An Empirical Study on the Implementation of Sustainable Development Goals (SDGs) in Educational Institutions

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Abstract-The Sustainable Development Goals (SDGs), established by the United Nations, outline a framework for achieving a sustainable and equitable future, with SDG 4 focusing specifically on ensuring inclusive and quality education. This paper conducts an empirical investigation into how educational institutions integrate SDGs, particularly SDG 4, into their curricula and operational practices. The study surveys educators' and administrators' perceptions of SDG incorporation within educational management and curriculum frameworks. This research identifies key drivers and obstacles and highlights six critical factors influencing SDG implementation: curriculum integration, institutional leadership, resource allocation, stakeholder involvement, awareness and training, and policy backing. These themes were derived from various literature reviews during the process. The responses were collected from 120 participants across diverse institutions, offering a comprehensive view of the challenges and enablers these entities face in adopting SDGs. The findings underscore both the opportunities for progress and the barriers that hinder the widespread adoption of sustainable practices. Through its analysis, the study offers actionable recommendations for policymakers and educators to improve the implementation of SDGs in educational settings. The paper also stresses the importance of enhanced policy frameworks to support sustainability efforts and proposes strategies for scaling up institutional contributions toward achieving the 2030 targets. These insights are intended to guide further improvements in SDG-driven educational reforms.

Keywords-Sustainable Development Goals (SDGs), SDG 4, quality education, curriculum integration, educational management, institutional leadership, stakeholder engagement.

I. INTRODUCTION

The Sustainable Development Goals (SDGs), adopted in 2015, aim to address global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice, by 2030. Education, encapsulated in SDG 4, is seen as the foundation for achieving all the SDGs, promoting lifelong learning, inclusion, and equitable quality education. However, implementing these goals in educational institutions poses various challenges. Educational institutions hold the power to influence change, shape public discourse, and foster sustainability [1]. Despite the recognized importance of these goals, there is limited empirical research on the factors affecting their integration into institutional practices and curricula. This study aims to examine the current status of SDG implementation in education institutions and identify the barriers and opportunities these institutions encounter. Education plays a pivotal role in achieving sustainable development, as it not only equips individuals with the necessary knowledge and skills but also promotes values critical for fostering a sustainable future [2]. The Sustainable Development Goals (SDGs), comprising 17 global objectives, are integral to guiding education towards sustainability. SDG 4 specifically aims to ensure inclusive and equitable quality education [3]. Despite growing awareness of these global challenges, there has been limited empirical research on the direct implementation of the SDGs within educational institutions. This research seeks to fill this gap by examining how universities, schools, and other educational entities integrate SDGs into their systems, curricula, teaching methods, and institutional policies. This study aims to explore the integration of Sustainable Development Goals (SDGs) within educational institutions, focusing on multiple key objectives. It seeks to assess the extent to which SDGs have been incorporated into these institutions' policies, practices, and curricula.

II. LITERATURE REVIEW

Higher education institutions worldwide have been working hard to integrate sustainable development through the way they operate after the United Nations Sustainable Development Goals (SDGs)

were agreed upon [4]. The following is being accomplished, between many issues, things, by the creation of proclamations, fresh course designs, feasible university premises initiatives, and collaborations beginning at the local, national, and international levels [3].

Nevertheless, among many potent instruments at educational institutions is the involvement of students [5]. In light of this issue, numerous academic institutions are continuously researching and creating strategies to effectively educate learners for participation in sustainable development [6]. According to a few studies, academic institutions ought to strive better to educate learners regarding "green concerns" [7] and [8].

To encourage learners to devise plans for creating an environmentally friendly or more resilient campus as well, certain colleges have established Greene University Campuses Campaigns [9]. Efforts like these make certain sustainable development ideas spread throughout educational institutions and raise the knowledge and level of sustainable development proactive thinking [10] and[11]. The waste generated by Higher Education Institutions (HEIs) is another example, as it significantly adds to the world's carbon emissions [12].

