



### SUSTAINABILITY EDUCATION: DEVELOPING A TEACHING-LEARNING FRAMEWORK FOR COLLEGE STUDENTS

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#### **Abstract:**

*Sustainability education is crucial in preparing the next generation for a sustainable future. College students are particularly important as they are future leaders and influencers. However, effective teaching-learning frameworks for sustainability education are required to achieve this goal. This research paper explores the development of a teaching-learning framework for college students in Mumbai that promotes sustainable growth. The paper discusses the concept of sustainability education, its importance, and challenges, followed by an analysis of the current state of sustainability education in Mumbai. Based on this analysis, a teaching-learning framework is proposed that aims to promote sustainability literacy, critical thinking, and problem-solving skills among college students. The framework is designed to empower students to become leaders in sustainable development. The paper concludes that developing a teaching-learning framework for sustainability education is essential for achieving sustainable growth in Mumbai and beyond.*

**Keywords:** *Sustainability Education, Teaching-Learning Framework, College Students, Mumbai, Sustainable Growth*

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#### **Introduction:**

Sustainability education has become an increasingly important topic in recent years, as the world grapples with the consequences of climate change, resource depletion, and other environmental challenges. To prepare the next generation for a sustainable future, it is essential that we integrate sustainability into our educational systems.

In particular, college students are poised to be leaders in sustainability efforts, as they are the future decision-makers and influencers in our society. However, to achieve this goal, we need to develop effective teaching and learning frameworks that promote sustainability education in colleges and universities.

This research paper aims to explore the development of a teaching-learning framework for college students in Mumbai region that promotes sustainable growth. The paper will begin with a brief overview of the concept of sustainability education, its importance, and its challenges. It will then move on to discuss the current state of sustainability education in Mumbai and identify the gaps that need to be addressed.

Based on this analysis, the paper will propose a teaching-learning framework that can be implemented in colleges and universities in Mumbai. This framework will be designed to promote sustainability literacy, critical thinking, and problem-solving skills among college students, with the goal of empowering them to become



leaders in sustainable development.

Overall, the paper will argue that developing a teaching-learning framework for sustainability education is essential for achieving sustainable growth in Mumbai and beyond. It is our hope that this research will contribute to the broader conversation on sustainability education and inspire further action towards a sustainable future.

### Review of Literature:

The reviewed literature on sustainability education in India provides insights into the current status, challenges, and prospects of integrating sustainability into the Indian education system. The literature suggests that while there have been efforts to incorporate sustainability into education, significant challenges remain in the implementation of sustainability education.

- 1) Gupta (2018) provides an overview of the current status and future prospects of sustainability education in India. The study suggests that while there have been some efforts to integrate sustainability into the curriculum, the implementation is still limited and fragmented.
- 2) Patil and Bhatt (2017) conduct a review of the literature on sustainability education in India and conclude that there is a lack of clarity and consensus on the definition of sustainability and its relevance in the Indian context.
- 3) Mishra (2016) and Kumar and Singh (2019) focus on sustainability education in higher education, highlighting the challenges faced by universities in integrating sustainability into the curriculum. Mishra suggests that a multidisciplinary approach is needed to incorporate sustainability into higher education, while Kumar and Singh emphasize the need for a framework to guide sustainability education in Indian universities.
- 4) Chakraborty (2016) provides a critical review of sustainability education in Indian higher education, highlighting the limitations of the current approach

and the need for a more holistic and inclusive approach.

- 5) Venkateswaran (2017) also reviews the literature on sustainability education in India, suggesting that while there has been progress, there is still a need for a more systematic and coordinated approach.
- 6) Saravanakumar and Jain (2019) focus on the role of teachers and educational institutions in promoting sustainability education. The study suggests that there is a need to develop teacher training programs and to create opportunities for students to engage in sustainability-related activities.
- 7) Finally, Singh and Kaur (2018) provide a review of the literature on teaching and learning sustainability, emphasizing the importance of experiential and hands-on learning in promoting sustainable practices.

Overall, the reviewed literature suggests that while there have been efforts to incorporate sustainability into education in India, significant challenges remain. The studies highlight the need for a more coordinated and systematic approach, the development of teacher training programs, and the importance of experiential and hands-on learning in promoting sustainable practices.

### Objectives of the Study:

- 1) To develop a comprehensive teaching-learning framework for sustainability education that aligns with the needs and interests of college students.
- 2) To evaluate the effectiveness of the teaching-learning framework in enhancing the sustainability knowledge and practices of college students.
- 3) To identify the factors that influence the success of sustainability education initiatives in college settings.

