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Integrating Sustainable Development Concepts into Modern Education Systems for Promoting Environmental Responsibility

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Abstract

Incorporation of sustainable development theories into current educational frameworks is necessary to instill in students environmental consciousness and responsible behavior. The current research assesses the impact of awareness about sustainable development, incorporation of the theory into the curriculum, experiential learning, involvement of teachers, and sustainability within the institution on the environmental responsibility of students. A quantitative and cross-sectional research methodology was used, and data was collected from 300 college and university students using a five-point Likert scale questionnaire. Data collected for the research were analyzed through descriptive statistics, reliability analysis, Pearson correlation, and multiple linear regression analysis. The results reveal that environmental responsibility was found to have the highest mean score (M = 3.732), followed by sustainable development awareness (M = 3.641) and curriculum integration (M = 3.635). Measurement scales had good internal consistency reliability coefficients (Cronbach's alpha) that

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ranged between 0.738 and 0.792. The regression analysis was statistically significant ($F(5,294) = 12.810$, $p < 0.001$), explaining 17.9% of the variance in environmental responsibility. The most powerful significant predictor of environmental responsibility is curriculum integration ($\beta = 0.230$, $p < 0.001$), whereas institutional sustainability practices and teacher involvement ($\beta = 0.216$, $p < 0.001$; $\beta = 0.138$, $p = 0.012$, respectively) were also significantly related to the dependent variable. Sustainable Development Awareness and Experiential Learning had a positive but non-significant impact on Environmental Responsibility.

Keywords:
Sustainable development, environmental education, curriculum integration, experiential learning, teacher engagement, environmental responsibility.

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Introduction

Sustainable development has become one of the issues that must be tackled by modern education since environmental problems require change in knowledge, attitudes, and human behavior. The role of education should be significant in the matter of raising environmental awareness and encouraging responsible behavior among learners. Education for Sustainable Development (ESD) means linking educational initiatives with the aims of sustainable development and the SDGs to develop the knowledge and competencies necessary for sustainable societies (Agbedahin, 2019; Kopnina, 2012).

Inclusion of sustainable development in education is not only about including environmental issues in the curricula. It is about the inclusion of sustainability in teaching and learning and in institutions' operations and activities of students. Sustainability is an integrated approach to consideration of environmental, economic, and social dimensions, which helps learners to understand connections between human activity and environmental effects (Hariram et al., 2023). The education for sustainability encourages students to criticize unsustainable activities and adopt responsible attitudes toward environmental problems (Gadotti, 2008).

Higher educational institutions should play an important role in fostering sustainability due to the training of future specialists. There are several ways of introducing sustainability into the university practice through curricula, educational practices, research, campus life and community engagement (Lozano et al., 2013). The introduction of SDGs into curricula can help the students realise how sustainability concerns are connected with their academic disciplines and future profession (López, 2022). Curricula-based education on sustainability can increase students' knowledge about sustainable development and motivate them to engage in sustainable practices (Zwolińska et al., 2022).

However, the creation of environmental responsibility is possible only by means of proper learning practices. Critical thinking and reflection will enable students to see complex environmental problems and assess possible solutions (Chaname-Chira et al., 2024). Practical and interdisciplinary learning will also help to link the notion of sustainability with reality. Thus, sustainability education can be used for different academic disciplines and not only for environmental studies but also for technical education and physical education (Khalikova et al., 2024; Baena-Morales et al., 2023).

Sustainable development actions within institutions could serve to reinforce classroom teaching in terms of offering students examples of proper environmental behavior. Recycling, generation of renewable energy, energy saving, and many more sustainable actions could help bridge the gap between educational knowledge and practice (Altassan, 2023). Integrated management systems could also facilitate the process of implementing sustainability across university operations (Holm et al., 2015). This research seeks to explore the integration of sustainable development principles into contemporary education systems.

Research Questions

- **RQ1:** What is the level of sustainable development awareness among students?
- **RQ2:** How does the integration of sustainable development concepts into the curriculum influence students' environmental responsibility?
- **RQ3:** What is the relationship between experiential learning, teacher engagement, and students' environmental responsibility?
- **RQ4:** To what extent do institutional sustainability practices contribute to promoting environmental responsibility among students?

Research Objectives

- **RO1:** To assess the level of sustainable development awareness among students.
- **RO2:** To examine the influence of sustainable development curriculum integration on students' environmental responsibility.
- **RO3:** To analyze the relationship between experiential learning and teacher engagement with students' environmental responsibility.
- **RO4:** To evaluate the contribution of institutional sustainability practices to promoting environmental responsibility among students.

