviour.

Materials and Methods

Study design and setting

This study adopted a quantitative design by following the survey approach, which allows the collection of numerical or quantifiable data from a sample of a population (Creswell, 2014). The study was conducted at the University of Environment and Sustainable Development in Ghana. As a relatively new public University with the mandate to contribute toward addressing contemporary environmental challenges, it is necessary to examine the environmental behaviour and knowledge of students in order to strategically position them to address environmental challenges through effective education and skills acquisition.

Population, sample and sampling technique

The population for the study included first year students enrolled into the two schools of the University – the School of Sustainable Development and the School of Natural and Environmental Sciences. It is important to note that this study forms part of a larger study that sought to improve climate and environmental knowledge of first year students in the University. First year students were chosen since preliminary investigation upon their arrival at the University showed that many of the students had little to no knowledge of climate change. At the time of the study, about 125 first year students admitted into the University had enrolled. According Krejcie & Morgan (1970) and Yamane (1973), a population of 125 requires the selection of a sample of 95. However, 103 students were randomly selected based on the list of first year students who had reported to the University at the time of the study. However, only those consented to voluntary participate in the study were included.

Instrument design and data collection procedure

A structured questionnaire survey was designed for collection. The questionnaire consisted of binary, multiple choice and five-point Likert scale closed-ended questions. The first section of the questionnaire solicited for information on respondents' demographic characteristics while the second, third and fourth sections solicited information on ecological behaviour, environmental knowledge and social values, respectively. The questions were adopted from existing studies (Amoah & Addoah, 2021; Kaiser et al., 1999; Siyavooshi et al., 2019) and contextualised to the Ghanaian context.

Data analysis

The data for this study was analysed through descriptive and multiple regression analyses. For descriptive analysis, mean, standard deviation and frequency were computed. To aid in multiple regression analysis, indexes were developed for ecological behaviour (EB), environmental knowledge (EK) and social values (SV) items by following Kothari & Garg's (2013) recommendations. EB consisted of 18 items, while EK and SV had 10 and 14 items, respectively. To construct the indexes, Cronbach alpha computations were performed to examine the reliability (internal consistency) of the items. EB, EK and SV resulted in 0.893, 0.867 and 0.856 coefficients, respectively (see Appendix 1A, 1B, 1C). Pallant (2016) posits that Cronbach alpha coefficients greater than 0.70 demonstrate high internal consistency in the items for the indexes.

For the purpose of regression analysis, diagnostic tests, such as normality and multicollinearity were performed. Normality test was performed using Shapiro-Wilk, box and whisker plots, and normal quartile-quartile (Q-Q) plots. The results of the correlation matrix in Table 1 shows that there was no multicollinearity in the variables of interest as none of them had high correlation exceeding 0.80 (Field, 2017). The highest inter-item correlation is observed between ecological behaviour and environmental knowledge with a coefficient of 0.651 (see Table 1). Indeed, the results of the normality tests and correlations showed that regression assumptions were met.

Three main regression computations were performed. The first regression examined the influence of respondents' demographic profile on environmental knowledge, with environmental knowledge as the dependent variable. The independent variables included gender, access to phone, current undergraduate

programme offered, locality (rural/urban), programme pursued at senior high school, household size and year of completion of senior high school. The second regression analysis also examined the influence of environmental knowledge and social values on ecological behaviour. In this analysis, ecological behaviour was the dependent variable while the independent variables include environmental knowledge and social values. In the last regression, the influence of demographic profile on ecological behaviour was assessed.

Ethical considerations

The study adhered to ethical principles of research by seeking informed consent from the participants. As indicated earlier, only participants who consented to participate voluntarily in the study were allowed to respond to the instrument. Although the instrument was adopted from existing studies, which are believed to be valid, the researchers contextualised the instrument, which was further reviewed by an expert in environmental research, thereby improving its construct and face validity (Creswell & Plano Clark, 2018). The instrument was pilot tested, leading to the revision and/or omission of ambiguous questions.

Table 1. Correlation matrix of ecological behaviour, environmental knowledge and social values

		Ecological Behaviour Index	Environmental Knowledge Index	Social Values Index
Pearson Correlation	Sustainable Behaviour Index	1.000	.651	.533
	Environmental Knowledge Index	.651	1.000	.565
	Social Values Index	.533	.565	1.000
Sig. (1-tailed)	Sustainable Behaviour Index	.	.000*	.000*
	Environmental Knowledge Index	.000*	.	.000*
	Social Values Index	.000*	.000*	.