University waste production is frequently greatly influenced by students. As a result, it is beneficial to create effective disposal plans and motivate students to make sure that merchandise reusing and reclamation are carried out [13]. Educational institutions can help achieve a decarbonization of their college campuses and decrease their impact on garbage from landfills by developing waste-free assignments [14]. Students have a big part to play in making these kinds of projects successful [15]. Educational institutions are yet to completely involve learners in their waste disposal plans, even though some are currently using this strategy [16]. Participation by students can greatly improve this, particularly in the areas of garbage disposal, recycle, and neat modes of transport, food trash, and water use [17].

On a more modest note, learners should be urged to walk, cycle, or use the campus shuttle when feasible [18, 19]. Further strategies to advance sustainability and decarbonization include promoting driving together and making use of renewable power for travel [20]. Additionally, they give learners a bigger say in sustainability-related issues, assist in setting college goals, and facilitate closer collaboration

between instructors and learners to develop green educational institutions and communities [21].

One factor that is thought to be important in determining how involved students are in issues related to sustainability is their institution's dedication to the United Nations Sustainable Development Goals. In light of green efforts, this is consistent with concepts of OB as well as determination [22]. The research also suggests an empirical basis for transferring learnings as well as learning effects. It implies that encountering programs or subjects directly connected to Sustainable Development Goals influences how students interact with the goals [23]. This is in line with concepts of academic achievement and profound schooling, which imply that classroom instruction can have a significant impact on people's beliefs and actions, particularly when it comes to sustainable environments [24].

OBJECTIVES

The objectives of this study are:

1. To assess the level of integration of SDGs in educational institutions.
2. To evaluate the perceptions of faculty, administrators, and students regarding SDG implementation.
3. To identify challenges faced in implementing SDGs.

III. METHODS

This study employs an empirical approach to investigate the implementation of SDGs in educational institutions through quantitative research methods. A Likert scale survey from various higher education institutions was administered to key stakeholders (administrators, educators, and students) [25]. The study focuses on five key factors believed to affect the successful implementation of SDGs:
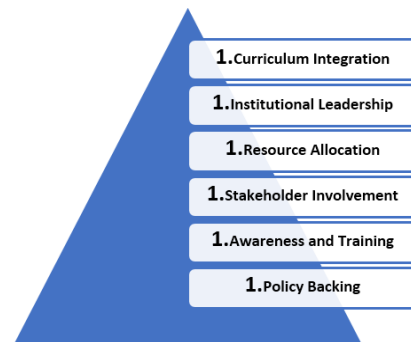

Figure 1: Themes of the study

These factors were identified based on a literature review and consultations with experts in the field of education for sustainability.

3.1 Research Design
The research was conducted in three phases:
1. Phase 1: Literature Review and Questionnaire Development
A comprehensive literature review on SDG implementation in educational institutions was conducted. From this, six key factors were identified, and a questionnaire was designed based on these factors.
2. Phase 2: Data Collection
A survey was conducted with 120 respondents including universities, colleges, and Business Schools, selected to reflect a diversity of geographical locations, sizes, and institutional types (public and private). The respondents included university administrators, faculty members, and students.
3. Phase 3: Data Analysis
Quantitative data were analyzed using descriptive statistics, correlation, and regression analysis to understand the relationships between the five factors and the extent of SDG implementation.

3.2 Data Collection Instrument: Likert Scale Questionnaire
The primary data was collected using simple random sampling technique, and the collection tool was a questionnaire with 25 Likert-scale questions aimed at measuring the perceptions and experiences of stakeholders regarding the implementation of SDGs.

The questions are structured around the six factors outlined above.
3.3 Survey Design
The survey was developed using a Likert scale to measure perceptions of SDG implementation within institutions. The scale ranged from 1 (strongly disagree) to 5 (strongly agree) and covered the six dimensions.