This paper has been structured into seven sections. Section 1 presents the background of the research, the problem, the objectives, and the research question. Section 2 shows the review of the literature and the gap in the research. Section 3 presents the conceptual framework and variables for the study. Section 4 outlines the research method, sample, data collection, measurements, and statistical procedures. Section 5 describes the data analysis and results of the empirical analysis. Section 6 interprets the findings and limitations. Section 7 concludes the study.

Review of Literature

Education for Sustainable Development has been identified as one of the most important strategies for achieving sustainable development and the SDGs. It involves the acquisition by the learner of the necessary knowledge, skills, values, and attitudes to address the challenges of both the environment and society (Agbedahin, 2019). Sustainable development education needs to be based on an integrated approach that takes into account environmental, social, and economic factors (Hariram et al., 2023). It enables the learners to view sustainability as a broad societal issue and not as an environmental one.

The integration of sustainability into higher education has been given due importance. Universities play an important role in sustainable development through teaching, research, administration, and community engagement (Lozano et al., 2013). The incorporation of SDGs into postgraduate curricula offers the chance to link academic studies to the issues of sustainable development (López, 2022). Likewise, the perspectives of students suggest that sustainability needs to be included in curricula and learning processes and not in addition to it (Zwolińska et al., 2022).

Critical thinking and reflective practice are essential parts of sustainability education. Critical thinking provides the students with the chance to assess the environmental issues and come up with informed decisions, while reflective practice is used to connect sustainability theories to the actions of the students themselves (Asencio et al., 2026; Chaname-Chira et al., 2024;Mendross & Valtieri, 2026). Such methods of education will contribute to the development of the sustainability competence of students, making them more active in solving environmental issues.

Moreover, experiential and interdisciplinary learning may serve as additional tools for the improvement of sustainability education. In the case of the former, students receive the opportunity to apply their theoretical knowledge to specific environmental situations through practical activities. Sustainability may also be introduced in other subjects, including technical and professional education (Khalikova et al., 2024;Rai et al., 2026), as well as in physical education (Baena-Morales et al., 2023). These approaches demonstrate the importance of providing students with learning experiences that connect sustainability theory with practical application.

Awareness of environmental concerns is linked to environmental responsibility. Proper environmental education will enable students to gain better knowledge about sustainability concerns and motivate them to behave responsibly towards the environment (Aldawsari et al., 2025). However, this may not always result in behavioural changes. Sustainability activities within the institution, such as recycling, renewable energy use and behaviour change programmes, may complement sustainability education and offer examples of environmental responsibility to students (Altassan, 2023; Eswaramoorthi, 2026).

Other concerns in the literature with regard to the implementation of ESD include curriculum integration, institutional coordination and the link between environmental education and other sustainability concerns. It is therefore clear that higher education institutions require a strategy for addressing all these aspects. In general, available research shows that incorporating sustainable development into education enhances awareness and competency on sustainability issues as well as environmental responsibility (Zinchenko et al., 2021; Kovács, 2026). This is the foundation for studying the way sustainable development principles can be systematically incorporated into education systems for environmentally responsible behaviour.

Research Hypotheses

- **H1:** Sustainable development awareness has a significant positive influence on students' environmental responsibility.
- **H2:** Sustainable development curriculum integration has a significant positive influence on students' environmental responsibility.
- **H3:** Experiential learning has a significant positive influence on students' environmental responsibility.
- **H4:** Teacher engagement in sustainable development education has a significant positive influence on students' environmental responsibility.
- **H5:** Institutional sustainability practices have a significant positive influence on students' environmental responsibility.

Conceptual Framework

The conceptual framework of the current study is used to determine the mechanism through which the inclusion of sustainable development concepts within current education systems could help promote environmental responsibility among students. Education for sustainable development goes beyond environmental learning since it involves the development of students' awareness, critical thinking, practical skills and responsible decision-making on sustainability (Agbedahin, 2019). Consequently, this study looks at various educational, behavioural and institutional factors that could affect environmental responsibility among students.

The conceptual framework includes five independent variables: Sustainable Development Awareness (SDA), Curriculum Integration (CI), Experiential Learning (EL), Teacher Engagement (TE) and Institutional Sustainability Practices (ISP). The dependent variable is Environmental Responsibility (ER). Sustainable Development Awareness is the students' awareness of sustainable development, environmental problems, conservation of resources and sustainability issues. Curriculum integration is the inclusion of sustainable development concepts within various courses and learning experiences (Lozano et al., 2013).

Experiential learning is concerned with the involvement of students in practical and activity-based sustainability exercises, such as environment projects, recycling efforts, field-based learning, and sustainability-related assignments. The methods would assist in linking the theoretical information with environmental issues in the real world and foster critical and systemic thinking (Zwolińska et al., 2022; Baena-Morales et al., 2023). Teacher engagement means that teachers participate actively in explaining the concepts of sustainability, environmental thinking, and sustainability activities and motivating students to conduct themselves responsibly (Glavič, 2020).

