Revista Brasileira de Ciências Ambientais
Brazilian Journal of Environmental Sciences

An empirical investigation on undergraduate students' perception and assessment of sustainability education

Uma investigação empírica sobre a percepção e a avaliação da educação para a sustentabilidade por estudantes de graduação

Ferdous Ahmed[1], *Adnan Chowdhury*[2], *Tamanna Siddiqua Ratna*[1], *Md. Sohel Rana*[1]

ABSTRACT

Achieving the Sustainable Development Goals (SDGs) by 2030 remains one of the vital global priorities, and Bangladesh is no exception. A key pathway to meeting these goals lies in educating graduates in sustainability to ensure national and global development. The integration of sustainability knowledge into higher education has significantly facilitated the lifelong learning process. At the International University of Business, Agriculture, and Technology, sustainability-focused courses have been incorporated into the undergraduate curriculum since 2013, reflecting a long-standing institutional commitment to fostering sustainable development education in Bangladesh. This study aimed to assess perceptions of sustainability and environmental practices among students on campus; thus, a multinomial logistic regression model was employed as the primary analytical tool. Findings revealed that 91.1% of students demonstrate a sufficient understanding of sustainability, and 93.9% agree that a sustainability-oriented approach positively influences them to change their lifestyles. However, 41.0% of respondents reported that they would participate in on-campus sustainability projects, while 47.8% strongly agreed, demonstrating a gap between awareness and active involvement. Lastly, this study suggests that increasing the number of undergraduate sustainability-focused courses offered by universities can enhance a country's ability to promote sustainability-related projects. These improvements in education are likely to lead to an increase in the number of graduates who show greater concern for sustainability and are eager to become involved in environmental initiatives both on- and off-campus. Consequently, this aids in global and national endeavors to accomplish the SDGs by 2030.

Keywords: sustainability education; undergraduate students, SDGs, universities; IUBAT; Bangladesh.

RESUMO

Atingir os Objetivos de Desenvolvimento Sustentável (ODS) até 2030 continua sendo uma das prioridades globais vitais, e Bangladesh não é uma exceção. Um caminho fundamental para alcançar esses objetivos reside na formação de graduados em sustentabilidade, visando garantir o desenvolvimento nacional e global. A integração do conhecimento sobre sustentabilidade no ensino superior tem facilitado significativamente o processo de aprendizagem ao longo da vida. Na *International University of Business, Agriculture, and Technology* (em português, Universidade Internacional de Negócios, Agricultura e Tecnologia), disciplinas focadas em sustentabilidade foram incorporadas ao currículo de graduação desde 2013, refletindo um compromisso institucional de longa data com o fomento da educação para o desenvolvimento sustentável em Bangladesh. Este estudo teve como objetivo avaliar as percepções sobre sustentabilidade e práticas ambientais entre os estudantes do campus; para tanto, um modelo de regressão logística multinomial foi empregado como principal ferramenta analítica. Os resultados revelaram que 91,1% dos estudantes demonstram compreensão suficiente sobre sustentabilidade, e 93,9% concordam que uma abordagem orientada para a sustentabilidade os influencia positivamente na mudança de estilo de vida. Contudo, 41,0% dos respondentes informaram que participariam de projetos de sustentabilidade no *campus*, enquanto 47,8% concordaram fortemente, demonstrando uma lacuna entre a conscientização e o envolvimento ativo. Por fim, este estudo sugere que o aumento do número de disciplinas de graduação com foco em sustentabilidade oferecidas pelas universidades pode melhorar a capacidade de um país de promover projetos relacionados à sustentabilidade. Essas melhorias na educação provavelmente levarão a um aumento no número de graduados que se preocupam mais com a sustentabilidade e estão ansiosos para se envolver em iniciativas ambientais dentro e fora do *campus*. Consequentemente, isso auxilia nos esforços globais e nacionais para alcançar os ODS até 2030.

Palavras-chave: educação para a sustentabilidade; estudantes de graduação; ODS; universidades; IUBAT; Bangladesh.

[1]International University of Business Agriculture and Technology – Bangladesh.
[2]Bangladesh Bank – Bangladesh.
Corresponding author: Ferdous Ahmed – International University of Business Agriculture and Technology, Department of Environmental Science – 4 Embankment Drive Road, Sector 10 – Uttara – Postal Code: 1230 – Dhaka, Bangladesh. E-mail: ferdous.ahmed@iubat.edu
Conflicts of interest: the authors declare no conflicts of interest.
Funding: none.
Received on: 04/14/2025. Accepted on: 10/29/2025.
https://doi.org/10.5327/Z2176-94782560

Introduction

Higher education institutions (HEIs) play a fundamental role and bear significant responsibility in promoting sustainability and achieving the Sustainable Development Goals (SDGs) (Leal et al., 2024). To drive the necessary transformation in education, sustainability principles must be embedded at the core of institutional strategies encompassing curricula, operational practices, and organizational culture (Žalėnienė and Pereira, 2021). However, Shih et al. (2025) emphasized the importance of fostering cross-disciplinary collaboration, securing institutional commitment, and leveraging technological advancements to mainstream sustainability. Similarly, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) highlights the need for integrating SDG-related indicators into course metrics in higher education (Mahesh et al., 2024). Existing research identifies several thematic areas supporting environmental sustainability within universities. As per Miranda et al. (2021) three core domains are identified: environmental education, sustainability integration, and environmental protection. Moreover, Trevisan et al. (2023) pointed out emerging priorities, including the development of sustainability competencies through digital transformation, the implementation of smart and sustainable campus models, and the theorization of sustainability in higher education. Strengthening sustainability competencies through active learning, capacity-building for students and faculty, and curriculum reform remains essential for achieving Education for Sustainable Development (ESD) and the SDGs (Rahardjanto and Husamah, 2024). Furthermore, effective knowledge codification and generation have been shown to significantly enhance the sustainability of HEIs (Budur et al., 2024).

