How academic discipline shapes students' environmental sustainability awareness and participation: Evidence from Knust, Ghana

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Abstract
Environmental sustainability has become a central priority for higher education institutions, yet students' awareness and participation in sustainability initiatives remain uneven across academic disciplines. This study examined environmental sustainability awareness, participation, and perceived barriers among undergraduate students from the Departments of Geography and Rural Development, Economics, and Political Studies at the Kwame Nkrumah University of Science and Technology (KNUST), Ghana. A descriptive case study design was employed, and data were collected through semi-structured interviews with 30 purposively selected undergraduate students. The data were analysed using inductive thematic analysis. The findings revealed that although students generally demonstrated awareness of environmental sustainability, their understanding and participation differed across academic disciplines. Sustainability engagement was influenced by the extent to which sustainability was integrated into academic programmes, with greater curriculum exposure associated with higher levels of awareness and participation. The study also identified institutional barriers, including inadequate funding, limited institutional support, and poor coordination of sustainability initiatives, as key constraints to student engagement. The findings underscore the need for higher education institutions to adopt a whole-institution approach that integrates sustainability across curricula, strengthens institutional support, and expands experiential learning opportunities to promote meaningful student participation in sustainability initiatives. The study contributes empirical evidence on disciplinary differences in environmental sustainability engagement and provides practical insights for designing more inclusive and effective sustainability strategies in higher education.

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1. Introduction

Universities around the world are increasingly implementing green campus initiatives such as waste reduction programmes, energy conservation measures, sustainability education and environmental awareness campaigns, to advance sustainable development and contribute to the achievement of the Sustainable Development Goals (Cubas et al., 2025). Despite these institutional efforts, many universities continue to face persistent environmental challenges stemming from unsustainable resource-use behaviours, inefficient waste management practices, and limited adoption of environmentally responsible behaviours among students (Adjei et al., 2021; Cubas et al., 2025). A study conducted at a public university in Ghana further illustrates this challenge, where students' ecological footprints exceeded environmentally sustainable levels despite relatively high environmental knowledge, suggesting that environmental awareness does not necessarily lead to sustainable behaviour (Adjei et al., 2021).

Existing studies examining environmental sustainability among university students have found differing degrees in both environmental awareness and environmentally responsible practices across different educational contexts. Moody-Marshall (2023) found that students enrolled in Natural Science programmes demonstrated higher levels of environmental awareness and environmentally responsible practices than their counterparts in the Social Sciences, suggesting that students' academic backgrounds may influence their sustainability engagement. In Ghana, Nyarkoh & Berényi (2025) observed that while sustainability education has gained momentum as an educational trend, its application is fragmented and students do not have adequate opportunities to build a deeper understanding of sustainability

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Student participation in environmental sustainability initiatives is influenced by a combination of individual and institutional factors. Students with stronger pro-ecological worldviews and prior exposure to sustainability through study, work, or volunteering demonstrated greater interest in acquiring sustainability competencies (Hyytinen et al., 2023). Similarly, curriculum relevance, practical learning opportunities, student leadership, and institutional support as key drivers of student engagement, while limited financial resources and competing economic priorities were identified as major barriers to participation (Uzorka et al., 2024). Collectively, these studies indicate that meaningful student participation in environmental sustainability depends not only on individual commitment but also on supportive institutional environments that provide opportunities for active engagement.

Despite these advances, important gaps remain in the literature on environmental sustainability within Ghanaian universities. Existing research has largely focused on institutional sustainability initiatives and specific sustainability practices, such as waste management and green consumption behaviours, with limited attention given to differences in environmental sustainability awareness and participation across academic disciplines (Agyeman-Prempeh et al., 2021; Keelson & Johnson, 2021; Owusu-Agyeman, 2021). As a result, little is known about whether students from different academic disciplines differ in their awareness of and participation in environmental sustainability. Understanding whether environmental sustainability awareness and participation vary across academic disciplines is important because disciplinary training shapes students' knowledge, values, perspectives, and approaches to environmental problem-solving (Findler et al., 2019)

To address this gap, the present study examines environmental sustainability among undergraduate students from the Departments of Geography and Rural Development, Economics, and Political Studies within the Faculty of Social Sciences at the Kwame Nkrumah University of Science and Technology (KNUST). Specifically, the study compares students' levels of environmental sustainability awareness, the forms and extent of their participation in sustainability practices, and the key challenges that hinder their engagement across the three departments. Unlike previous studies in Ghana, which have largely examined institutional sustainability initiatives or specific environmental practices, this study provides a comparative analysis of environmental sustainability awareness, participation, and perceived barriers across three academic disciplines within the same university.