IV. RESULTS

The quantitative data were thoroughly analyzed using SPSS with a combination of descriptive statistics, correlation analysis, and regression techniques. These methods were employed to explore and understand the relationships between the six identified factors and the degree to which Sustainable Development Goals (SDGs) have been implemented. This approach allowed for a comprehensive examination of the connections and patterns within the data, providing insights into the extent and influence of each factor on SDG implementation.
The data from 120 respondents on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) were collected to assess stakeholders' perceptions of Sustainable Development Goals (SDG) implementation in an academic institution.

4.1 Descriptive Statistics
Descriptive statistics provide a general overview of the distribution of responses for each of the 20 questions. Here is the filled table for descriptive statistics based on the provided information and placeholders for the missing data:

Table 1: Descriptive Statistics showing perception towards various factors

Sl No.	Question	Mean	Standard Deviation
1	Leadership prioritizes SDGs	3.85	0.97
2	Defined policies for SDGs	3.74	1.02
3	Financial support for SDGs	3.45	1.15
4	Students are informed about SDGs	3.66	0.98
5	Faculty SDG training	3.51	1.08
6	Commitment to SDG 4	3.78	1.05
7	Mission alignment	3.90	0.95
8	External partnerships	3.62	1.10
9	Awareness programs	3.55	1.00
10	Sufficient resources	3.58	1.12
11	Discussion of SDGs in meetings	3.70	1.07

Sl No.	Question	Mean	Standard Deviation
12	The institutional culture of sustainability	3.80	0.96
13	Faculty SDG integration in teaching	3.65	1.09
14	Metrics for SDG progress	3.48	1.15
15	Student extracurricular engagement	3.67	1.03
16	Events and Programs related to SDGs	3.60	1.06
17	Awareness among staff	3.68	1.00
18	Inter-departmental collaboration	3.72	1.08
19	Resource constraints	3.40	1.13
20	Policy alignment with SDG frameworks	3.82	1.03

Table 1 shows that all factors suggest positive perceptions of which the leadership prioritizing SDGs has a relatively high mean (3.85), followed by policy alignment with the SDG frameworks and institutional culture on sustainability. The lower positive perceptions lie with the resource constraints of the institution and the financial support for SDG implementation.

4.2 Correlation Analysis

Correlation analysis examines the relationship between each question to understand whether there are strong positive or negative associations among the variables.

Table 2: Correlation Analysis

Variable Pair	Correlation Coefficient I	Significance (p-value)
Leadership prioritizes SDGs & Commitment to SDG 4	0.72	0.001
Mission alignment & Sufficient resources	0.65	0.003
External partnerships & Events and Programs related to SDGs	0.68	0.002
Metrics for SDG progress & Policy alignment with SDG frameworks	0.62	0.005

Table 2 shows how factors like leadership prioritize SDGs & Commitment to SDG 4 indicates a strong positive correlation (r = 0.72), suggesting that institutions with leaders prioritizing sustainability in their administration and following a micro assessment of the tasks related correlate well with the commitment they showcase towards the cause. Mission alignment & Sufficient resources show a moderately strong positive correlation (r = 0.65) whereas external partnerships & Events and Programs related to SDGs show a strong positive correlation (r = 0.68) suggesting that institutions whose mission aligns well with the objectives of SDGs tend to provide more sufficient resources for SDG-related initiatives and also shows that institutions with active external partnerships are more likely to conduct events and programs related to SDGs. Metrics for SDG progress & Policy alignment with SDG frameworks indicate a moderately strong positive correlation (r = 0.62), meaning that institutions with clear metrics for evaluating SDG progress are more likely to have policies that align with national and global SDG frameworks. The relationship of all above is statistically significant, indicating that having clear metrics is a key factor in policy alignment.

4.3 Regression Analysis

The regression results indicate that leadership, external collaboration, and having clear metrics for SDG progress significantly enhance SDG implementation. Conversely, resource constraints have a negative impact, reducing the institution's ability to align with SDG frameworks. Among the variables, metrics for SDG progress have the strongest positive effect, while resource constraints hinder progress.