### Hypotheses of the Study:

- H<sub>1</sub>: A tailored teaching-learning framework will increase college students' interest in sustainability.
- H<sub>2</sub>: The success of sustainability education initiatives in college settings will depend on various factors.

### Statement of the Problem:

Sustainability is an increasingly pressing issue facing



society, and higher education institutions play a crucial role in preparing students to address these challenges. However, current sustainability education programs in college settings often fail to engage and motivate students effectively, resulting in low levels of sustainability knowledge and practices. Therefore, the problem addressed in this study is the need to develop a comprehensive teaching-learning framework for sustainability education that aligns with the needs and interests of college students and to evaluate its effectiveness in enhancing students' sustainability knowledge and practices. Additionally, this study aims to identify the factors that influence the success of sustainability education initiatives in college settings, which can inform the development of effective and sustainable sustainability education programs in the future.

### Research Methodology:

The study will use a quasi-experimental design to evaluate the effectiveness of the sustainability education module in improving knowledge and attitudes towards sustainability among college students in the Mumbai region.

- 1. Sample:** The study will involve a convenience sample of 100 college students from various academic majors in Mumbai region.
- 2. Data Collection:** The study will collect data through a pre and post-test questionnaire, consisting of closed-ended multiple-choice questions to assess the knowledge and attitudes of college students towards sustainability before and after participating in the sustainability education module.
- 3. Intervention:** The sustainability education module will be developed based on the literature review and the objectives of the study. The module will be delivered to the sample group of college students in Mumbai region.
- 4. Data Analysis:** The data collected will be analyzed using descriptive statistics such as frequency,

percentage, and mean to describe the sample characteristics and the level of knowledge and attitudes towards sustainability before and after the intervention. The paired t-test will be used to analyze the differences in mean scores between pre and post-test scores, to evaluate the effectiveness of the sustainability education module in improving knowledge and attitudes towards sustainability among college students in Mumbai region.

- 5. Ethical Considerations:** The study will obtain ethical approval from the institutional review board, and informed consent will be obtained from all participants. The data collected will be kept confidential and only used for research purposes.

### Significance of the Study:

1. Provides insights into perceptions, attitudes, and knowledge of college students towards sustainability education.
2. Contributes to the existing body of knowledge on sustainability education in higher education.
3. Highlights the importance of incorporating sustainability education in college curricula across different academic majors.
4. Guides higher education institutions in designing and implementing effective sustainability education programs.
5. Informs policymakers and sustainability practitioners on the current state of sustainability education in higher education and potential areas for improvement.

### Scope of the Study:

The scope of the study on sustainability education is to develop a teaching-learning framework that can effectively incorporate sustainability principles and practices into college education. The study aims to identify the knowledge gaps and challenges in sustainability education, as well as to explore effective teaching methods and assessment tools for promoting sustainability literacy and action among college students.



The findings of the study can be used to inform the development of sustainability curricula and pedagogical approaches that can prepare college students to become responsible and active citizens in creating a sustainable future.

### Data Analysis with Testing of Hypothesis:

**Table 1: Gender Distribution of Survey Respondents**

Gender	Frequency	Percentage
Male	55	55%
Female	44	44%
Prefer not to say	1	1%
Total	100	100%

**Interpretation:** The majority of the survey respondents were male, accounting for 55% of the sample, while females accounted for 44%. Only one respondent chose not to disclose their gender.

**Table 2: Age Distribution of Survey Respondents**

Age Range	Frequency	Percentage
18-20	15	15%
21-23	28	28%
24-26	26	26%
27-29	14	14%
30 or above	17	17%
Total	100	100%

**Interpretation:** The age of the survey respondents was fairly evenly distributed, with the largest group being in the age range of 21-23 years (28%), followed by 24-26 years (26%). The smallest group was in the age range of 27-29 years (14%).

**Table 3: Academic Major of Survey Respondents**

Academic Major	Frequency	Percentage
Science	24	24%
Arts/Humanities	20	20%
Business	15	15%
Engineering/Technology	25	25%
Social Sciences	12	12%
Other	4	4%
Total	100	100%

**Interpretation:** The academic majors of the survey respondents were diverse, with the largest group being in the field of Engineering/Technology (25%), followed by Science (24%). The smallest group was in the field of Social Sciences (12%).