Sustainability education must be rooted in justice and provide all learners with the knowledge needed to understand and transform their environments, from local to global contexts (Ajaps, 2023). While interdisciplinary curriculum models in higher education offer transformative potential, they also present significant challenges (Ajiga et al., 2025). Universities play a crucial role in advancing sustainability, and developing sustainability competencies in graduates should be a central educational goal (Kioupi and Voulvoulis, 2022). Education is essential for achieving the SDGs and supporting the transition toward sustainable societies (Kioupi and Voulvoulis, 2022). However, successful implementation depends heavily on educators. Without adequate training, incentives, and systemic support, initiatives such as ESD and Service-Learning may fall short (Álvarez-Vanegas et al., 2024). Key priorities for future graduates include fostering professionals committed to society and nurturing critical thinking and ethical awareness (Idoiaga Mondragon et al., 2023). Yet, differing interpretations of sustainability and the SDGs pose challenges for HEIs, highlighting the need for clear strategic communication and stakeholder engagement (Dziubaniuk et al., 2024). In Thailand, critical sustainability issues in HEIs include the integration of strategic vision, safety, well-being, waste management, and the structure of educational systems (Tabucanon et al., 2021). Despite focusing on environmental actions, many institutions have overlooked social engagement, collaboration, management training, and internal assessments (Sanchez-Carrillo et al., 2021). Moreover, a deeper appreciation for sustainability research processes remains necessary (Leal Filho et al., 2023), along with active faculty involvement and interdisciplinary approaches (Abo-Khalil, 2024). Sustainability must be embedded throughout entire curricula, not limited to specific disciplines (Husic, 2024). Student exposure to SDG-related courses significantly contributes to implementation efforts (Leal Filho et al., 2024). HEIs have a clear mandate to address the 2030 Agenda (Ruiz-Mallén and Heras, 2020), and quality, pro-sustainability education is increasingly essential (Olmos-Gomez et al., 2020). Comparisons between early and senior students show measurable growth in sustainability competencies (Muñoz-Rodríguez et al., 2020), reinforcing the impact of education. HEIs remain central to the transition toward environmental education for sustainability (Luna-Krauletz et al., 2021). Globally, the higher education sector is increasingly aligning with the United Nation (UN)'s SDGs, though debates continue over the content and pedagogical approaches of higher ESD (Probst, 2022). Nonetheless, the importance of integrating sustainability across all university departments is gaining recognition (Basheer et al., 2024), even as the specific contributions of individual HEIs and researchers remain somewhat unclear (Leal Filho et al., 2025). Ultimately, as institutions shaping future generations, universities are uniquely positioned to lead the transformation toward sustainable development (Popowska and Sady, 2024).

However, the successful implementation of ESD programs faces several challenges, including limited understanding of the concept of sustainability, insufficient resources and institutional support, inadequate integration of ESD into the curriculum, lack of teacher training, low levels of student engagement, absence of systematic assessment and evaluation mechanisms, and a lack of collaboration and partnerships among stakeholders. According to previous research, education plays a critical role in enhancing public awareness of environmental and ecological issues, slowing population growth, and improving agricultural productivity, all of which are essential for sustainable development in Bangladesh. Environmental concerns are just getting started in Bangladesh. The influence of technological breakthroughs, ecological and environmental concerns, and their effects on society and people are poorly understood. In Bangladesh, many universities offer courses on sustainable development to prepare students to tackle sustainability challenges. In recent years, course curricula have included social and environmental themes in addition to economic ones in the past few years. Numerous universities in Bangladesh offer graduate and undergraduate programs that include courses in environmental/green marketing, green accounting, ethical business practices, waste management, and environmental management. Notably, green universities need to contribute more to sustainability performance as they become more widespread. In the higher education sec-

tor, there is considerable growth in demand for sustainable development and social responsibility-oriented undergraduate degrees, with many more courses and a healthy uptake. The International University of Business, Agriculture, and Technology (IUBAT), a private university in Bangladesh, has also developed courses that educate students on sustainable development, enabling them to contribute effectively to society and easily accomplish the SDGs. Ther fore, this study aimed to investigate sustainability assessment among undergraduate students at IUBAT to determine their knowledge levels after attending the introductory environmental course, which addresses the overall challenges of SDGs in Bangladesh.

Review of Literature

Olsson et al. (2022) reported that sustainability education improves self-perceived action competence for sustainability (SPACS) and environmental citizenship, especially when taught holistically, according to the authors' long-term study of 760 Swedish students conducted between 2017 and 2019. Pluralistic teaching approaches, however, had no discernible effect, underscoring the need to strengthen this area of sustainability education (Olsson et al., 2022). However, according to Mattos et al. (2022), some dimensions like leadership, student and societal focus, strategic planning, transparency, and management by competences are essential for identifying important indicators to assess the efficacy of sustainability evaluations in undergraduate education. These concepts have a direct impact on the effectiveness of higher education management, highlighting the importance of adjusting to changing conditions and encouraging quality enhancement. In order to improve the overall management and sustainability of HEIs, the Baldrige Excellence Model provides a framework for evaluating these metrics (Mattos et al., 2022). Besides Gönczi (2023) identifies a number of sustainability performance metrics that assist businesses in measuring and controlling sustainability performance, including the Sustainable Balanced Scorecard (SBSC), Organizational Sustainability Performance Index (OSPI), and Corporate Sustainability Index (ISE). These frameworks stress the value of incorporating sustainability into performance management, and they could be adapted for use in educational settings to analyze sustainability evaluations (Gönczi, 2023). A third of the participants cited two factors, while about one-third mentioned all three. A study conducted in Pakistan by Jamil et al. (2024) demonstrates that although the textbook discusses sustainability from an environmental, social, institutional, cultural, and values-based perspective, it does not sufficiently address economic sustainability and makes no specific reference to sustainable practices or green technologies. Based on the Punjab Curriculum and Textbook Board's educational policies, the results indicate that the textbook has limitations in encouraging students to become responsible citizens. Enhancing the curriculum with thorough coverage of all sustainability components and integrating ESD are two suggestions for change that would better prepare students for responsible social involvement (Jamil et al., 2024).

The SDGs, a set of 17 interconnected goals that address the main development challenges faced by people in Bangladesh and around the world, are being pursued by the UN and its partners in Bangladesh. The UN agencies in Bangladesh have been collaborating in a fresh and cogent manner as per the 2030 Agenda for Sustainable Development and UN Development System Reform (UNDS) to assist the government in implementing the SDGs and increasing the development effect (Uddin et al., 2019). Bangladesh, as a developing nation, faces significant challenges related to environmental, social, and economic sustainability across multiple sectors. Educational institutions play a crucial role in developing human capital aligned with the country's natural and socio-economic resources. To enhance students' understanding of these interconnected challenges, it is essential to adapt curricula by integrating relevant sustainability-focused course components. Additionally, curricula should be periodically updated to align with evolving societal and environmental needs. Prior to 1995, the higher education system in Bangladesh lacked a timely and structured approach to environmental education. Since then, both public and private universities have begun offering programs in diverse disciplines, including in-demand fields such as environmental studies. Among private institutions, North South University introduced environmental sciences and management in 1995, followed by Independent University in 1996, marking a significant step toward integrating sustainability into higher education. Recently, Dhaka University and Jahangir Nagar University began offering undergraduate programs in environmental education.