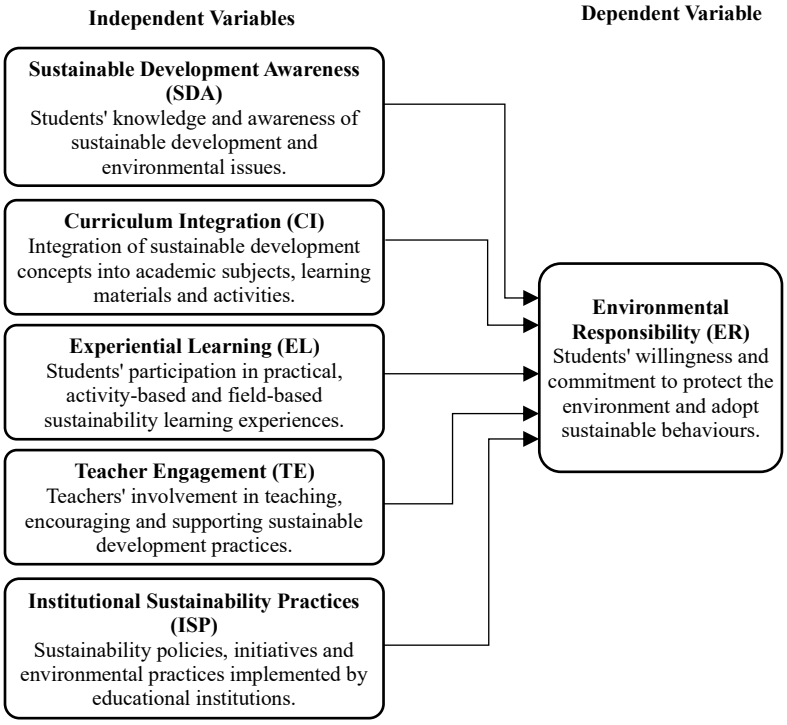

Figure 1. Conceptual framework of the study

Source: *Studies conceptualization based on (Agbedahin, 2019; Glavič, 2020; Lozano et al., 2013; Holm et al., 2015; Zwolińska et al., 2022; Berchin et al., 2021).*

Sustainability practices of the institution include sustainability-oriented policies, programs, facilities, and activities adopted by educational institutions. They could be waste management, recycling, energy saving, environmental campaigns, sustainable use of resources, and other sustainability initiatives of institutions. Higher educational institutions can promote sustainable development through incorporating sustainability into the teaching process, operations of the institution, and educational activities (Holm et al., 2015; Garcia et al., 2017; Berchin et al., 2021).

Environmental responsibility is regarded as the dependent variable and denotes the willingness and dedication of students to preserve the environment and adopt sustainable practices. In previous research, it has been highlighted that through environmental education and sustainable development education, students' awareness and environmental responsibility can be improved (Aldawsari et al., 2025). Therefore, in the current research, it is assumed that more awareness about sustainable development and various other factors will help improve the environmental responsibility of students.

As shown in figure 1, the five independent variables are predicted to have a positive effect on environmental responsibility. Awareness about sustainable development is a component of the knowledge and awareness factor, while curriculum integration and experiential learning are components of the educational mechanism factors where the ideas of sustainability can be developed and practiced. Teacher engagement is a component of the educator factor, and institutional sustainability practices are a component of the environmental factor supporting sustainable behavior.

Table 1. Variables and operational definitions of the conceptual framework

Variable	Abbreviation	Type	Operational Definition
Sustainable Development Awareness	SDA	Independent Variable	Students' knowledge and awareness of sustainable development and environmental issues
Curriculum Integration	CI	Independent Variable	Integration of sustainable development concepts into academic subjects and learning activities
Experiential Learning	EL	Independent Variable	Students' participation in practical and activity-based sustainability learning
Teacher Engagement	TE	Independent Variable	Teachers' involvement in teaching, encouraging, and supporting sustainable development practices
Institutional Sustainability Practices	ISP	Independent Variable	Sustainability policies, initiatives, and environmental practices implemented by educational institutions
Environmental Responsibility	ER	Dependent Variable	Students' willingness and commitment to protect the environment and adopt sustainable behaviours

Source: *Studies compilation based on (Agbedahin, 2019; Glavič, 2020; Holm et al., 2015; Zwolińska et al., 2022; Berchin et al., 2021).*

As seen from table 1, the conceptual framework has five independent variables and one dependent variable. The conceptual framework argues that sustainable development awareness, curriculum integration, experiential learning, teacher engagement, and sustainability practices will affect environmental responsibility positively. The above-stated relationships form the basis of testing the research hypotheses by the 300-sample student survey data set.

