A Study on Sustainable Higher Education

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Abstract

Purpose- This study delves into the concept of transformative education as a potent instrument for propelling sustainable development forward. It delves into how institutions of higher education can assume a central role in equipping students and communities with the essential knowledge, proficiencies, and principles requisite for steering constructive transformations, confronting global adversities, and forging a future that is both sustainable and just.

Design/Methodology- This study considers a corpus of 1781 publications in sustainable education published from 2000 to 2023. The data was gathered from Scopus and the Web of Science Core Collection database. Further, the bibliometrix package in R was used to perform a comprehensive bibliometric study. The analysis delved into the collaborative research work, identifying the citation, finding co-references, and co-occurrence patterns to understand the research work in a better manner.

Findings-The complete composition is structured into nine subsections, each dedicated to an in-depth exploration of distinct facets. The framework encompasses a spectrum of elements within transformative education, encompassing the overhaul of curricula, involvement with communities, advancement of faculty, and the evaluation of learning outcomes, thereby presenting a comprehensive scrutiny of the subject matter.

Research Implications- Educators and policymakers alike can refer to this composition to gain insights into the pivotal function of higher education institutions in melding prospective trailblazers, catalysts of change, and pioneers who will proactively contribute to a world characterized by sustainability.

Keywords: Sustainable, Higher Education, Policies, transformative education, learning outcome

1 Introduction

The transformative education aims to motivate and empower joyous, holistically enriched students who can make wise decisions and positively contribute to their communities and the world. Acquiring rational and emotional skills is the main objective of transformative education so that the learners can make critical decisions in the changing world landscape. Transformative education takes on heightened importance within higher education institutions, addressing sustainability and encompassing crucial aspects such as human rights, value systems, diversity, equity, holistic education, and community-based learning. This broader perspective underscores the multifaceted role of higher education institutions in shaping individuals who are academically proficient and also socially responsible and ethically firm.

As a core tenet of transformative education, sustainability solidifies its significance in the educational offerings of higher education institutions (HEIs). Transformative learning actively advocates for sustainable development goals by emphasizing the harmonious culmination of social equity, well-being, economic advancement, environmental respect, and protection. This educational approach actively promotes and supports the practice of sustainable development, fostering a holistic understanding of interconnected global challenges among students. Higher education plays a pivotal role in shaping individuals into well-rounded, knowledgeable, and critical thinkers. It goes beyond the acquisition of specialized knowledge and serves as a transformative experience that equips students with the skills necessary for success in a rapidly evolving global landscape. Through higher education, individuals not only gain expertise in their chosen fields but also develop essential skills like critical thinking ability, problem-solving attitude, strong communication, and collaboration. Moreover, it fosters a sense of intellectual curiosity and a lifelong commitment to learning. Higher education institutions also play a role as hubs for research & innovation, contributing to the applicability of knowledge and the development of groundbreaking technologies. Dunlap *et al.* (2000) introduced the New Ecological Paradigm (NEP) scale to measure an individual's environmental concerns and awareness. Additionally, higher education provides a platform for cultural exchange and diversity, exposing students to a variety of perspectives and preparing them for a sustainable world. As societies continue to face complex challenges, the role of higher education becomes increasingly crucial in preparing individuals to navigate and contribute meaningfully to the ever-changing global

landscape. Barr (2003) examines the strategies for promoting sustainable education and responsible consumption concerns among citizens. Cranton (2006) explores transformative learning by modifying the beliefs and actions of educators and young leaders.

Link between Education and Sustainable Development Goals (SDGs)

The 17 Sustainable Development Goals (SDGs) are global objectives established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development, these goals try to handle diverse are designed to address a wide variety of social, economic, and environmental issues to create a more equitable, just, and viable world. The SDGs cover diverse areas, like poverty, education, hunger alleviation, health and well-being, gender equality, access to clean water, affordable clean energy, decent work conditions and economic growth, industry innovation and infrastructure, reduced inequalities, smart cities and equitable communities, responsible consumption, climate action, marine life, life on land, peace, justice, and strong partnership among institutions, and partnerships for the attainment of sustainable goals. Brundiers, Wiek, and Redman (2010) emphasized the importance of real-world learning of sustainable education by linking it with classroom education to ensure that students can address sustainability challenges. Cortese (2003) highlighted the crucial role of higher education in promoting sustainability by embedding the principles in the curriculum. Dale and Newman (2005) emphasize the link between sustainable education and HEIs for advocating critical thinking towards sustainability challenges. Elliott (1999) emphasized the role of environmental education in building a sustainable society to deal with future sustainable challenges.