However, these universities demand more facilities for study and research. Environmental studies are taught at the Master of Science (MSc) level (and occasionally at the undergraduate level) at Bangladesh Agricultural University (BAU), Khulna University's Life Science School, and the Civil Engineering Department of Bangladesh University of Engineering and Technology (BUET). At BUET in Dhaka, environmental engineering courses are offered at both the postgraduate and undergraduate levels. In addition, the undergraduate civil engineering curricula at the Bangladesh Institutes of Technology (BITs) include environmental engineering classes. Every university in Bangladesh attempted to launch its program in the years following 1990, focusing on the most recent social, economic, and environmental problems that may directly affect sustainability approaches. In line with this, IUBAT has also introduced environment-related education to undergraduate and postgraduate students. Additionally, most business studies programs incorporate sustainability into their curricula. The literature on campus sustainability for sustainable education in Bangladesh needs to be revised. More research should focus on student awareness or adoption of sustainability practices or activities. However, this research specifically highlighted the sustainability assessment of education for sustainable development in private universities in Bangladesh, such as

IUBAT. Therefore, this study aimed to measure students' perceptions and knowledge of sustainability and their willingness to participate in environmental efforts on- and off-campus.

Methodology

This study employed a descriptive cross-sectional design with a quantitative approach to assess students' knowledge, awareness, and attitudes toward the SDGs at IUBAT in 2020. The conceptual framework defined knowledge through perceived environmental impacts, awareness via understanding of sustainability concepts and campus practices, and attitude by willingness to engage in sustainability activities. A semi-structured, self-administered questionnaire was developed based on a literature review and validated by two public health experts, yielding a Cronbach's alpha of 0.83. The questionnaire contained 30 items covering socio-demographics, knowledge, awareness, and attitudes. A convenience sampling method was used, involving 179 undergraduate students from five departments (Business Administration, Computer Science and Engineering, Electrical and Electronics Engineering, Civil Engineering, and Mechanical Engineering). Participation was voluntary and limited to enrolled students during the data collection period. Questionnaires were distributed in classrooms, and informed consent was obtained. Confidentiality was ensured by not collecting personally identifiable information, and ethical clearance was obtained from the institutional research committee. Data were manually entered, cleaned, and coded using Statistical Package for the Social Sciences (SPSS), version 20. Incomplete or invalid responses were excluded from analysis. Two statistical techniques were employed based on the data type:

1. Multiple response analysis, to summarize responses with multiple selections on knowledge, awareness, and attitude items; and,
2. Multinomial logistic regression, to examine the relationship between campus activity related to sustainable practices and students' attitudes toward environmental responsibility. This tool was chosen due to the categorical nature of the dependent variable.

Multiple response analysis

Multiple response analysis is a frequency investigation of data that encompasses several responses from each participant, as seen in a multiple-response survey question. Multiple response analysis facilitates an assortment of responses to be combined and collectively analyzed, rather than treating them as distinct variables. The SPSS multiple response sets function is used to perform multiple response analysis on this data set.

Multinomial logistic regression

Qualitative and quantitative responses were gathered from the semi-structured research question, which motivated the adoption of multinomial logistic regression for the subsequent analysis. This statistical model is used to analyze relationships between a categorical dependent variable with three or more unordered levels and one or more independent variables. It uses maximum likelihood estimation to evaluate the probability of categorical membership. This model aims to determine whether the respondents consider IUBAT a leader in sustainable practices for the university students. The questionnaire was distributed to 179 students from five colleges in IUBAT.

The sample size was tested for adequacy using the criteria proposed by Pate et al. (2023) and applied to the multinomial prediction model. Based on the expected model fit (Nagelkerke R^2) and considering a target shrinkage factor (S) of 0.9 to limit overfitting, the minimum required sample size per logit was estimated at approximately 51 observations, yielding a total minimum of 154 for three logits based on the four outcome categories. The actual sample of 179, therefore, exceeds this threshold, meeting the recommended conditions for developing a well-calibrated multinomial logistic model.

Eight independent variables were examined using the chi-square test of independence. After excluding four variables that were not significant, the subsequent analyses were conducted using the remaining four variables which are considered to be leaders in sustainability practices. The odds ratios for the variables in the multinomial logistic regression model were determined through maximum likelihood estimation. The validity of the model was assessed with a likelihood ratio test.

Once the multinomial regression model is created, the parameters are used to predict the probability of an event occurring compared with the reference category. Let Y be a categorical dependent variable with j unordered levels (j>2), and X be a matrix of independent variables with K columns. The multinomial logistic regression model assumes that the probability of Y taking on the j^{th} level, given X, is expressed by Equation 1:

$$P(Y = j/X_1, X_2, X_3, \ldots . X_K) = P(Y = j/K); j = 0,1, \ldots . , J \quad (1)$$

$$P(Y = j/X) = \frac{\exp\,(X\beta_j)}{1 + \sum_{h=1}^{J} \exp(X\beta_h)} = p_j(X, \beta); j = 1, \ldots . , J \quad (2)$$

$$P(Y = 0/X) = \frac{1}{1 + \sum_{h=1}^{J} \exp(X\beta_h)} = p_0(X, \beta) \quad (3)$$

Where:

β_j = vector of regression coefficients associated with the j^{th} level of Y; and

$\exp(X\beta_j)$ = odds of Y taking on the j^{th} level, given a one-unit increase in Xj.

The denominator of the equation is the sum of the odds for all J-1 categories, ensuring that the probabilities sum to 1 across all categories. In multinomial case, response probabilities were represented in Equations 2 and 3.

Maximum likelihood was used to estimate multinomial logit models, in which the logarithm of the likelihood function, that typically

provides consistent and asymptotically normal estimators, is expressed by Equation 4 as:

$$I(\beta) = \sum_{i=1}^{n}\sum_{j=0}^{J} I[Y_i = j] \log[p_j(X_i, \beta)] \quad (4)$$

Where:

βj = vector of regression coefficients associated with the j^{th} level of Y;

$\exp(X\beta j)$ = odds of Y taking on the j^{th} level, given a one-unit increase in Xj;

Y_i = observed level of the dependent variable for the i^{th} observation; and

n = sample size.

The objective is to find the values of β that maximize the likelihood function.

The nominal dependent variable of the study was "campus is a leader in sustainable practices." The responses were organized as strongly disagree, disagree, agree, and strongly agree. The variables believed to influence responses to "campus is a leader in sustainable practices" include: whether environmental issues directly affect life; understanding the term sustainability; campus community is well-informed about sustainable practices; and willingness to participate in sustainability activities on campus.

Both campus communities are well-informed about sustainable practices and willingness to participate in sustainability activities on campus are categorical variables with multiple levels. These were dummy-coded to conduct the analysis. The independent variables employed in the study, along with their levels, are listed in Table 1.

The dependent variable employed in the study is described as follows:

Dependent Variable	Levels of Dependent Variable
Y: Campus is leader in sustainable practices	Strongly disagree Disagree Agree Strongly agree

Table 1– Independent variables employed in the study and their levels.