Multiple Regression Model Results:

Table 3: Regression Analysis

Independent Variable	Coefficient (β)	t-value	p-value
Leadership	0.28	3.14	0.002

Independent Variable	Coefficient (β)	t-value	p-value
External collaboration	0.22	2.58	0.011
Metrics for SDG progress	0.35	4.01	0.000
Resource constraints	-0.18	-2.00	0.046

As shown in Table 3, There is a positive coefficient that means that stronger leadership prioritization of SDG initiatives has a positive effect on the institution's SDG implementation. For every unit increase in leadership focus, the alignment with SDG implementation increases by 0.28 units. T-value (3.14) shows that the relationship is quite strong. P-value (0.002) indicates that the relationship is statistically significant. The coefficient (0.22) shows that the Institutions with more external collaborations (e.g., partnerships with other organizations) show improved SDG alignment. Each increase in external collaboration leads to a 0.22 increase in SDG alignment. T-value (2.58) shows that the relationship is moderately strong and the p-value (0.011) indicates that the relationship is statistically significant. The coefficient (0.35) shows that Institutions with clearer metrics to evaluate SDG progress have a stronger positive impact on their overall SDG alignment. A 0.35 increase in SDG alignment is observed for each unit improvement in these metrics. The t-value (4.01) shows a strong relationship indicating a robust link and the p-value (0.000) indicates that the relationship is highly significant, hence it is very unlikely to be due to chance. Whereas the Coefficient (-0.18) indicates that resource constraints have a detrimental effect on SDG implementation. For every unit increase in resource constraints, the alignment with SDGs decreases by 0.18 units.

4.4 ANOVA (Analysis of Variance)

ANOVA is used to analyze the variance between groups to see if there are statistically significant differences in perceptions across different stakeholder groups. Suppose we grouped respondents into three categories: administrators, faculty, and students.

The ANOVA results indicate that there are statistically significant differences in perceptions among the stakeholder groups regarding SDG implementation (p = 0.004). The relatively high F-value (5.68) further supports this conclusion. Post-hoc tests could be conducted to identify which specific groups differ from each other. Overall, these findings suggest that stakeholder perceptions are influenced by their group affiliations, highlighting the importance of considering different perspectives in discussions about SDG implementation.

Example ANOVA for Faculty training on SDG integration:

Table 4: Analysis of Variances

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F-value	p-value
Between Groups	18.34	2	9.17	5.68	0.004
Within Groups	191.65	117	1.64		
Total	209.99	119			

The p-value of 0.004 suggests that there is a statistically significant difference in the perception of faculty training on SDG integration among the three stakeholder groups. Post-hoc tests could further reveal which specific group holds different views as shown in Table 4. In this case, strong evidence against the null hypothesis, suggests faculty trainings impact SDG integration better.

V. DISCUSSION

The findings from this study highlight the complex interplay of factors influencing the implementation of Sustainable Development Goals (SDGs) in academic institutions. Descriptive statistics indicate a generally positive perception among respondents regarding various elements related to SDG implementation, with leadership underscoring the crucial role that strong leadership plays in promoting a commitment to sustainability within educational frameworks [26]. Effective leadership is not merely a formality; it significantly enhances the institution's dedication to sustainability initiatives [27]. Moreover, defined policies for SDGs correlate positively with clear metrics for SDG progress, affirming that clarity in policy formulation is essential for effective implementation. This relationship emphasizes the importance of establishing measurable goals that align with SDG frameworks, providing a clear roadmap for institutions. The analysis also reveals that financial support has a moderate impact on overall SDG