The SDG framework represents a shared commitment by countries around the world to work collaboratively to tackle pressing global issues. They provide a comprehensive framework that encourages cooperation between governments, regulators, corporate houses, civil society, and individuals to achieve common objectives. Sustainable development goals are interconnected, recognizing that work in one area often depends on advancements in others. Monitoring and reporting on the progress toward these goals are crucial components of the 2030 Agenda, promoting transparency and accountability globally. SDGs demand a collective and concerted effort, innovative approaches, and a great commitment to inclusivity for a more sustainable and inclusive future.

Numerous Sustainable Development Goals (SDGs), such as gender equality and economic growth, explicitly recognize the pivotal role of education as a facilitator.

Conversely, progress in various fields can influence education in diverse ways, a phenomenon extensively researched since the introduction of the Millennium Development Goals (MDGs) in 2000, the responsibility for advancing Education for Sustainable Development (ESD) 2030 rests with UNESCO. ESD empowers learners of all ages to tackle interconnected global issues like climate change, biodiversity depletion, unsustainable resource usage, and social inequality. ESD equips individuals to make informed decisions and helps them take both personal and collective action. ESD enhances societal well-being and safeguards the environment through high-quality education and lifelong learning. The Pacific Education for Sustainable Development Framework has outlined key priority areas in formal education and teacher training to strengthen knowledge, awareness, and the adoption of sustainable practices.

Globally, there is substantial attention on Education for Sustainable Development, and in India, the National Education Policy (NEP) reflects a revised framework aligning with many sustainable development goals. While the recent adoption of NEP is a positive step, effective implementation remains a work in progress. Until full implementation, the focus should be on integrating best practices and ensuring the widespread adoption of NEP and ESD components across all educational institutions in India.

The present study undertakes the endeavor of addressing this scholarly gap by addressing the following research questions:

RQ1. *What is the current state of research in Sustainable Education?*

RQ2. *Which are the most impactful journals, authors, and countries in the field of Sustainable Education?*

RQ3. *What is the connection between SDGs and HEIs?*

The flow of the paper is as follows:

Section 1: The introduction provides a comprehensive overview literature of higher education and links between Education and Sustainable Development Goals

Section 2: deals with the methodology

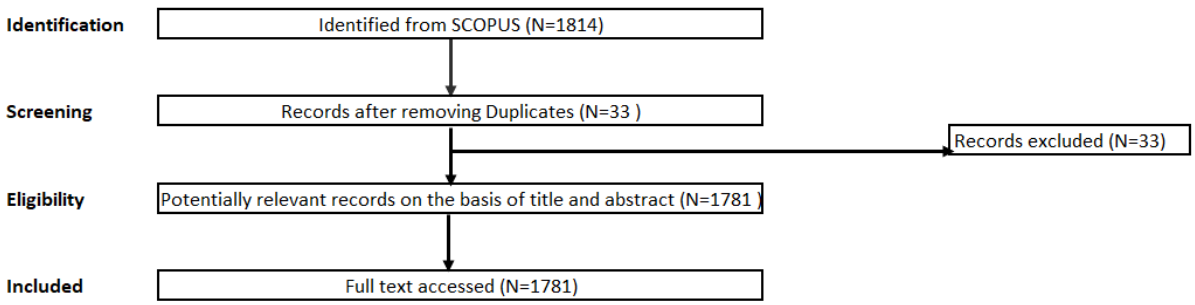
Section 3: compiles the results generated with the bibliometric analysis.

Section 4: deals with the conclusion discussion and future scope of study.