*$p < 0.05$

Results and Discussion

Socio-demographic characteristics of the respondents

The socio-demographic profile of the respondents are presented in Table 2. About 50.5% of the respondents were females as opposed to males (49.5%). More than half of the respondents (54.4%) were 18 to 20 years old. The majority of the respondents were Christians (93.2%). In terms of present school affiliation at the University, 51.5% of the respondents were affiliated to the School of Natural and Environmental Sciences (SNES) while 48.5% were affiliated to the School of Sustainable Development (SSD). Except 5.8%, all the respondents had access to a mobile phone. The average household size among the respondents was about 5.8, with 1 and 20 being the minimum and the maximum household size, respectively. Over two-third of the respondents (80.3%) pursued Science and General Arts programmes at the Senior High School. Among this population, about 36.9% were Science students while 43.7% were General Arts students. The majority of the respondents (68%) complemented Senior High School after 2020, with 1992 as the earliest completion year while 2021 was the latest completion year among the respondents.

Table 2. Respondents' socio-demographic characteristics

Variable	Frequency (%)	Mean (SD)
Gender		
Male	51 (49.5)	
Female	52 (50.5)	
Age category		
Below 18 years	6 (5.8)	
18 – 20 years	56 (54.4)	
21 years and above	41 (39.8)	
Religious affiliation		
Christian	96 (93.2)	
Muslim	6 (5.8)	
Other	1 (1.0)	
Present School affiliation		
SSD	50 (48.5)	
SNES	53 (51.5)	
Access to phone		
Yes	97 (94.2)	
No	6 (5.8)	
Household size		5.8 (2.8)
Senior High School Programme		
Science	38 (36.9)	
General Arts	45 (43.7)	
Business	8 (7.8)	
Visual Arts	2 (1.9)	
Home Economics	8 (7.8)	
Agricultural Science	2 (1.9)	
Year of completion of SHS		
Before 2015	9 (8.7)	
After 2015	94 (91.3)	

Source: Authors' computation from fieldwork, 2022

The influence of demography on ecological behaviour and environmental knowledge

In Table 3, the results of the influence of respondents' demographic variables on their environmental knowledge are presented. The independent variables made about 17% significant contributions to the dependent variable (F (9, 93) = 3.57, p = 0.000). The most significant predictor of environmental knowledge is programme pursued at the SHS (*beta* = 0.306, p = 0.032), followed by the year of completion of SHS, which has a significant inverse relationship with environmental knowledge (*beta* = -0.201, p = 0.032). There is a significant positive relationship between current school affiliation at the University and environmental knowledge (*beta* = 0.198, p = 0.007). Other significant predictors of environmental knowledge include access to phone (*beta* = 0.178, p = 0.018) and household size (*beta* = 0.156, p = 0.026).

Table 3. Regression results of demography and environmental knowledge

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
	Gender	-.068	.087	-.058	-.789	.431	-.030	-.057	-.052
	Age category	-.083	.081	-.084	-1.028	.305	.020	-.074	-.068
	Religious affiliation	.059	.132	.030	.444	.657	.053	.032	.029
	School affiliation	.233	.086	.198	2.705	.007**	.093	.192	.178
	Access to phone	.463	.194	.178	2.390	.018*	.073	.170	.157
	Household size	.027	.012	.156	2.249	.026*	.175	.160	.148
	Programme at SHS	.129	.033	.306	3.917	.000**	.177	.272	.258
	Year of SHS completion	-.032	.015	-.201	-2.164	.032*	-.165	-.154	-.142

a. Dependent Variable: Environmental Knowledge Index

*$p < 0.05$; **$p < 0.01$

The results of the influence of demographic variables on ecological behaviour are presented in Table 4. Demographic variables in this model contributed to about 12.9% significant variation in ecological behaviour (F (9, 93) = 2.55, p = 0.004). The programme pursued at the high school was the most significant contributor to respondents ecological behaviour (*beta* = 0.19, p = 0.020), followed by current school affiliation at the University (*beta* = 0.17, p = 0.030). The results of the part and partial correlations also confirmed the relative importance of high school programme and current university programme as the significant predictors of ecological behaviour.

Environmental knowledge and social values as determinants of ecological behaviour

Table 5 presents the results of the relationship between social values, environmental knowledge and ecological behaviour. Both environmental knowledge and social values made about 46.4% positive contribution to ecological behaviour (F (6, 97) = 2.48, p = 0.000). Similarly, environmental knowledge (*beta* = 0.514, p = 0.000) and social values (*beta* = 0.243, p = 0.000) significantly predicted ecological behaviour, although the results of the part and partial correlations show that environmental knowledge made the most relative important contribution to ecological behaviour compared to social values.