Independent variables	Levels of independent variables
X1: Whether environmental issues directly affect Life	1. Yes 2. No
X2: Understanding the term sustainability	1. Yes 2. No
X3: Campus community is well-informed about sustainable practices	1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
X4: Willingness to participate in sustainability activities on campus	1. Very willing 2. Somewhat willing 3. Willing 4. Not willing

By incorporating the above discussions into the context of this study, the underlying model can be expressed as follows in Equation 5:

$$\log\left(\frac{P(Y = j|X = x)}{P(Y = j|X = x)}\right) = \beta_{ho} + \beta_{h1}X_1 + \beta_{h2}X_2 + \beta_{h3}X_3 + \beta_{h4}X_4 \quad (5)$$

Model fit was assessed using likelihood ratio tests, Nagelkerke pseudo-R^2, and goodness-of-fit tests. Odds ratios with 95% confidence intervals were reported, and statistical significance was considered at the 5 and 10% levels.

Limitations of the study

This research acknowledges various methodological constraints. Convenience sampling limits the generalizing ability of results beyond the sampled institution. The self-reported nature of the data may add social desirability bias, especially in replies about environmental responsibility. The questionnaire exhibited significant internal consistency; nevertheless, broader validation and a pilot study could have strengthened its robustness. The cross-sectional design ultimately precludes any inference of causality between predictors and attitudes. It may also fail to capture the nuances within each response category. Furthermore, since the multinomial logistic regression was conducted using close-ended questions in this survey, it did not provide the in-depth complexity of students' perspectives on environmental sustainability issues. However, these limitations can easily be overcome by conducting in-depth focus group discussions to discuss the factors influencing IUBAT students' awareness of environmental sustainability and the reasons behind their views. This will paint a more complete picture of students' awareness and motivations.

Results

Findings from multiple response analysis

By adopting the multiple response analysis, this study presented descriptive findings in response to IUBAT students' awareness and practices related to environmental issues and SDG goals. The overall response to the "responsibility on environmental issues" is presented in Table 2. Out of 179 students, 108 strongly agreed with responsibility for environmental issues, representing 60.3%. This finding indicates that whatever knowledge the students receive from the ENV-101 Environmental Science and Sustainability course has a positive significance in changing students' psychology toward environmental issues, leading to sustainability in their daily lives.

However, a multiple response analysis in Figure 1 shows the frequencies and percentages by case and response to "issues about sustainability." This analysis shows that the percentage of affirmative responses is very close to knowledge and concern about

sustainability related to waste, safety and security, unemployment, resource consumption, water use, health and wellness, and local business or local economy. This study shows that those knowledgeable about these sustainability aspects are equally concerned. In the case of education, knowledgeable people are less concerned about their education in sustainability; instead, they are more concerned about the significance of sustainability efforts. As for other cases, it has been noted that students are more eager for knowledge of sustainability, but their willingness to act could be stronger. The findings of the current study are validated by the existing literature, where scholars have pointed out similar issues (Strong, 1998; Arbuthnott, 2009; Zsóka et al., 2013; Boca and Saraçlı, 2019).

Figure 2 presents multiple responses regarding the information about on-campus sustainability activities and the best way to access them collectively. Multiple response analysis of the data depicts the various methods students use to access information about sustainability on campus and their perceptions of the effectiveness of those methods. The findings indicate that while many students access information through Blackboard and email, they need to consider these methods effective for learning about sustainability. On the other hand, students perceive platforms dedicated to sustainable community development initiatives, such as website designs, social networking sites, posters/flyers, and events, as more effective for learning about sustainability. This result suggests that current educational curricula must equip professors to convey sustainability approaches effectively. The findings of this study are unique, and only limited literature is available in the knowledge domain (Alturki and Aldraiweesh, 2023), which is a significant contribution to the existing literature. Overall, students' perspectives indicated a need for more interactive and engaging strategies to improve sustainability understanding and practices on campus. This outcome suggests that lecture knowledge alone is inadequate; rather, it necessitates the exploration of more multidimensional ways to achieve significant understanding.

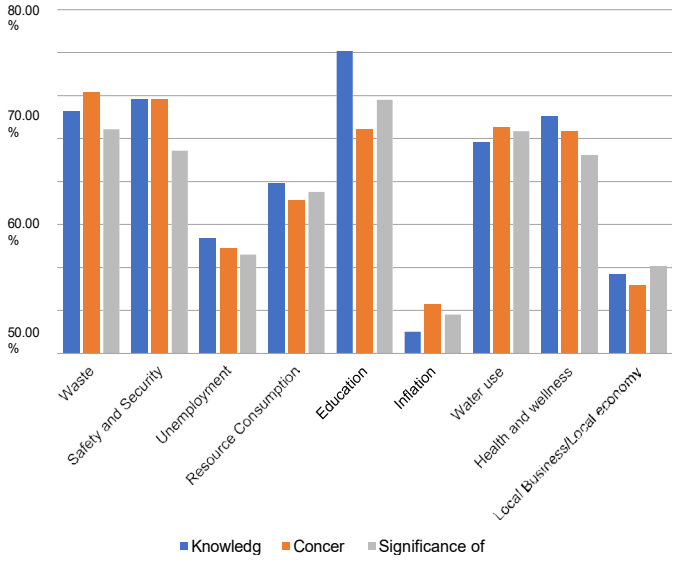

Figure 1 – Multiple responses for sustainability issues.

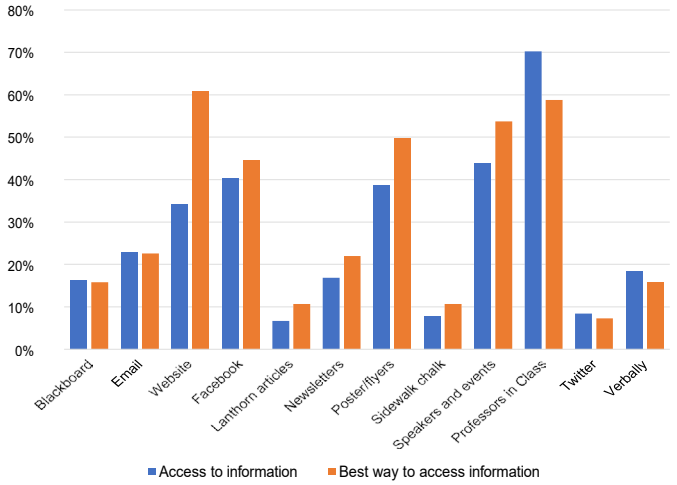

Figure 2 – Multiple responses on access to information of sustainability on-campus and best way to access the information.

Table 2 – Students' opinion for responsibility on environmental issues.