1.1. Profile of KNUST Campus

The study was undertaken at Kwame Nkrumah University of Science and Technology (KNUST), located in the Oforikrom Municipality of Kumasi, Ghana. As shown in Figure 1, the KNUST campus provides an ideal setting as it combines educational infrastructure with significant green spaces that support a range of environmental sustainability initiatives. These characteristics offer a dynamic environment suitable for examining students'environmental sustainability awareness and participation at the campus scale.

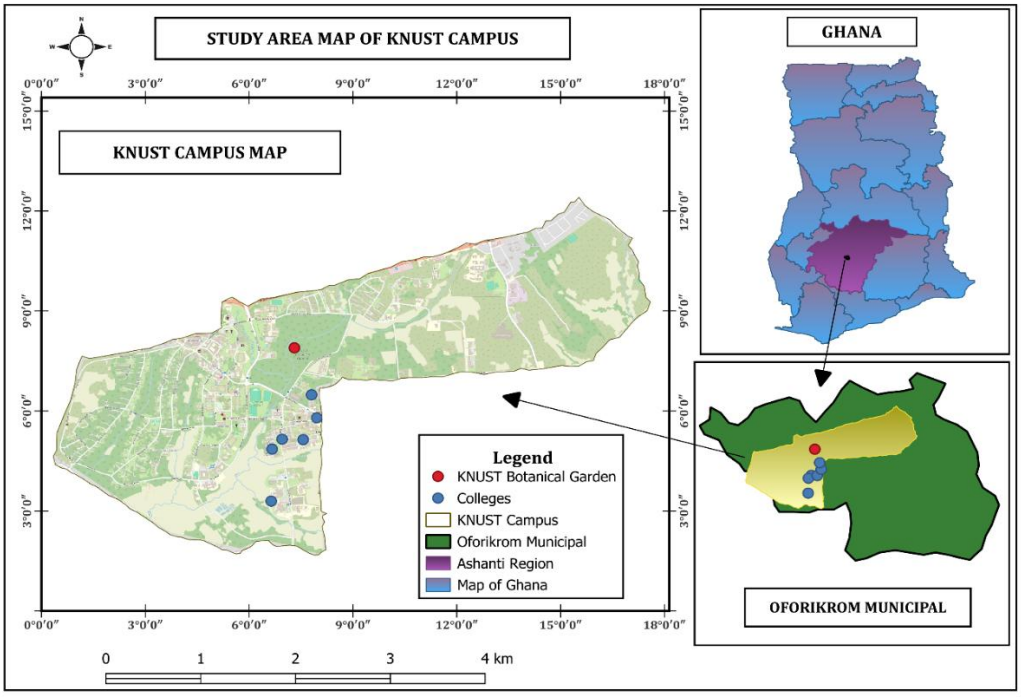

Figure 1. Map of KNUST campus, Ghana. Source: Author's construct (2026)

2. Method

This study employed a qualitative research approach using a descriptive case study design to gain an in-depth, comparative understanding of students' environmental sustainability awareness, participation, and perceived challenges across selected academic departments at KNUST. A qualitative approach is appropriate for exploring participants' experiences, perceptions, and meanings regarding a phenomenon (Creswell & Poth, 2018). The descriptive case study design enabled a deeper examination of the phenomenon within its real-life context by focusing on the Department of Geography and Rural Development, Economics, and Political Studies, thereby allowing comparisons across academic disciplines. Figure 2 illustrates the methodological process.

Figure 2. Overview of the Research Methodology

2.1. Data Collection

Data were collected through face-to-face semi-structured interviews using an interview guide developed in line with the study objectives. Semi-structured interviews were selected because they enabled participants to express their experiences and perceptions in depth while allowing the researcher to probe emerging issues and maintain consistency across interviews. The interview guide comprised four sections covering demographic characteristics, environmental sustainability awareness, participation in sustainability practices, perceived barriers to participation, and suggested improvement measures. Interviews were conducted after obtaining informed consent and were audio-recorded with participants' permission to facilitate accurate transcription and analysis.

2.2. Data Analysis

Data were analysed thematically using an inductive approach to capture students' experiences and perceptions. All interviews were audio-recorded and transcribed verbatim to preserve participants' original meanings. The transcripts were read several times to gain familiarity with the data. Key ideas and recurring patterns were identified and coded; the coded data were compared for similarities and differences before being organised into broader themes reflecting students' environmental sustainability awareness, participation, and perceived challenges. To enhance credibility and reduce bias, the identified themes were reviewed and validated through consensus-building.

2.3. Participants and Sampling

A stratified purposive sampling technique was employed to ensure representation from each of the three selected departments while enabling the deliberate selection of participants with relevant knowledge and experience in campus sustainability issues. The departments served as the sampling strata, and within each stratum, participants were purposively selected based on their willingness to participate and their ability to provide rich information relevant to the study objectives. A total of 30 undergraduate students from the Departments of Geography and Rural Development, Economics, and Political Studies were interviewed. Third and second-year students were prioritised, as they were considered more familiar with the activities carried out on campus and with existing sustainability programmes. Although the sample size was predetermined to facilitate interdepartmental comparison, thematic saturation was observed between the 25th and 30th interviews, as responses became repetitive and no substantially new themes emerged. Table 1 presents the demographic characteristics of the participants.