Research Methodology

Research Design

Cross-sectional survey design methodology was used in this study. The data was collected in the form of a structured data set that included the results provided by 300 students. This research concentrates on the identification of the sustainability perceptions of the respondents and the investigation of the influence of the five independent variables on environmental responsibility. This research has a quantitative methodology due to the usage of a numerical Likert scale.

Population and Sample

The target population of the study includes college and university students. 300 respondents were selected for empirical analysis. The respondents are students coming from various educational backgrounds and study different fields of study. Some demographic variables like gender, age, level of education, field of study, year of study, type of institution, and involvement in environmental programs were included in order to have a wider picture of the respondents. The survey data used in this analysis was prepared survey data intended to be used for research and demonstration of the methodology. This implies that any result derived from the survey is not an actual response obtained from the field population.

Data Collection Instrument

The structured questionnaire was developed considering the conceptual framework and the objectives of the study. The structured questionnaire has two components; the first component captures demographic data about the respondents, while the second one captures the six constructs of the study. The five independent variables of the study include Sustainable Development Awareness (SDA), Curriculum Integration (CI), Experiential Learning (EL), Teacher Engagement (TE), and Institutional Sustainability Practices (ISP). The dependent variable of the study includes Environmental Responsibility (ER). Each of the six constructs has five measurement items, which implies that there are 30 Likert-type statements. A five-point Likert scale has been used to capture the perceptions of the respondents, with 1 being "Strongly Disagree" while 5 being "Strongly Agree."

Variables and Measurement

The measurement structure of the study is presented in table 2.

Table 2. Measurement structure of the study variables

Variable	Code	Number of Items	Measurement Scale	Role
Sustainable Development Awareness	SDA1–SDA5	5	5-point Likert scale	Independent
Curriculum Integration	CI1–CI5	5	5-point Likert scale	Independent
Experiential Learning	EL1–EL5	5	5-point Likert scale	Independent
Teacher Engagement	TE1–TE5	5	5-point Likert scale	Independent
Institutional Sustainability Practices	ISP1–ISP5	5	5-point Likert scale	Independent
Environmental Responsibility	ER1–ER5	5	5-point Likert scale	Dependent

As table 2 indicates, there are five items for measuring each of the constructs. Then the scores of the constructs are obtained through computing the average of the five respective items. The computed average is to be used in analyzing the relationship between the independent variable and environmental responsibility.

Data Structure

The data set contains 300 observations and 44 variables. Except for the 30 variables which measure the responses to the questions on the Likert scale, the rest of the variables in the data set include respondent identification, demographics, and environmental program participation. Construct mean variables include SDA_Mean, CI_Mean, EL_Mean, TE_Mean, ISP_Mean, and ER_Mean. The demographic variables include gender, age, education level, field of study, year of study, institution type, and environmental program participation. These variables will assist in describing the sample and, in some cases, compare differences in environmental responsibility among demographic groups.

Statistical Tools

The data set obtained is analyzed by means of proper methods of both descriptive and inferential statistics. The use of descriptive statistics such as frequency, percentage, mean, and standard deviation will be helpful in summarizing the demographic profile as well as the constructs. Internal consistency and reliability of each construct is measured using Cronbach's alpha. The Pearson correlation coefficient is used to measure the strength of association between Sustainable Development Awareness, Curriculum Integration, Experiential Learning, Teacher Engagement, Institutional Sustainability Practices, and Environmental Responsibility. Multiple regression analysis is used to analyze the impact of the five independent constructs on environmental responsibility.

Model Specification

The proposed relationship between the independent variables and Environmental Responsibility is represented by the following regression model:

$$ER = \beta_0 + \beta_1 SDA + \beta_2 CI + \beta_3 EL + \beta_4 TE + \beta_5 ISP + \varepsilon \quad (1)$$

Equation (1) where:

- ER = Environmental Responsibility
- SDA = Sustainable Development Awareness
- CI = Curriculum Integration
- EL = Experiential Learning
- TE = Teacher Engagement
- ISP = Institutional Sustainability Practices
- β_0 = Constant
- $\beta_1 - \beta_5$ = Regression coefficients
- ε = Error term

The model is used to determine whether the five dimensions of sustainable development education significantly explain variations in students' Environmental Responsibility.

Data Analysis and Results

Data analysis was carried out based on the answers from 300 students who were part of the study sample. Data analysis involved investigating the demographic information of the respondents, descriptive statistics of the study constructs, reliability of the measuring instrument, correlation between the variables, and effect of the independent variables on environmental responsibility. This was done following the conceptual framework of the study.