Program of study	Responsibility on environmental issue				
	Strongly disagree	Disagree	Slightly agree	Agree	Strongly agree
BBA	0	0	1	7	11
BSCE	2	0	2	22	43
BCSE	0	2	0	9	24
BSME	0	1	1	6	14
BSEEE	1	0	2	15	16
Total	3	3	6	59	108

BBA: Bachelor of Business Administration; BSCE: Bachelor of Science in Civil Engineering; BCSE: Bachelor of Computer Science and Engineering; BSME: Bachelor of Science in Mechanical Engineering; BSEEE: Bachelor of Science in Electrical and Electronics Engineering.

Table 3 presents the respondents' awareness of particular sustainability efforts on campus. The majority of students were aware of waste management (69.9%), while the least (40.9%) showed knowledge of climate preservation and carbon reduction. In addition, 35.8% are aware of sustainable café services, 36.4% of environment-friendly transportation, and 30.7% of buildings with lower carbon footprints. Therefore, this indicates that students' awareness is primarily significant for on-campus waste management. This suggests that IUBAT fosters a culture of critical thinking and social responsibility. Students are encouraged to question, debate, and form informed opinions on global issues, including environmental sustainability.

Findings from multinomial logistic regression

Tables 4 and 5 present the level of understanding on sustainability among the students who participated in this survey. Table 4 shows that 55.3% of respondents agreed that the university campus is a leader in sustainability practices, and 53.1% believe the campus community is well-informed about sustainability practices since it follows various approaches. In addition, 39.1% strongly agreed with this statement. Willingness to participate in sustainability activities on campus was one of the critical questions asked of the participants, to which 47.8% strongly agreed, and 41.0% agreed to be involved in on-campus sustainability activities. Since most students are familiar with the sustainability approach, they are confident enough to join willingly.

Table 3 – Multiple awareness responses for on-campus sustainability efforts.

Awareness of sustainability effort on campus	Yes Cases (%)
Waste management	69.9
Energy saving	42.6
Café service	35.8
Water use	45.5
Transport facility	36.4
Building	30.7
Grounds	40.9
Purchasing	15.3
Climate / carbon	40.9

Table 5 shows the analysis of the understanding level of sustainability and opinion in affecting life. This result indicates that 91.1% of students have an understanding knowledge of sustainability, and 93.9% responded that the sustainability approach might have a positive influence on their lifestyle.

Model validation

Likelihood ratio test

The likelihood ratio test of the model fitting information indicates that the final model is significant at the 5% significance level, as shown in Table 6. The estimated chi-square statistic is 109.101, with a p-value less than 0.05, which supports the existence of a significant association between dependent and independent variables in the final model.

Goodness-of-fit test

A goodness-of-fit test is a statistical procedure used to determine whether a set of observed values matches those expected under the applicable model. It can show whether your sample data fit an expected data set from a population with a normal distribution. The hypothesis for this test is as follows: $H_{0=}$ the model fits the data well; and $H_{A=}$ the model does not fit the data.

Table 7 shows that the significance level indicates that the model fits the data well in both the Pearson and Deviance goodness-of-fit tests. The Nagelkerke pseudo-R^2 test was performed to evaluate the goodness-of-fit of the logistic regression model.

Table 5 – Analysis of understanding level for sustainability and opinion in affecting life.

Do environmental issues directly affect life?	Understand sustainability		Total
	Yes	No	
Yes count % of Total	163 91.1%	9 5.0%	172 96.1%
No count % of Total	5 2.8%	2 1.1%	7 3.9%
Total Count % of Total	168 93.9%	11 6.1%	179 100.0%

Table 4 – Analysis of knowledge, willingness, and sustainability practices.

Level	Campus is leader in sustainability practices		Campus community is well-informed about sustainability		Willingness to participate in sustainability activities on campus		
	n	%	n	%	Level	n	%
Strongly disagree	8	4.5	6	3.4	Not willing	11	6.2
Disagree	15	8.4	8	4.5	Somewhat willing	9	5.1
Agree	99	55.6	95	53.1	Willing	73	41.0
Strongly agree	56	31.6	70	39.1	Very much willing	85	47.8
Total	178	100	179	100	**Total**	178	100

From Table 8, it is found that the Nagelkerke pseudo-R^2 value of 52.4% of the total variation in the responses to "campus is a leader in sustainable practices" can be explained by factors such as "whether environmental issues directly affect life", "understanding the term sustainability", "campus community is well-informed about sustainable practices", and "willingness to participate in sustainability activities on campus".

The chi-square statistic is the difference in -2 log likelihoods between the final and reduced models. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are zero. Table 9 shows that the independent variables in the study model are significant, indicating a significant contribution of this predictor to the final model.

Parameter estimates

The multinomial logistic regression results reveal that students' perceptions of their campus as a leader in sustainable practices are strongly influenced by their understanding of sustainability, belief in the personal impact of environmental issues, and perception of campus-wide sustainability awareness. Specifically, students who understand sustainability are significantly more likely to disagree (79.248 times), agree (30.974 times), or strongly agree (9.173 times) rather than strongly disagree that the campus is sustainable. Similarly, those who believe environmental issues affect their lives are 6.61 times more likely to agree and 7.243 times more likely to strongly agree. Additionally, students who strongly agree that their campus community is well-informed about sustainability are far more likely to agree (49.549 times) or strongly agree (24.77 times), while those who merely agree are 21.2 times more likely to strongly agree. Overall, these findings suggest that greater awareness and engagement with sustainability topics make students more likely to view their campus as a leader in sustainability, with responses shifting from strongly disagree to agree or strongly agree.

Table7 – Goodness-of-fit test result of the study model.

	Goodness-of-fit Chi- Square	df	Sig.
Pearson	23.396	42	.991
Deviance	28.373	42	.947

df: degrees of freedom; sig.: significance (p-value).

Table 8 – Nagelkerke pseudo-R^2 test result of the study model.

Pseudo-R^2	
Nagelkerke	.524

Table 6 – Likelihood ratio test result of the proposed model.

Model	Model Fitting Information			
	Model fitting criteria	Likelihood ratio tests		
	-2 log likelihood	chi-square	df	sig.
Intercept only	178.745			
Final	69.644	109.101	24	p<0.001

df: degree of freedom; sig.: significance (p-value).

Table 9 – Likelihood ratio tests of reduced study model.

Likelihood ratio tests of reduced model					
Variables	Effect	Model fitting criteria	Likelihood ratio tests		
		-2 log likelihood of reduced model	Chi-square	df	Sig.
	Intercept	69.644[a]	0.000	0	
Whether environmental issues directly affect life	ENV_AFCT_LF	78.282	8.639	3	***.035***
Understanding the term sustainability	UNSTN_SUS	77.858	8.215	3	***.042***
Campus community is well-informed about sustainable practices	DUM1_CAM_WL_INF	81.961	12.317	3	***.006***
	DUM2_CAM_WL_INF	77.914	8.270	3	***.041***
	DUM3_CAM_WL_INF	71.739	2.095	3	.553
Willingness to participate in sustainability activities on campus	DUM1_WIL_SUS_CAM	80.480[b]	10.836	3	***.013***
	DUM2_WIL_SUS_CAM	74.538	4.894	3	.180
	DUM3_WIL_SUS_CAM	76.007[b]	6.363	3	***.095***

df: degrees of freedom; sig.: significance (p-value).