Table 1. Participants (N=30)

Variable	Category	Frequency	Percentage
Department	Geography & Rural development	10	33.3
	Economics	10	33.3
	Political Studies	10	33.3
Gender	Male	16	53.3
	Female	14	46.7
Age	18-24	26	86.7
	25-30	04	13.3
Year of Study	2nd Year	12	40.0
	3rd Year	18	60.0

Equal representation was achieved across the three departments. The sample consisted of slightly more males (53.3%) than females (46.7%). Most participants (86.7%) were between 18 and 24 years old, while 60% were third-year students. This distribution indicates that the findings largely reflect the perspectives of students who are actively engaged in university life and are likely to have substantial exposure to campus sustainability initiatives.

3. Results and Discussion

The analysis identified four main themes: students' understanding of environmental sustainability, participation in sustainability practice, the influence of academic discipline on participation, and the barriers to participation.

3.1. Understanding Environmental Sustainability

Participants across the three departments demonstrated awareness of environmental sustainability, although their explanations reflected disciplinary perspectives.

> "Environmental sustainability means protecting the natural resources and ensuring that human activities do not destroy the environment for the benefit of future generations." (P3, Geography)

> "To me, environmental sustainability is about using resources efficiently in a manner that ensures that the developmental process goes on without destroying the environment." (P12, Economics)

> "In my view, environmental sustainability is about having policies that inform the manner in which people utilize environmental resources to ensure they are not depleted." (P21, Political Studies)

3.1.1. Student Participation in Environmental Sustainability Practices

Participants reported different forms of participation in sustainability-related activities on campus. These activities ranged from organised environmental campaigns to individual behavioural practices.

> "Our department sometimes organises environmental campaigns and cleaning exercises, and many of the students participate in them." (P1, Geography)

> "In my hostel, I try not to leave the lights or fan on when I am not around, and I'm careful about how I use water. It may be small, but I believe those things are important". (P14, Economics)

> "I've heard about some environmental activities on campus, like clean-up exercises, but personally, I haven't taken part in any." (P23, Political Studies)

3.1.2. Influence of Academic Discipline on Participation

Students indicated that academic programmes influence their awareness and participation in sustainability.

> "Most of our courses discuss environmental issues, so it makes us more aware of sustainability." (P2, Geography)

> "In economics, we sometimes talk about environmental issues, but it is mainly in relation to economic policies." (P15, Economics)

> "We discuss environmental governance in some courses, but there are not many practical activities related to it." (P30, Political Studies)

3.1.3. Barriers to Student Participation in Sustainability Initiatives

Participants identified several challenges that limit student participation in environmental sustainability activities on campus.

> "We are sometimes interested in organising environmental programmes, but there is not enough support from the university." (P9, Geography)

> "Many environmental projects require funding, and without financial support, it becomes difficult to organise them." (P17, Economics)

> "There are some environmental campaigns on campus, but they are not well coordinated, so many students don't hear about them." (P28, Political Studies)

3.2. Discussion

The findings indicate that students' conceptualisations of environmental sustainability differ according to their disciplinary backgrounds. Geography students predominantly viewed environmental sustainability as the interaction between humans and the natural environment, reflecting the discipline's emphasis on human-environment systems. In contrast, Economics students understood sustainability mainly in terms of efficient resource use, waste reduction, and balancing economic development with environmental protection, while Political Studies students framed sustainability as a governance issue centred on environmental policy, institutional responsibility, and leadership. These differences suggest that students interpret environmental sustainability through the theoretical perspectives and priorities of their respective disciplines. This finding is consistent with the study by Gericke et al (2019), who argue that sustainability consciousness is shaped by the knowledge, attitudes, and behaviours developed through educational experiences. Similarly, Menon & Suresh (2020) contend that sustainability education in higher education is often embedded within disciplinary contexts, leading students to develop discipline-specific understandings of sustainability. Sørensen & Stenalt (2025) further demonstrate that students from different academic backgrounds approach sustainability from distinct perspectives, highlighting both the value of disciplinary diversity and the challenge of fragmented sustainability thinking when interdisciplinary learning is limited. Consequently, as emphasised by Leal Filho et al (2018), higher education institutions should promote interdisciplinary sustainability education that enables students to integrate environmental, social, economic, and governance perspectives, thereby developing a more comprehensive understanding of complex sustainability challenges.