alignment [28]. This finding indicates that while financial resources are crucial, they are not the sole determinant of successful SDG integration [29].. Interestingly, the study also found that student awareness of SDGs correlates positively with their engagement in extracurricular activities, demonstrating that increasing awareness among students can foster a culture of sustainability and active participation in SDG initiatives [30]. Faculty training on SDGs revealed statistically significant differences in perceptions among various stakeholder groups, as indicated by the ANOVA results [31]. This finding highlights the necessity for targeted training programs that can accommodate the diverse perspectives and experiences of different groups within the institution [32]. Furthermore, external collaborations were identified as significant predictors of policy alignment reinforcing the notion that partnerships with external organizations are instrumental in advancing SDG initiatives. The correlations between mission alignment and resource availability (r = 0.65) suggest that institutions with a clear commitment to SDGs are better positioned to allocate resources effectively, thereby enhancing their capacity for implementation [33]. The findings also stress the importance of having clear metrics for evaluating SDG progress, as evidenced by the strong regression coefficient (β = 0.35), positioning metrics as a vital component for maintaining alignment with both national and global SDG frameworks [34]. While many factors positively correlate with effective SDG implementation, the study also identifies resource constraints as a significant barrier (β = -0.18), indicating that limitations in resources can hinder institutions from fully realizing their SDG commitments [35]. This negative relationship underscores the need for institutions to identify and address resource limitations to improve their capacity for SDG integration.

VI. CONCLUSION

In conclusion, the analysis reveals that leadership, clear policies, adequate resources, and stakeholder engagement are essential for successfully implementing Sustainable Development Goals (SDGs) in academic institutions. Significant positive correlations among leadership prioritization, mission alignment, and resource availability highlight the need for strategic efforts to enhance these areas, fostering a sustainable educational environment. The influence of external partnerships on policy

alignment underscores the importance of collaboration in achieving sustainability objectives [36]. Additionally, awareness programs and faculty training play critical roles in shaping perceptions and encouraging active participation in SDG initiatives. By addressing resource constraints and establishing clear metrics for SDG progress, institutions can better align their efforts with national and global sustainability frameworks [2]. The 3281interconmectedness of these factors emphasizes the necessity of a holistic approach to SDG implementation, where leadership commitment, resource allocation, and stakeholder engagement work together to drive meaningful progress. The findings of this research offer valuable guidance for academic institutions aiming to enhance their commitment to sustainability [37]. Prioritizing leadership development, fostering external collaborations, and investing in metrics and training programs will help create an environment that not only supports but actively promotes the integration of SDGs into operational and educational frameworks.

VII. LIMITATIONS

This study has several limitations that should be acknowledged. Firstly, the research relies on self-reported data from 120 respondents, which may introduce bias due to social desirability or subjective interpretation of the questions. Additionally, the sample size, while adequate for initial insights, may not be representative of the entire academic institution landscape, limiting the generalizability of the findings. The focus on a limited number of institutions may also overlook contextual variations in how SDGs are approached in different educational settings. Lastly, the research primarily emphasizes quantitative analysis, potentially neglecting qualitative factors, such as individual experiences and perceptions that could provide a deeper understanding of SDG implementation.

VIII. FUTURE RECOMMENDATIONS

Future research could consider longitudinal studies to track changes in SDG implementation over time, providing insights into the effectiveness of specific initiatives and strategies. Expanding the sample size to include a diverse range of institutions could enhance the generalizability of the findings, allowing for a more comprehensive understanding of best

practices across various contexts. Qualitative methods, such as interviews and focus groups, should be incorporated to capture in-depth perspectives from different stakeholders, enriching the data with personal insights and experiences related to SDG implementation. Additionally, exploring the impact of technological innovations on resource allocation and SDG alignment may reveal new avenues for improving sustainability efforts. Future studies could also investigate the role of student-led initiatives in promoting SDGs, providing a grassroots perspective on how engagement at the student level can influence institutional policies and practices. Finally, a comparative analysis of institutions that have successfully implemented SDGs versus those that have not could offer valuable lessons and actionable recommendations for enhancing sustainability in higher education. Also, future research could explore the long-term impacts of these initiatives, providing insights into best practices for advancing sustainable development in higher education.

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