2. Method

The study is based on bibliometric analysis, utilizing the data from Scopus and Web of Science (WOS). The analytical exploration is from 2000 to 2023, using Biblioshiny through R studio. The tools enabled various file export alternatives such as BibTex, CSV, Plain Text, and RIS formats for further study. A total of 1781 documents from 382 resources and 4258 authors have been considered after removing 33 duplicate documents from the exported data. To fetch the data from the sources, the following search equation was used: (*Sustainable Education* OR *Higher Education Institutions* OR *Sustainable Development Goals*). The asterisk (*) was selected to encompass any cluster of characters relevant to sustainable finance. The search was refined further for Article or Review document types and restricted to the English language. The indices used were SCI-EXPANDED, SSCI, and A&HCI. A bibliometric analysis is done on the merged file (1781 records). The acronym "PRISMA" stands for "**Preferred Reporting Items for Systematic Reviews and Meta-Analyses**". These records have undergone a refinement process employing the defining characteristics. The PRISMA process is shown below in Figure 2.1

Figure 2.1



3. Result and Discussion

A Bibliometric Review of available literature has been done using the databases of Scopus and Web of Science. A total of 1781 papers were collected from 382 sources and 4258 authors. A detailed review was conducted using biblioshiny software.

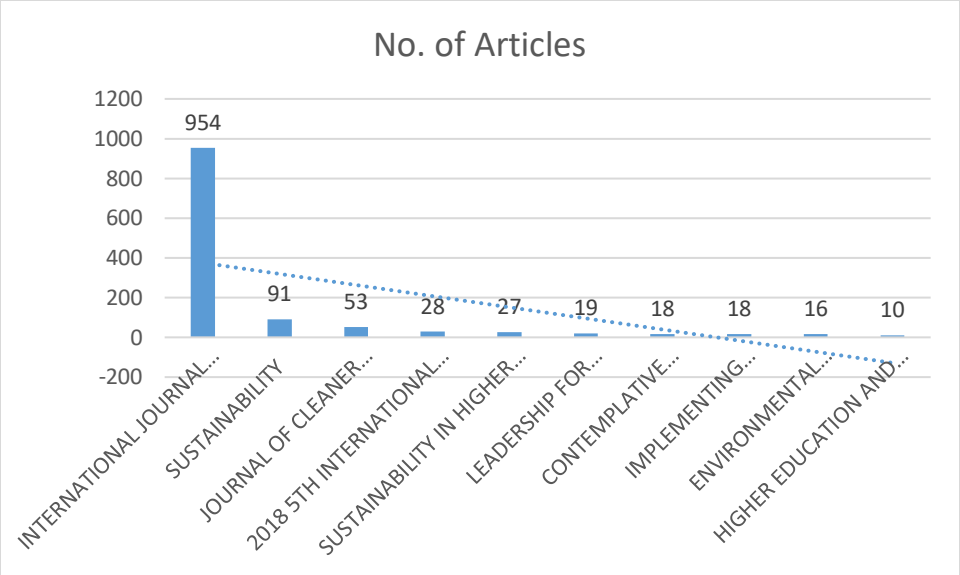
Some important tables are reported as below:

Most Relevant sources in which studies regarding sustainable higher education are reported are listed in the below-mentioned table 3.1:

Table 3.1: Most Relevant Sources

Sources	Articles
International Journal of Sustainability in Higher Education	954
Sustainability	91
Journal of Cleaner Production	53
2018 5th International Conference on Electric Vehicular Technology	28
Sustainability In Higher Education: Stories and Strategies for Transformation	27
Leadership For Sustainability in Higher Education	19
Contemplative Approaches to Sustainability in Higher Education: Theory and Practice	18
Implementing Sustainability in Higher Education: Learning in An Age of Transformation	18
Environmental Education Research	16
Higher Education and The Challenge of Sustainability	10

Figure 3.1: Most Relevant Sources



As reported above in figure 3.1, the International Journal of Sustainability in Higher Education has a maximum number of relevant studies, which is 954. This journal is followed by sustainability with 91 studies on the topic, and the journal of cleaner production is the third top most journal with 53 studies reported on the theme.