Table 10 – Parameter estimates.

Parameter estimates of multinomial logistic regression model					
Campus is leader in sustainable practices		B	Standard Error	Sig.	e^B (Exp(B))
Disagree	Intercept	17.052	1342.037	.990	
	[ENV_AFCT_LF=1]	-19.735	1342.035	.988	2.685E-09
	[ENV_AFCT_LF=2]	0[c]			
	[UNSTN_SUS=1]	**4.373**	**2.159**	**.043**	**79.248**
	[UNSTN_SUS=2]	0[c]			
	[DUM1_CAM_WL_INF=1]	-1.876	1.797	.296	.153
	[DUM1_CAM_WL_INF=2]	0[c]			
	[DUM2_CAM_WL_INF=1]	1.312	1.717	.445	3.713
	[DUM2_CAM_WL_INF=2]	0[c]			
	[DUM3_CAM_WL_INF=1]	-.203	1.618	.900	.816
	[DUM3_CAM_WL_INF=2]	0[c]			
	[DUM1_WIL_SUS_CAM=1]	-1.422	1.442	.324	.241
	[DUM1_WIL_SUS_CAM=2]	0[c]			
	[DUM2_WIL_SUS_CAM=1]	14.148	3020.358	.996	1394570.519
	[DUM2_WIL_SUS_CAM=2]	0[c]			
	[DUM3_WIL_SUS_CAM=1]	-.694	1.437	.629	.500
	[DUM3_WIL_SUS_CAM=2]	0[c]			
Agree	Intercept	15.635	1342.036	.991	
	[ENV_AFCT_LF=1]	**1.889**	**1342.035**	**.001**	**6.61**
	[ENV_AFCT_LF=2]	0[c]			
	[UNSTN_SUS=1]	**3.433**	**1.251**	**.006**	**30.974**
	[UNSTN_SUS=2]	0[c]			
	[DUM1_CAM_WL_INF=1]	1.547	1.457	.289	4.695
	[DUM1_CAM_WL_INF=2]	0[c]			
	[DUM2_CAM_WL_INF=1]	**3.903**	**1.644**	**.018**	**49.549**
	[DUM2_CAM_WL_INF=2]	0[c]			
	[DUM3_CAM_WL_INF=1]	-1.608	1.849	.384	.200
	[DUM3_CAM_WL_INF=2]	0[c]			
	[DUM1_WIL_SUS_CAM=1]	.173	1.349	.898	1.189
	[DUM1_WIL_SUS_CAM=2]	0[c]			
	[DUM2_WIL_SUS_CAM=1]	15.401	3020.358	.996	4883702.458
	[DUM2_WIL_SUS_CAM=2]	0[c]			
	[DUM3_WIL_SUS_CAM=1]	.852	1.368	.534	2.344
	[DUM3_WIL_SUS_CAM=2]	0[c]			
Strongly agree	Intercept	-15.380	1262.220	.990	
	[ENV_AFCT_LF=1]	**1.980**	**0.000**	**0.028**	**7.243**
	[ENV_AFCT_LF=2]	0[c]			
	[UNSTN_SUS=1]	**2.216**	**1.233**	**.072**	**9.173**
	[UNSTN_SUS=2]	0[c]			
	[DUM1_CAM_WL_INF=1]	**3.210**	**1.604**	**.045**	**24.770**
	[DUM1_CAM_WL_INF=2]	0[c]			
	[DUM2_CAM_WL_INF=1]	**3.056**	**1.787**	**.087**	**21.239**
	[DUM2_CAM_WL_INF=2]	0[c]			
	[DUM3_CAM_WL_INF=1]	-19.413	0.000		3.709E-09
	[DUM3_CAM_WL_INF=2]	0[c]			
	[DUM1_WIL_SUS_CAM=1]	16.372	1262.219	.990	12889575.546
	[DUM1_WIL_SUS_CAM=2]	0[c]			
	[DUM2_WIL_SUS_CAM=1]	30.864	3273.493	.992	25355588873711.500
	[DUM2_WIL_SUS_CAM=2]	0[c]			
	[DUM3_WIL_SUS_CAM=1]	15.901	1262.219	.990	8045014.894
	[DUM3_WIL_SUS_CAM=2]	0[c]			

[a]The reference category is strongly disagree; [b]floating point overflow occurred while computing this statistic. Its value is therefore set to system missing; [c]this parameter is set to zero because it is redundant.

Conclusion

Since the 50th anniversary of Bangladesh's independence, the country has made a significant socio-economic progress and achieved middle-income country status. As it aspires to become an upper-middle-income country, the attainment of SDGs by 2030 has become increasingly critical. In light of the recognition of this need, the IUBAT introduced sustainability-focused courses, aiming to instill environmental awareness and lifelong responsible practices among students. To date, over 15,000 students have completed the Environmental Science and Sustainability course. IUBAT delivers extensive lecture content that includes environmental pollution (soil, air, water, noise), waste management, water saving, energy saving, occupational safety and health, carbon footprint, biodiversity and ecosystems, global warming and climate change, population, and the environment. Moreover, this sustainability course led IUBAT to organize a national seminar on World Environment Day, a Sustainability Olympiad for students, a field trip or study tour, a National Environmental Fair, community engagement for building understanding on environmental awareness, reducing any environmental pollution, building sustainability awareness among high school students, and engaging IUBAT students for sustainability practices. The study explored students' knowledge, awareness, and attitude towards sustainability-related activities, both on campus and in their daily lives. The findings indicate that while classroom-based instruction has some influence, students show a stronger preference for experiential learning through extracurricular engagements. These observations align with prior research by Al-Nuaimi et al. (2022) and Abowardah et al. (2024), who found similar preferences among students in different contexts.

Additionally, the study found a positive association between students' understanding of sustainability and their willingness to participate in sustainability initiatives. Many students expressed concern about issues such as waste management, energy conservation, water use, transportation, and climate change. However, it is important to note that these are correlational insights; the study design does not support causal inference. Therefore, it cannot be conclusively stated that academic training alone caused these concerns or behaviors. Similar patterns have been observed internationally. For instance, Figueiredo et al. (2024) emphasized the importance of public awareness in promoting sustainable water use in Portugal, while Almusalami et al. (2024) highlighted the effectiveness of digital platforms in raising sustainability awareness among students in the United Arab Emirates — findings that resonate with the preferences expressed by IUBAT students. Another insight drawn from this study is that the integration of sustainability education in Bangladesh remains limited. Among 103 private universities, fewer than ten offer sustainability courses as a core component of their undergraduate programs. This gap raises concern about the country's readiness to meet SDG targets, as theoretical learning alone may not be sufficient. The emphasis on traditional and career-oriented curricula often overlooks the importance of real-life capacity building in sustainability.