Demographic Profile of Respondents

Demographic profiles of the 300 respondents are illustrated in table 3. The study population was comprised of 161 (53.7%) female respondents and 139 (46.3%) male respondents. The average age of the respondents was 21.24 years. Respondents were aged between 18 and 25 years. A majority of the respondents were undergraduates (74.0%), while 26.0% were postgraduates.

Table 3. Demographic profile of respondents (n = 300)

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Female	161	53.7
	Male	139	46.3
Education Level	Undergraduate	222	74.0
	Postgraduate	78	26.0
Field of Study	Engineering	86	28.7
	Education	57	19.0
	Management	56	18.7
	Arts & Humanities	55	18.3
	Science	46	15.3
Institution Type	Private	153	51.0
	Government	90	30.0
	Autonomous	57	19.0
Environmental Programme Participation	Yes	171	57.0
	No	129	43.0

As seen from table 3 above, the respondents came from different disciplines and institutions. Over half of the respondents (57.0%) claimed involvement in an environmental programme, which means that there were quite a number of respondents who had been involved in sustainability-related programmes. In addition, the dataset comprises students from various disciplines, including engineering, education, management, arts and humanities and science.

Descriptive Statistics

Table 4 shows the descriptive statistics of the six constructs in this study. The construct that scored the highest mean was environmental responsibility (M = 3.732, SD = 0.572). On the other hand, Sustainable Development Awareness scored a mean of 3.641 (SD = 0.551), whereas Curriculum Integration obtained a mean of 3.635 (SD = 0.548). The remaining two constructs, experiential learning and teacher engagement, had a mean of 3.514 and 3.518, respectively.

As can be seen from table 4, all construct means are above the middle point of the five-point Likert scale, implying that the respondents have positive views about sustainable development education and environmental responsibility. Environmental responsibility had the highest mean, while institutional sustainability practices obtained the lowest mean value.

Table 4. Descriptive statistics of study variables

Variable	Mean	Standard Deviation
Sustainable Development Awareness (SDA)	3.641	0.551
Curriculum Integration (CI)	3.635	0.548
Experiential Learning (EL)	3.514	0.557
Teacher Engagement (TE)	3.518	0.548
Institutional Sustainability Practices (ISP)	3.469	0.583
Environmental Responsibility (ER)	3.732	0.572

Reliability Analysis

The Cronbach's Alpha method was employed in testing the consistency of the measuring items. Each construct was measured by five items on the questionnaire. The reliability measures are shown in table 5.

Table 5. Reliability analysis of the study constructs

Construct	Number of Items	Cronbach's Alpha	Reliability
Sustainable Development Awareness	5	0.753	Acceptable
Curriculum Integration	5	0.739	Acceptable
Experiential Learning	5	0.738	Acceptable
Teacher Engagement	5	0.741	Acceptable
Institutional Sustainability Practices	5	0.792	Good
Environmental Responsibility	5	0.771	Good

From the results provided in table 5, it is evident that the six constructs provided all yielded values for Cronbach's alpha above 0.70. The values obtained varied between 0.738 and 0.792. Among the constructs that had a higher Cronbach's alpha value are the Institutional Sustainability Practices ($\alpha = 0.792$) and Environmental Responsibility ($\alpha = 0.771$). These results indicate that the items within each construct consistently measure their respective dimensions.

Mean Comparison of Study Constructs

The relative mean scores of the six constructs are illustrated in figure 2.