Table 4. Regression results of demography and ecological behaviour

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
	Gender	-.092	.106	-.066	-.866	.388	-.012	-.062	-.058
	Age category	.012	.099	.010	.121	.904	.077	.009	.008

Religious affiliation	.058	.162	.025	.356	.722	.047	.026	.024
School affiliation	.231	.105	.165	2.193	.030*	.107	.156	.148
Access to phone	.077	.237	.025	.327	.744	-.029	.024	.022
Household size	.024	.015	.116	1.634	.104	.126	.117	.110
Programme at SHS	.095	.040	.188	2.351	.020*	.107	.167	.158
Year of SHS completion	-.016	.018	-.084	-.887	.376	-.177	-.064	-.060

a. Dependent Variable: Ecological Behaviour Index
*$p < 0.05$

Table 5. Regression results of environmental knowledge, social values and ecological behaviour

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
Environmental Knowledge Index	.612	.074	.514	8.252	.000*	.651	.501	.424
Social Values Index	.290	.074	.243	3.899	.000*	.533	.264	.200

*$p < 0.01$

Discussion

Addressing contemporary environmental challenges including climate change, requires the promotion of pro-environmental behaviour across all levels of the society, including students and educational institutions. Studies that attempt to provide empirical evidence of drivers of pro-environmental behaviour particularly in developing economies, have focused primarily on household analysis (Amoah & Addoah, 2021). While there is no doubt that households have important roles to play in tackling environmental challenges, the role of students has received less attention in the literature. However, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) through its 'education for sustainable development' initiative recognises the relevance of education institutions and students as critical stakeholders in effectively addressing environmental problems (UNESCO, 2015). To contribute to the realisation of the initiative, this study examined the factors that drive students' ecological behaviour.

Environmental knowledge constitutes both subjective and objective knowledge of individuals on the environment. Objective knowledge is more relevant in determining sustainable response to environmental challenges. For instance, having an objective knowledge of climate change can play an instrumental role in responding sustainably to climate change and its associated impacts. Subjective knowledge, while important may mislead households and individuals from taking actions that address the root causes of environmental challenges and minimise their effects. For instance, authors argue that farmers' misconception of climate change has negative implications on sustainable response to climate change. The results from this study show that current programme being offered at the University, past programme pursued at SHS, access to a phone, household size and year of completion of SHS significantly influence environmental knowledge of students.

Academic programmes have great potential to expose students to environmental challenges and the associated means of addressing them. This concurs with the position of UNESCO that education programmes and institutions can strategically empower learners with the right knowledge and attitude to tackle environmental challenges (UNESCO, 2019). Consequently, students enrolled into environmentally related programmes are more likely to have higher and objective knowledge of the environment compared to students whose programmes have little to no environmental components. For instance, at the SHS, Science programmes are more likely to expose students to environmental issues and increase their knowledge compared to business, general or visual arts programmes. Intuitively, it is essential for academic

programmes to incorporate environmental components as a means to boost environmental knowledge among students. Access to a mobile phone has been reported in the literature to increase environmental knowledge as it offers an opportunity to access relevant environment related information via the internet or receive such information on the phone through messaging (Antwi-Agyei et al., 2021; Asare-Nuamah & Amungwa, 2021). This study also confirms that students with access to mobile phones are more likely to have higher knowledge of the environment compared to their counterparts. However, it is important to note that accessing relevant environment related information on the internet requires skills and knowledge to identify credible sources of information, as information overload and disinformation characterise the recent information explosion on the internet.

The results show that household size is an important predictor of environmental knowledge. Within the Ghanaian and African cultural setting, communal living has the tendency to increase collective responsibility towards the environment. Such a phenomenon has a role to play in increasing environmental knowledge and consciousness among members of the household and the community at large. In consonance with Amoah & Addoah (2021), larger household size are therefore in a better position to have higher environmental knowledge than smaller households. The year of completion of SHS significantly but inversely predicted environmental knowledge. The inverse relationship may be due to the fact that issue of the environment and the associated challenges gained heightened attention at all sectors of the world economy including education, particularly after the Paris Agreement and the Sustainable Development Goals (Agenda 2030) in 2015. Implicitly, students who completed SHS prior to 2015 may have lower environmental knowledge compared to those who completed after 2015. This is because, many educational institutions have intensified the integration of SDGs including the environment into educational programmes in recent times compared to the last decade when environmental issues were sparingly incorporated into academic programmes, particularly in developing economies, including Ghana. Also, the global action programme on education for sustainable development, which was initiated in 2015 is a testament to the call for the inclusion of environmental issues in education (UNESCO, 2019). It is noteworthy that the environment is an integral component of the SDGs, and therefore, incorporating SDGs into educational programmes may expose students to diverse environmental challenges at national and global levels, thereby improving their knowledge.