Recommendation

While the study is limited to IUBAT and, thus, cannot be generalized to all institutions, it raises several actionable recommendations for policymakers:

1. **Curriculum integration:** The government should mandate the inclusion of sustainability courses across all educational institutions.
2. **Beyond lectures:** Teaching methods should incorporate hands-on, practical, and extracurricular learning to better engage students.
3. **National initiatives:** The Ministry of Education should consider launching a national "Sustainability Olympiad" to promote student engagement in SDGs.
4. **Public awareness:** Awareness campaigns using electronic and print media can foster widespread behavioral change.
5. **Digital outreach:** Social media should be utilized to promote sustainability and build public support.
6. **Political engagement:** Political parties can include sustainability agendas to enhance public commitment to environmental goals.
7. **Incentives for innovation:** National-level awards can be introduced to recognize sustainability champions — both individuals and organizations.

In conclusion, while this study provides valuable insights into student attitudes and preferences regarding sustainability, its findings must be interpreted within the limits of its design. Expanding such research to include multiple institutions and employing more robust methodologies could offer deeper insights and help inform national strategies for sustainable development.

Authors' Contributions

Ahmed, F.: conceptualization, data curation, supervision, administration, investigation, writing – original draft. **Chowdhury**, A.: methodology, formal analysis, software. **Ratna**, S.T.: resources, visualization, validation. **Rana**, S.M.: writing – review & editing, validation.

References

Abo-Khalil, A.G., 2024. Integrating sustainability into higher education challenges and opportunities for universities worldwide. Heliyon, v. 10 (9). https://doi.org/10.1016/j.heliyon.2024.e29946.

Abowardah, E.S.; Labib, W.; Aboelnagah, H.; Nurunnabi, M., 2024. Students' Perception of Sustainable Development in Higher Education in Saudi Arabia. Sustainability, v. 16 (4), 1483. https://doi.org/10.3390/su16041483.

Ajaps, S.; 2023. Deconstructing the constraints of justice-based environmental sustainability in higher education. Teaching in Higher Education,v. 28 (5), 1024-1038. https://doi.org/10.1080/13562517.2023.2198639.

Ajiga, D.I.; Hamza, O.; Eweje, A.; Kokogho, E.; Odio, P.E.; 2025. Developing interdisciplinary curriculum models for sustainability in higher education: a focus on critical thinking and problem solving. Journal of Public Administration and Social Welfare Research, v. 10, 87-102. https://doi.org/10.56201/jpaswr.v10.no1.2025.pg87.102.

Almusalami, A.; Alnaqbi, F.; Alkaabi, S.; Alzeyoudi, R.; Awad, M., 2024. Sustainability Awareness in the UAE: A Case Study. Sustainability, v. 16 (4), 1621. https://doi.org/10.3390/su16041621.

Al-Nuaimi, S.R.; Al-Ghamdi, S.G., 2022. Assessment of Knowledge, Attitude and Practice towards Sustainability Aspects among Higher Education Students in Qatar. Sustainability, v. 14, 13149. https://doi.org/10.3390/su142013149.

Alturki, U.; Aldraiweesh, A., 2023. The factors influencing 21st century skills and problem-solving skills: the acceptance of blackboard as sustainable education. Sustainability, v, 15 (17), 12845. https://doi.org/10.3390/su151712845.

Álvarez-Vanegas, A.; Ramani, S.V.; Volante, L.; 2024. Service-Learning as a niche innovation in higher education for sustainability. Frontiers in Education, v. 9, 1291669. https://doi.org/10.3389/feduc.2024.1291669.

Arbuthnott, K.D., 2009. Education for sustainable development beyond attitude change. International Journal of Sustainability in Higher Education, v. 10 (2), 152-163. https://doi.org/10.1108/14676370910945954.

Basheer, N.; Ahmed, V.; Bahroun, Z.; Anane, C., 2024. Exploring sustainability assessment practices in higher education: a comprehensive review through content and bibliometric analyses. Sustainability, v. 16 (13), 5799. https://doi.org/10.3390/su16135799.

Boca, G.D.; Saraçlı, S., 2019. Environmental education and student's perception, for sustainability. Sustainability, v. 11 (6), 1553. https://doi.org/10.3390/su11061553.

Budur, T.; Abdullah, H.; Rashid, C.A.; Demirer, H.; 2024. The connection between knowledge management processes and sustainability at higher education institutions. Journal of the Knowledge Economy, v. 15 (4), 16632-16665. https://doi.org/10.1007/s13132-023-01664-4.

Dziubaniuk, O.; Groop, C.; Ivanova-Gongne, M.; Nyholm, M.; Gugenishvili, I., 2024. Sensemaking of sustainability in higher educational institutions through the lens of discourse analysis. International Journal of Sustainability in Higher Education, v. 25 (5), 1085-1102. https://doi.org/10.1108/IJSHE-09-2023-0427.

Figueiredo, M.; Fernandes, A.; Neves, J.; Vicente, H., 2024. Sustainable Water Use and Public Awareness in Portugal. Sustainability, v. 16 (13), 5444. https://doi.org/10.3390/su16135444.

Gönczi, J., 2023. Sustainability Performance Indicators. Annals of Faculty of Economics, University of Oradea, Faculty of Economics, v. 1 (1), 126-141.

Husic, D.W., 2024. Reframing sustainability initiatives in higher education. Sustainable Earth Reviews, v. 7 (1), 5. https://doi.org/10.1186/s42055-024-00076-9.

Idoiaga Mondragon, N.; Yarritu, I.; Saez de Cámara, E.; Beloki, N.; Vozmediano, L., 2023. The challenge of education for sustainability in higher education: key themes and competences within the University of the Basque Country. Frontiers in Psychology, v. 14, 1158636.

Jamil, M.; Anwar, F.; Sohail, H., 2024. Unlocking the sustainability: Evaluating the sustainability education in English textbook grade IX. Journal of Social Sciences Development, v. 3 (2), 1-13. https://doi.org/10.53664/JSSD/03-02-2024-01-01-13.

Kioupi, V.; Voulvoulis, N.; 2022. The contribution of higher education to sustainability: the development and assessment of sustainability competences in a university case study. Education Sciences, v. 12 (6), 406. https://doi.org/10.3390/educsci12060406.

Leal Filho, W.; Eustachio, J.H.P.P.; Avila, L.V.; Dinis, M.A.P.; Hernandez-Diaz, P.M.; Batista, K.; Borsari, B.; Abubakar, I.R., 2025. Enhancing the contribution of higher education institutions to sustainable development research: A focus on post-2015 SDGs. Sustainable Development, v. 33 (2), 1745-1757. https://doi.org/10.1002/sd.3184.