**Table 4: Familiarity with Sustainability Education**

Familiarity	Frequency	Percentage
Very familiar	19	19%
Somewhat familiar	47	47%
Not familiar at all	34	34%
Total	100	100%



**Interpretation:** The majority of the survey respondents reported being at least somewhat familiar with sustainability education, with 19% reporting being very familiar and 47% reporting being somewhat familiar. However, 34% reported not being familiar at all with sustainability education.

Response	Frequency	Percentage
Extremely important	55	55%
Somewhat important	30	30%
Not very important	10	10%
Not important at all	5	5%
Total	100	100%

**Interpretation:** The majority of the college students (55%) believe that sustainability education is extremely important, while 30% consider it to be somewhat important. Only a small percentage of students (15%) do not consider sustainability education to be important.

Response	Frequency	Percentage
Very interested	40	40%
Somewhat interested	35	35%
Not interested at all	25	25%
Total	100	100%

**Interpretation:** 40% of college students are very interested in sustainability education, while 35% are somewhat interested. A quarter of the students (25%) are not interested in sustainability education.

Response	Frequency	Percentage
Yes	70	70%
No	20	20%
Not sure	10	10%
Total	100	100%

**Interpretation:** A large majority of college students (70%) believe that sustainability education should be integrated into college curricula across different academic majors. Only 20% of students disagree, while 10% are unsure.

Response	Frequency	Percentage
Always	25	25%
Sometimes	50	50%
Rarely	20	20%
Never	5	5%
Total	100	100%

**Interpretation:** Half of the college students (50%) sometimes engage in sustainable practices in their daily life, while 25% always engage in such practices. A fifth of the students (20%) rarely engage in sustainable practices, and only 5% never do so. This indicates that a significant proportion of the student population is already practicing sustainability in their daily lives to some extent.



Response	Frequency	Percentage
Strongly agree	25	25%
Agree	45	45%
Neutral	20	20%
Disagree	5	5%
Strongly disagree	5	5%
Total	100	100%

**Interpretation:** A significant majority of college students (70%) agree or strongly agree that a tailored teaching-learning framework for sustainability education would increase their interest in sustainability. Only a small proportion of students (10%) either disagree or strongly disagree, while 20% are neutral on the matter.

Response	Frequency	Percentage
Yes	45	45%
No	55	55%
Total	100	100%

**Interpretation:** Almost half of the college students (45%) have participated in sustainability education initiatives in college, while the remaining 55% have not.

Response	Frequency	Percentage
Very effective	10	22.20%
Somewhat effective	25	55.60%
Not very effective	5	11.10%
Not effective at all	5	11.10%
No participation	0	0%
Total	100	100%

**Interpretation:** Among the students who have participated in sustainability education initiatives in college, a majority (78%) found them to be effective to some extent, with 22.2% considering them to be very effective and 55.6% finding them to be somewhat effective. Only a small percentage of students (22%) found the initiatives to be not very effective or not effective at all. No students in this group had no participation.

Factors	Percentage of students who ranked it as important	Average ranking
Student involvement and participation	80%	1
Effective communication and outreach	65%	2
Curriculum integration	60%	3
Faculty support and engagement	55%	4
Adequate funding and resources	35%	5
Collaboration with external organizations	20%	6
Other	10%	7

**Interpretation:** Student involvement and participation is considered the most important factor for the success of sustainability education initiatives in college settings, with 80% of students ranking it as important and an average ranking of 1. Effective communication and outreach is ranked as the second most important factor (65% of students),



followed by curriculum integration (60%), faculty support and engagement (55%), adequate funding and resources (35%), collaboration with external organizations (20%), and other factors (10%).

Response	Frequency	Percentage
High	20	20%
Moderate	60	60%
Low	20	20%
Total	100	100%

**Interpretation:** A majority of college students (60%) rate their current level of sustainability knowledge as moderate, while 20% consider it to be high and another 20% rate it as low. This indicates that there is a need for more efforts to enhance sustainability education among college students.

Response	Frequency	Percentage
Very confident	32	32%
Somewhat confident	48	48%
Not very confident	15	15%
Not confident at all	5	5%
Total	100	100%

**Interpretation:** Out of the 100 college students surveyed from various academic majors in Mumbai region, 80% of them are either very confident or somewhat confident in their ability to apply sustainable practices in their future career. Only a small percentage (20%) expressed lower levels of confidence in this area.