The findings also revealed notable disciplinary differences in students' participation in environmental sustainability activities. Geography students reported greater involvement in organised activities, such as environmental campaigns and community clean-up exercises, whereas Economics students predominantly engaged in individual pro-environmental practices, including conserving electricity and water. Political Studies students reported the lowest level of participation in sustainability-related activities. These variations suggest that students engage in environmental sustainability in different ways, ranging from collective environmental action to individual conservation behaviours. This finding is consistent with Ifegbesan et al (2017), who observed that although university students generally possess environmental awareness, this awareness does not always translate into active participation, as engagement is shaped by behavioural factors and opportunities for involvement. Likewise, Benzehaf et al (2025) identified an awareness-action gap among Moroccan university students, where environmental concern was expressed primarily through simple individual conservation practices rather than participation in organised sustainability initiatives. From an Education for Sustainable Development perspective, González-salamanca et al (2020) argue that meaningful sustainability engagement is strengthened through participatory and experience-based learning that enables students to develop critical thinking, collaboration, and problem-solving competencies. Taken together, these findings suggest that while individual conservation behaviours are important, organised and collaborative sustainability activities provide greater opportunities for students to translate environmental awareness into meaningful environmental action.

An important finding of this study is that the extent to which environmental sustainability is embedded within academic programmes influences students' sustainability engagement. Geography students reported that environmental sustainability is regularly integrated into coursework and field-based learning, which they perceived to enhance both their environmental awareness and participation in sustainability-related activities. In contrast, students from the Economics and Political Studies programmes indicated that environmental sustainability receives comparatively less emphasis within their curricula, limiting their opportunities to engage with sustainability beyond theoretical knowledge. This finding underscores the pivotal role of Education for Sustainable Development (ESD) in equipping students with the competencies required to respond to complex environmental challenges. Studies by Olsson et al (2022) and Demirci et al (2025) similarly emphasise that embedding ESD throughout academic programmes, using interdisciplinary and systems-based approaches, is fundamental to developing the knowledge, values, critical thinking, and behavioural competencies needed for meaningful sustainability engagement. However, curriculum integration alone is insufficient unless students are provided with opportunities to apply these competencies in practice. Ardoin et al (2020) demonstrate that environmental education achieves stronger sustainability outcomes when it incorporates experiential, participatory, and action-oriented learning, allowing students to translate sustainability knowledge into real-world environmental action. Taken together, these findings suggest that effective sustainability engagement depends not only on the inclusion of ESD within university curricula but also on learning environments that enable students to apply sustainability principles through authentic and practical experiences.

The findings identified barriers, including limited institutional support, inadequate funding for student-led environmental initiatives, and poor coordination of sustainability programmes, as key constraints to students' participation. These challenges highlight that sustainability engagement is shaped not only by students' awareness and willingness but also by the institutional structures that create opportunities for participation. Sustainability policies in universities often remain fragmented during implementation due to limited resources, weak leadership commitment, and limited cross-departmental collaboration (Dalelo., 2025; Thondhlana & Nkosi., 2024),. Effective sustainability implementation requires a whole-institution approach in which governance, curriculum, campus practices, and stakeholder collaboration are aligned to support

sustainability goals (Beynaghi et al., 2016; Sanchez et al., 2025; Leal Filho et al., 2021). Therefore, strengthening institutional commitment, providing adequate resources, and establishing coordinated sustainability systems are essential for creating meaningful and sustained opportunities for student participation.

4. Conclusion and Recommendations

This study demonstrates that students' environmental sustainability engagement in higher education extends beyond individual awareness and is shaped by the interplay between disciplinary learning, curriculum design, and institutional support. Although participants generally understood the importance of environmental sustainability, differences in their engagement highlight the need for universities to move beyond isolated sustainability initiatives towards more integrated and practice-oriented approaches. The findings suggest that sustainability education is most effective when it is embedded across academic programmes, supported by experiential learning opportunities, and reinforced through institutional policies and coordinated campus initiatives. Addressing institutional constraints such as inadequate funding, limited organisational support, and weak coordination is therefore essential to creating an enabling environment for meaningful student participation.

Given that this study was conducted within one faculty of a single university using a qualitative case study approach, future research could examine disciplinary differences across multiple higher education institutions using mixed-methods to provide broader evidence on how curriculum, institutional contexts, and student experiences interact to influence environmental sustainability engagement.

Author Contributions

For clarity, the roles and contributions of each author to this study are detailed as follows: Ebenezer Osei Akuoku: conceptualisation, Methodology, Data curation, Formal analysis, Investigation, Writing - original draft, writing - review and editing, Visualisation, Project administration, Supervision. Bernard Akowuah: Data curation, Formal analysis, Validation, Writing -review and editing. Priscilla Sugri Alhassan: Validation, Data curation, Writing - review and editing.

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Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability

The datasets generated during and/ or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration on AI Use

The authors declare that no artificial intelligence (AI) or AI-assisted tools were used in the preparation of this manuscript.

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