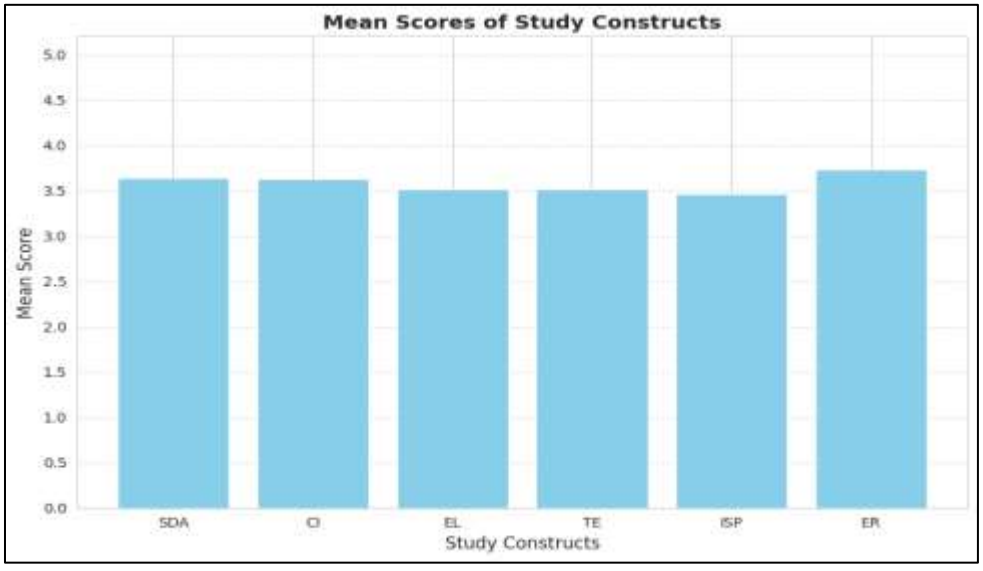

Figure 2. Mean scores of study constructs

From figure 2, the mean scores indicate that environmental responsibility ranks highest, followed by sustainable development awareness and curriculum integration. The least ranked factor is Institutional Sustainability Practices, which has the lowest mean score among the six factors, though still ranking above the midpoint of the measurement scale. This indicates that the students have high environmental responsibility compared to institutional sustainability practices.

Correlation Analysis

The Pearson correlation coefficient was used to analyze the relationship between the independent variables and Environmental Responsibility. These findings can be seen in table 6 below.

Table 6. Pearson correlation matrix

Variable	SDA	CI	EL	TE	ISP	ER
SDA	1.000	0.264	0.144	0.214	0.152	**0.231**
CI	0.264	1.000	0.021	0.161	0.021	**0.283**
EL	0.144	0.021	1.000	0.033	0.099	0.106
TE	0.214	0.161	0.033	1.000	0.100	**0.220**
ISP	0.152	0.021	0.099	0.100	1.000	**0.254**
ER	0.231	0.283	0.106	0.220	0.254	1.000

Note: Correlations shown in bold with ER are statistically significant at $p < 0.05$.

As shown in table 6, Sustainable Development Awareness exhibits a positive association with Environmental Responsibility ($r = 0.231$, $p < 0.001$). Curriculum integration exhibits the most significant correlation with environmental responsibility ($r = 0.283$, $p < 0.001$). There exists a positive correlation between teacher engagement and environmental responsibility ($r = 0.220$, $p < 0.001$), as well as a positive association between institutional sustainability practices and environmental responsibility ($r = 0.254$, $p < 0.001$). A positive, non-statistically significant association exists between experiential learning and environmental responsibility ($r = 0.106$, $p = 0.066$).

Multiple Regression Analysis

Multiple linear regression analysis was carried out to investigate the influence of sustainable development awareness, curriculum integration, experiential learning, teacher engagement, and sustainability practice on environmental responsibility. Results obtained from the multiple linear regression are provided in table 7.

Table 7. Multiple regression analysis predicting environmental responsibility

Predictor	B	Standardized β	t-value	p-value	Decision
Constant	1.031	—	2.875	0.004	—
Sustainable Development Awareness	0.103	0.100	1.756	0.080	Not Supported
Curriculum Integration	0.238	0.230	4.142	<0.001	Supported
Experiential Learning	0.063	0.062	1.145	0.253	Not Supported
Teacher Engagement	0.144	0.138	2.530	0.012	Supported
Institutional Sustainability Practices	0.210	0.216	3.984	<0.001	Supported

Model statistics: $R^2 = 0.179$; Adjusted $R^2 = 0.165$; $F(5, 294) = 12.810$; $p < 0.001$.

The regression model depicted in table 7 is significant at the level of $F(5, 294) = 12.810$, $p < 0.001$. The model accounts for approximately 17.9% of the variance in environmental responsibility. From all predictors included in the model, curriculum integration has the greatest standardized effect size ($\beta = 0.230$, $p < 0.001$), followed by institutional sustainability practices ($\beta = 0.216$, $p < 0.001$) and teacher engagement ($\beta = 0.138$, $p = 0.012$). Sustainable Development Awareness has a positive coefficient but is not statistically significant in multiple regression analysis ($\beta = 0.100$, $p = 0.080$). Likewise, experiential learning has a positive but insignificant effect ($\beta = 0.062$, $p = 0.253$). It should be noted that the most influential predictors of environmental responsibility are curriculum-based sustainability integration, teacher engagement, and institutional sustainability practices. Standardized regression coefficients are depicted in figure 3.