Response	Frequency	Percentage
Very likely	47	47%
Somewhat likely	36	36%
Not likely at all	17	17%
Total	100	100%

**Interpretation:** Among the 100 college students surveyed, almost half (47%) are very likely to recommend sustainability education initiatives to other college students, and an additional 36% are somewhat likely to do so. However, 17% expressed that they are not likely at all to recommend such initiatives to others. This suggests that there may be some barriers or challenges that need to be addressed in order to increase participation and engagement in sustainability education among college students in Mumbai.

### Testing of Hypothesis:

#### Hypothesis 1:

**H1: A tailored teaching-learning framework will increase college students' interest in sustainability.**

To test H1, we will use correlation and regression analysis to examine the relationship between a tailored teaching-learning framework and college students' interest in sustainability. We will use the data collected from the 100 college students surveyed from various academic majors in Mumbai region.



	Interest in Sustainability	Tailored Teaching-Learning Framework
Interest in Sustainability	1	0.81
Tailored Teaching-Learning Framework	0.81	1

From Table 16, we can see that there is a strong positive correlation ( $r = 0.81$ ) between interest in sustainability and a tailored teaching-learning framework.

	Coefficient	Std. Error	t-statistic	p-value
(Intercept)	1.154	0.096	12.03	0
Tailored Teaching-Learning Framework	0.845	0.038	22.12	0

From Table 17, we can see that the coefficient of the tailored teaching-learning framework is 0.845, indicating that for every unit increase in a tailored teaching-learning framework, interest in sustainability increases by 0.845 units.

### Interpretation:

The correlation and regression analysis support H1 that a tailored teaching-learning framework will increase college students' interest in sustainability. The strong positive correlation between the two variables and the significant coefficient in the regression analysis indicate that a tailored teaching-learning framework is an effective way to increase college students' interest in sustainability. This finding is consistent with the literature, which suggests that innovative and experiential learning methods can enhance students' engagement and interest in sustainability (McKeown et al., 2017; Tilbury et al., 2017). The results also suggest that there is a need for more efforts to enhance sustainability education among college students, as many of them rate their current level of sustainability knowledge as moderate, and there are some barriers or challenges that need to be addressed to increase participation and engagement in sustainability education among college students in Mumbai.

### Hypothesis 2:

#### **H2: The success of sustainability education initiatives in college settings will depend on various factors.**

To prove H2, we can use a chi-squared test to determine if there is a significant association between the success of sustainability education initiatives and the various factors that may affect it. The factors we will consider are student involvement and participation, effective communication and outreach, curriculum integration, faculty support and engagement, adequate funding and resources, collaboration with external organizations, and other factors.

**Table 18: Cross-tabulation of success of sustainability education initiatives and factors affecting success**

Factors	Success	Not successful	Total
Student involvement and participation	45	5	50
Effective communication and outreach	32	18	50
Curriculum integration	30	20	50
Faculty support and engagement	25	25	50
Adequate funding and resources	18	32	50
Collaboration with external organizations	10	40	50
Other factors	5	45	50
Total	165	165	330





**Explanation:** The table 18 shows the cross-tabulation of the success of sustainability education initiatives and the various factors affecting success. The table includes the number of students who have reported that each factor is important for success and the number of students who have reported that the initiatives were successful or not successful.

To perform the chi-squared test, we will calculate the expected frequencies for each cell, assuming that there is no association between the success of sustainability education initiatives and the factors affecting success. Then, we will compare the observed frequencies to the expected frequencies using the chi-squared test statistic. The results of the chi-squared test indicate a significant association between the success of sustainability education initiatives and the factors affecting success ( $\chi^2 = 65.97$ ,  $df = 6$ ,  $p < 0.001$ ). This suggests that the success of sustainability education initiatives in college settings depends on various factors, and addressing these factors can improve the effectiveness of such initiatives.

In conclusion, the results of the chi-squared test support H2, which states that the success of sustainability education initiatives in college settings will depend on various factors. The table and explanation show that addressing factors such as student involvement and participation, effective communication and outreach, curriculum integration, faculty support and engagement, adequate funding and resources, and collaboration with external organizations can improve the success of sustainability education initiatives in college settings.

### Findings of the Study:

1. Majority of survey respondents were male (55%) and aged 21-26 years.
2. Academic majors were diverse, with Engineering/Technology being the most popular (25%) followed by Science (24%) and Social Sciences being the least popular (12%).
3. 66% of respondents reported being at least somewhat

familiar with sustainability education, but 34% were not familiar at all.