This study highlights the importance of environmental knowledge and social values in positively and significantly predicting students' ecological behaviour, which is consistent with the VBN theory. Indeed, environmental knowledge has a great role to play in building the right attitude and mindset among students to tackle environmental challenges. Similarly, it is a tool for innovating thinking and action towards environmental problems. According to Action Aid International (2009), the environmental knowledge of students played a key role in responding effectively to Cyclone Sidr in Bangladesh. The influence of environmental knowledge on pro-environmental or ecological behaviour has been reported in the literature. For instance, Amoah & Addoah (2021) noted that households' pro-environmental behaviour in urban Ghana is driven by their environmental knowledge. In Mexico, Tapia-Fonllem et al. (2013) highlighted the centrality of environmental knowledge in University students' pro-environmental behaviour. Similar results were reported among the self-reported environmental behaviour of college students in Mongolia (Liu et al., 2018). Implicitly, improving objective environmental knowledge among students can increase positive behaviour towards environmental protection and conservation.

Again, the study reveals that social values positively affect students' ecological behaviour. In consonance with value-belief-norm and social identify theories, values offer an identity and membership to a society and bond individuals to a collective social action. Consequently, social values for the environment direct and influence attitudes and behaviour of individuals and the society at large, to collectively tackle common environmental problems. In Iran, Siyavooshi et al. (2019) found that Islamic values greatly influence behaviour toward the purchase and consumption of green products. Without doubt, certain Ghanaian social

values, such as the protection of sacred groves and forests, have been reported to promote sustainable environmental practices (Aniah & Yelfaanibe, 2018). A study in Malaysia argue that social norms significantly influence pro-environmental behaviour of Chinese and Malaysians, thereby demonstrating the centrality of social values even in a heterogeneous environment (Ghazali et al. (2019). Intuitively, integrating environmentally conscious social values and norms into educational programmes can further boost students' positive actions towards the environment. In addition, the study shows that students' ecological behaviour is driven by their past and current academic programmes, which concurs with the argument that education can positively enhance learners' pro-environmental behaviour (UNESCO, 2015, 2019).

Conclusion and Recommendations

Without doubt, students are key players in addressing contemporary environmental challenges and achieving sustainable development. Using a quantitative survey design, this study sought to examine the determinants of ecological behaviour among tertiary students in Ghana. First year students of the University of Environment and Sustainable Development were selected for this study. The results from the study show that students' environmental knowledge is influenced significantly by the programme they offered at the SHS and their current University programme as well as the size of their households and year of completion of SHS. Similarly, students' ecological behaviour is significantly determined by their environmental knowledge and social values. Essentially, improving students' knowledge of contemporary environmental challenges coupled with the strengthening of social values for the environment will be relevant to boosting ecological behaviour of learners and their societies in Ghana.

In view of this, it is imperative for academic institutions at basic, secondary and tertiary levels of education to aggressively integrate environmental education into existing and new curricula and programmes for students. This requires a collaborative effort between key stakeholders including the National Council for Curriculum and Assessment (NaCCA), the Ghana Education Service (GES), Ministry of Education (MoE), the Conference of Heads of Assisted Secondary Schools (CHASS), the Ghana National Association of Teachers (GNAT), the Ghana National Commission for UNESCO, traditional leaders, among others. Such a collaborative approach will ensure the incorporation of environmental issues from different perspectives while taking into consideration the context of the Ghanaian society. The inclusion of traditional leaders and local stakeholders is critical to ensure that social values are strengthened in academic programmes. Again, traditional leaders must collaborate with local authorities and indigenous institutions, as well as opinion leaders, for the purpose of championing and strengthening social values that promote care for the environment within their communities and households. Consequently, the interaction between social values learned from homes and the knowledge acquired through formal education will strategically position students to promote ecological behaviour.

While the sample size for this study is small as the University is relatively new and admission is low compared to other existing universities in Ghana, the results should be cautiously interpreted. Nonetheless, the results from the study have provided significant insights that can contribute immensely to promoting sustainable and pro-environmental behaviour in Ghana' educational system. Further studies should explore how different components of social values and environmental knowledge drive general and specific sustainable ecological behaviour and attitudes among Ghanaian students. Similarly, studies should examine how different educational programmes, particularly their contents, drive students' ecological behaviour and attitudes.

Conflict of interests: The authors report there are no competing interests to declare.

Data availability statement: The data supporting this study will be provided upon reasonable request.

Financial Funding: The authors received no financial support for this study

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Appendix

1A: Cronbach alpha computation for EB

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.893	.908	18

1B: Cronbach alpha computation for EK

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.867	.870	10

1C: Cronbach alpha computation for SV

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.856	.867	14