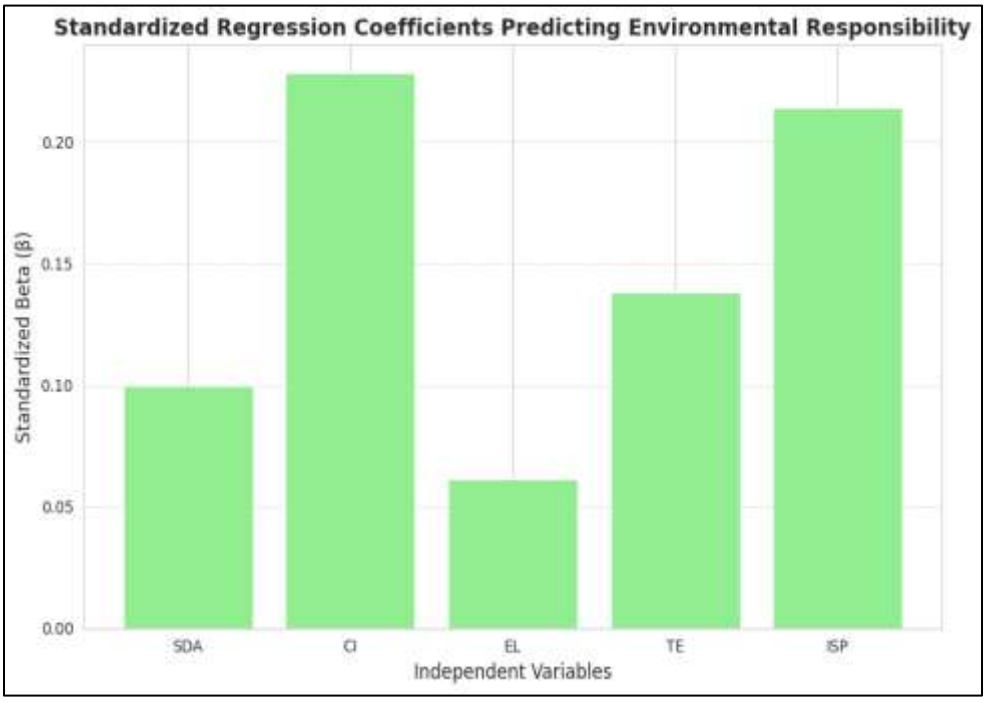

Figure 3. Standardized regression coefficients predicting environmental responsibility

Curriculum integration leads the pack in terms of producing the greatest standardized regression coefficient, followed by institutional sustainability practices and teacher engagement. Even though Sustainable Development Awareness and Experiential Learning have positive standardized regression coefficients, they are not statistically significant at the 5% level.

Hypothesis Testing

The overall hypothesis-testing results are summarized in table 8.

Table 8. Summary of hypothesis testing

Hypothesis	Relationship	β	p-value	Result
H1	SDA → ER	0.100	0.080	Not Supported
H2	CI → ER	0.230	<0.001	**Supported**
H3	EL → ER	0.062	0.253	Not Supported
H4	TE → ER	0.138	0.012	**Supported**
H5	ISP → ER	0.216	<0.001	**Supported**

As presented in table 8, H2, H4, and H5 have been proven as correct, which means that curriculum integration, teacher engagement, and institutional sustainability practices have strong positive impacts on environmental responsibility. In contrast to that, H1 and H3 have not been proven to be correct, as Sustainable Development Awareness and Experiential Learning have no statistically significant effects in the regression model.

In general, it can be concluded that the ways of integrating sustainability into the curriculum, combined with teacher engagement and institutional sustainability practices, have much greater importance for the prediction of students' environmental responsibility than awareness or experiential learning separately. Thus, the results of the study have confirmed the main idea discussed in it—modern education systems should integrate sustainability and education, not focus just on raising awareness.

Discussion

Results of the research have provided the evidence that the inclusion of sustainable development ideas within the education systems of the present day is linked with the environmental responsibility of students. Descriptive statistics reveal that environmental responsibility had the highest mean value (M = 3.732), while sustainable development awareness (M = 3.641) and curriculum integration (M = 3.635) were the next highest. It means that students have positive perceptions about sustainability and environmental responsibility. The results

support the general point of view that education is able to raise the awareness and responsibility of students (Agbedahin, 2019; Aldawsari et al., 2025).

Positive correlations were established between Sustainable Development Awareness, Curriculum Integration, Teacher Engagement, Institutional Sustainability Practices, and Environmental Responsibility, as presented in table 6. The highest correlation between curriculum integration and environmental responsibility was recorded ($r = 0.283$). It means that the inclusion of sustainability concepts in academic studies can be of particular significance for promoting environmentally responsible behaviors. It is in line with the findings of previous studies, which stressed the importance of including sustainable development in curricula and higher education (López, 2022; Zwolińska et al., 2022).