Leal Filho, W.; Frankenberger Silva, F.; Salvia, A.; Shiel, C.; Paço, A.; Price, E.; ... & Pretorius, R.W., 2023. An overview of research trends on sustainability in higher education–an exploratory study. International Journal of Sustainability in Higher Education, v. 24 (5), 1161-1175. https://doi.org/10.1108/IJSHE-08-2022-0252.

Leal Filho, W.; Trevisan, L.V.; Dinis, M.A.P.; Ulmer, N.; Paço, A.; Borsari, B.; Sierra, J.; Salvia, A., 2024. Fostering students' participation in the implementation of the sustainable development goals at higher education institutions. Discover Sustainability,v. 5 (1), 22. https://doi.org/10.1007/s43621-024-00204-7.

Leal, S.; Azeiteiro, U.M.; Aleixo, A.M.; 2024. Sustainable development in Portuguese higher education institutions from the faculty perspective. Journal of Cleaner Production, v. 434, 139863. https://doi.org/10.1016/j.jclepro.2023.139863.

Luna-Krauletz, M.D.; Juárez-Hernández, L.G.; Clark-Tapia, R.; Súcar-Súccar, S.T.; Alfonso-Corrado, C., 2021. Environmental education for sustainability in higher education institutions: Design of an instrument for its evaluation. Sustainability,v. 13 (13), 7129. https://doi.org/10.3390/su13137129.

Mahesh, K.M.; Aithal, P.S.; Sharma, K.R.S.; 2024. Green HRM and teaching sustainability in higher education institutions: for promoting sustainable education and sustainable development goals. International Journal of Case Studies in Business IT and Education, v. 8 (1), 261-271. https://doi.org/10.47992/IJCSBE.2581.6942.0345.

Mattos, L.K.D.; Flach, L.; Costa, A.M.; Moré, R.P.O., 2022. Effectiveness and sustainability indicators in higher education management. Sustainability, v. 15 (1), 298. https://doi.org/10.3390/su15010298.

Miranda, L.F.; Sánchez Buitrago, J.O.; Viloria Escobar, J.D.J.; 2021. Environmental sustainability in higher education: mapping the field. Revista Electrónica de Investigación Educativa, v. 23, e09. https://doi.org/10.24320/redie.2021.23.e09.4053.

Muñoz-Rodríguez, J.M.; Sánchez-Carracedo, F.; Barrón-Ruiz, Á.; Serrate-González, S., 2020. Are we training in sustainability in higher education? Case study: Education degrees at the University of Salamanca. Sustainability,v. 12 (11), 4421. https://doi.org/10.3390/su12114421.

Olmos-Gomez, M.D.C.; Luque Suarez, M.; Ferrara, C.; Olmedo-Moreno, E.M., 2020. Quality of Higher Education through the Pursuit of Satisfaction with a Focus on Sustainability. Sustainability, v. 12 (6), 2366. https://doi.org/10.3390/su12062366.

Olsson, D.; Gericke, N.; Pauw, J.B.D., 2022. Students' action competence for sustainability and the effectiveness of sustainability education. Environmental Sciences Proceedings, v. 14 (1), 11. https://doi.org/10.3390/environsciproc2022014011.

Pate, A.; Riley, R.D.; Collins, G.S.; Van Smeden, M.; Van Calster, B.; Ensor, J.; Martin, G.P., 2023. Minimum sample size for developing a multivariable prediction model using multinomial logistic regression. Statistical Methods in Medical Research, v. 32 (3), 555-571. https://doi.org/10.1177/09622802231151220.

Popowska, M.M.; Sady, M., 2024. Universities' journey towards sustainability-systematic literature review. International Journal of Sustainability in Higher Education, v. 25 (3), 596-615. https://doi.org/10.1108/IJSHE-08-2022-0280.

Probst, L., 2022. Higher education for sustainability: A critical review of the empirical evidence 2013–2020. Sustainability,v. 14 (6), 3402. https://doi.org/10.3390/su14063402.

Rahardjanto, A.; Husamah, H.; 2024. Efforts by Universities to promote sustainability competence over the last few decades: a systematic literature review. Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran, dan Pembelajaran, v. 10 (2), 605-617. https://doi.org/10.33394/jk.v10i2.11407.

Ruiz-Mallén, I.; Heras, M., 2020. What sustainability? Higher education institutions' pathways to reach the agenda 2030 goals. Sustainability, v. 12 (4), 1290. https://doi.org/10.3390/su12041290.

Sanchez-Carrillo, J.C.; Cadarso, M.A.; Tobarra, M.A., 2021. Embracing higher education leadership in sustainability: A systematic review. Journal of Cleaner Production, v. 298, 126675. https://doi.org/10.1016/j.jclepro.2021.126675.

Shih, Y.H.; Hsu, M.C.; Chang, C.L.; 2025. Sustainability transformations in higher education: global perspectives on the challenges and solutions. International Journal of Education and Humanities, v. 5 (1), 126-139. https://doi.org/10.58557/(ijeh).v5i1.290.

Strong, C., 1998. The impact of environmental education on children's knowledge and awareness of environmental concerns. Marketing Intelligence & Planning, v. 16 (6), 349-355. https://doi.org/10.1108/02634509810237523.

Tabucanon, A.S.; Sahavacharin, A.; Rathviboon, S.; Lhaetee, H.; Pakdeesom, D.; Xue, W.; Charmondusit, K., 2021. Investigating the critical issues for enhancing sustainability in higher education institutes in Thailand. International Journal of Sustainable Development and Planning, v. 16 (3), 503-514. https://doi.org/10.18280/ijsdp.160311.

Trevisan, L.V.; Eustachio, J.H.P.P.; Dias, B.G.; Leal Filho, W.; Pedrozo, E.Á.; 2023. Digital transformation towards sustainability in higher education: state-of-the-art and future research insights. Environment, Development and Sustainability, v. 26, 2789-2810. https://doi.org/10.1007/s10668-022-02874-7.

Uddin, M.N.; Rahman, M.A.; Mofijur, M.; Taweekun, J.; Techato, K.; Rasul, M.G., 2019. Renewable energy in Bangladesh: Status and prospects. Energy Procedia, v. 160, 655-61. https://doi.org/10.1016/j.egypro.2019.02.218.

Žalėnienė, I.; Pereira, P.; 2021. Higher education for sustainability: A global perspective. Geography and Sustainability, v. 2 (2), 99-106. https://doi.org/10.1016/j.geosus.2021.05.001.

Zsóka, Á.; Szerényi, Z. M.; Széchy, A.; & Kocsis, T., 2013. Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. Journal of Cleaner Production, v. 48 (2013), 126-138. https://doi.org/10.1016/j.jclepro.2012.11.030.