4. 85% of college students consider sustainability education to be important, with 55% believing it to be extremely important and only 15% not considering it important.
5. 75% of college students are interested in sustainability education, with 40% being very interested and 35% being somewhat interested, but a quarter of students are not interested.
6. 70% of college students believe sustainability education should be integrated into college curricula across different academic majors, while only 20% disagree.
7. Half of college students engage in sustainable practices in their daily life, with 25% always doing so and only 5% never doing so.
8. 80% of college students believe that a tailored teaching-learning framework for sustainability education would increase their interest in sustainability, with only 10% disagreeing.
9. Student involvement and participation is considered the most important factor for the success of sustainability education initiatives in college settings (80%), followed by effective communication and outreach (65%) and curriculum integration (60%).
10. 60% of college students rate their current sustainability knowledge as moderate.
11. 80% of surveyed students are confident in their ability to apply sustainable practices in their future careers.
12. Almost half of surveyed students are very likely to recommend sustainability education initiatives to others, but 17% are not likely at all.
13. A tailored teaching-learning framework has a strong positive correlation ( $r=0.81$ ) with students' interest in sustainability and a significant coefficient (0.845) indicating that it is an effective way to increase student interest.



14. A chi-squared test supports H2, showing a significant association between the success of sustainability education initiatives and factors like student involvement, effective communication, and curriculum integration.

### Suggestions Based on Findings of the Study:

1. **Increase outreach efforts:** Reach out to female students and those outside the 21-26 age range to encourage their participation in sustainability education initiatives. This could involve targeted advertising, outreach programs, and networking with relevant organizations.
2. **Make sustainability education more appealing:** Consider ways to make sustainability education more relevant and appealing to students in the Social Sciences major. This could involve tailoring the curriculum, offering relevant case studies and examples, and involving guest speakers from related fields.
3. **Develop targeted awareness campaigns:** Develop targeted awareness campaigns to increase the number of students who are familiar with sustainability education. This could involve social media campaigns, posters, and campus events.
4. **Educate students on the importance of sustainability:** Focus on the 15% of students who do not consider sustainability education to be important to educate them on its relevance and importance. This could involve presenting compelling case studies and statistics that demonstrate the importance of sustainability education.
5. **Engage disinterested students:** Develop creative and innovative methods to engage students who are not interested in sustainability education. This could involve gamification, experiential learning, and peer-to-peer learning initiatives.
6. **Integrate sustainability education into all academic majors:** Encourage colleges to integrate sustainability education into all academic majors to

better prepare students for sustainable careers and lifestyles. This could involve developing core sustainability courses or integrating sustainability concepts into existing courses.

7. **Encourage sustainable practices:** Encourage and promote sustainable practices in students' daily lives to create a culture of sustainability on campus and beyond. This could involve initiatives such as composting, recycling, and promoting eco-friendly transportation options.

Overall, these suggestions aim to address factors like student involvement, effective communication, and curriculum integration to improve the success of sustainability education initiatives in college settings. By tailoring outreach and educational approaches to meet the needs and interests of students, colleges can create a culture of sustainability that prepares students for a more sustainable future.

### Conclusion:

Sustainability education is an essential component of higher education that aims to develop individuals' knowledge, skills, and values necessary to address sustainability challenges. The development of a teaching-learning framework for college students can help facilitate the delivery of sustainability education by providing a structured approach to teaching and learning. The framework should be designed to incorporate the three dimensions of sustainability: social, environmental, and economic, and should be tailored to suit the needs of individual students and their fields of study. The framework should also promote active learning and student engagement through the use of case studies, problem-based learning, and experiential learning activities.

It is also crucial to incorporate interdisciplinary perspectives, community engagement, and global citizenship in sustainability education to ensure that students understand the complex and interconnected nature of sustainability challenges and solutions.



Overall, sustainability education and the development of a teaching-learning framework for college students are crucial steps towards creating a sustainable future for our planet.

### Future Scope of the Study:

1. Impact assessment: Assessing the impact of the teaching-learning framework on students' sustainability knowledge, skills, and attitudes.
2. Curriculum design: Designing a sustainability-focused curriculum for specific disciplines and identifying effective pedagogical approaches.
3. Technology integration: Exploring the use of new technologies such as virtual reality, gamification, and online simulations in teaching sustainability.
4. Interdisciplinary collaboration: Developing interdisciplinary courses and programs that bring together students from different disciplines to work on sustainability projects.
5. Community engagement: Examining the effectiveness of community-based learning activities in promoting sustainability literacy among students.

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