The results from the multiple regression further clarify the relationships in question. As can be seen in table 7, the whole regression model proved to be statistically significant and accounted for 17.9% of variance in environmental responsibility. The most powerful significantly positive predictors in this case were Curriculum Integration ($\beta = 0.230$, $p < 0.001$), Institutional Sustainability Practices ($\beta = 0.216$, $p < 0.001$), and Teacher Engagement ($\beta = 0.138$, $p = 0.012$). Therefore, it may be said that the environmental responsibility of the respondents depends on the way how sustainability knowledge is integrated into the teaching process and educational organization itself. This fact proves the claim that educational organizations should incorporate sustainability into their processes and operations (Lozano et al., 2013; Holm et al., 2015; Berchin et al., 2021).

While Sustainable Development Awareness demonstrated a positive but insignificant effect in the regression model ($\beta = 0.100$, $p = 0.080$), the bivariate correlation between the two variables proved to be significant. Such a discrepancy indicates that sustainable development awareness might be insufficient for promoting environmentally responsible behaviour in the presence of other educational elements. The same applies to experiential learning, which demonstrated a positive but insignificant effect ($\beta = 0.062$, $p = 0.253$). Based on the results, one can assume that there should be certain structure, continuity, and relevance of the experiential learning to the curriculum content for better results. The low level of contribution to sustainable behaviour indicates that experiential sustainability learning activities should go further than participation (Baena-Morales et al., 2023).

From the results of the testing of the hypothesis presented in table 8, it can be seen that hypotheses H2, H4, and H5 have been supported, while H1 and H3 have not been supported. In general, the results suggest that curriculum integration, teacher engagement, and institutional sustainability practices are the best predictors for environmental responsibility under the proposed model. The results further confirm the significance of a holistic approach to sustainability that involves integration into curriculum, teacher engagement, and institutional practices (Berchin et al., 2021; Giesenbauer & Müller-Christ, 2020; Shoeib & Abri, 2026).

Implications

This shows that the educational system needs to incorporate the concept of sustainable development in the curriculum and classroom learning practices. Curriculum integration, teacher involvement, and institutional sustainability practice having a great effect shows that there could be an improvement in environmental accountability when there is support for sustainability not only in the classroom but also in the institution. Institutions need to integrate sustainability issues in different subjects, train the teachers on how to deliver such issues effectively, promote environmental activities, and practice sustainability practices like recycling, saving energy, reducing wastage, etc. (Lozano et al., 2013; Holm et al., 2015; Berchin et al., 2021; Ashour & Abdullah, 2026). These measures can help transform sustainability knowledge into responsible environmental attitudes and behaviors among students.

Limitations

There are some limitations of the study that should be considered when interpreting the results of the research. The results found in the paper are those of the analysis performed on the basis of the data collected among 300 respondents, which means that the results may not be generalized for any other populations besides those studied in the context of the research. Also, being cross-sectional, the paper allows one to evaluate only how the level of environmental responsibility remains unchanged throughout time, and the use of Likert scale answers is also subject to criticism. Future empirical research using larger and more diverse samples, longitudinal designs, and objective behavioral measures would help address these limitations.

Future Work

This particular theoretical framework needs validation through future research done through the use of primary data collected from students enrolled in higher education institutions in different geographical locations and study areas. More generalizable results may be found because of larger samples and also because of the use of

longitudinal research which will enable one to find out if there are any long-term effects that occur due to continuous exposure to sustainability education in terms of increased environmental responsibility of the students. Future research may also include the mediating and moderating effects of factors such as sustainability knowledge, environmental attitudes, student involvement, and participation in environmental programmes.

Conclusion

It aimed at examining the influence of incorporating the ideas of sustainable development within modern education systems on nurturing environmental responsibility in students. The findings revealed that the students held positive attitudes in connection with the constructs considered in the study, with the mean value being the greatest for Environmental Responsibility ($M = 3.732$), then Sustainable Development Awareness ($M = 3.641$), and finally Curriculum Integration ($M = 3.635$). The employed regression model was found to be statistically significant ($F(5,294) = 12.810$, $p < 0.001$) with an R^2 of 17.9%. The predictors with the highest statistical significance were Curriculum Integration ($\beta = 0.230$, $p < 0.001$), Institutional Sustainability Practices ($\beta = 0.216$, $p < 0.001$), and Teacher Engagement ($\beta = 0.138$, $p = 0.012$). Thus, hypotheses H2, H4, and H5 were confirmed, but hypotheses H1 and H3 were not confirmed. It is clear from the results that environmental responsibility is increased if sustainability is consciously integrated into the curriculum content with the help of teachers and institution practices. Nevertheless, despite the importance of the correlation between Sustainable Development Awareness and Environmental Responsibility and between Experiential Learning and Environmental Responsibility, the impact of these two factors was insignificant in the regression model, which means that the awareness and experiential learning should be better implemented in the educational process to result in some behavior changes. In conclusion, it is necessary to say that this research demonstrates the importance of the integrative approach in the implementation of sustainable development education that goes beyond awareness creation.

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