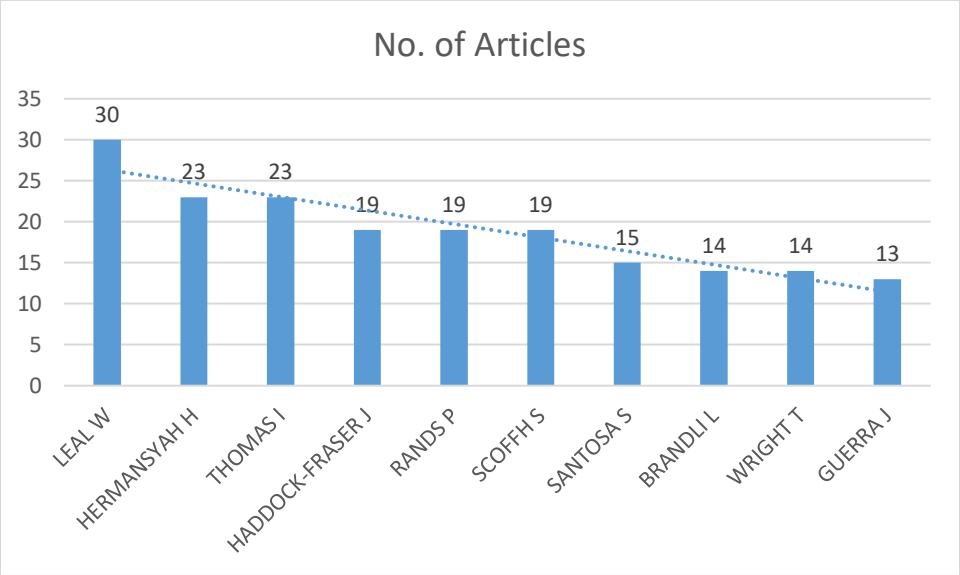
This review is followed by studying the work of authors with the maximum reported studies. The top ten authors in the area of sustainability in higher education are mentioned in table 3.2 and figure 3.2 below:

Table 3.2: Most Relevant Authors

Authors	Articles
Leal W	30
Hermansyah H	23
Thomas I	23
Haddock-Fraser J	19
Rands P	19
Scoffh S	19
Santosa S	15
Brandli L	14
Wright T	14

Guerra J	13

Figure 3.2: Most Relevant Authors



As shown above in figure 3.2, Leal W is the topmost author with 30 published studies on sustainable higher education. He is followed by Hermansyah H and Thomas I with 23 studies. Next in line are Haddock-Fraser J, Rands P, and Scoffh S with 19 studies each. Santosa S, Brandli L, Wright T, and Guerra J are the other prominent authors with 15, 14, and 13 studies, respectively.

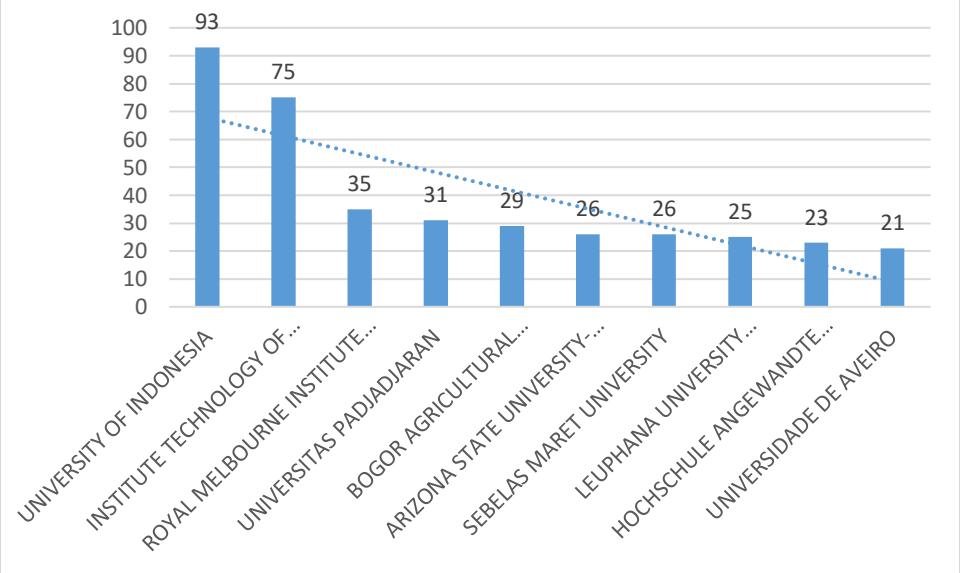
Most relevant affiliations in which the research on the area of sustainable higher education has been conducted are as below in table 3.3:

Table 3.3: Most Relevant Affiliations

Affiliation	Articles
University of Indonesia	93
Institute Technology of Bandung	75
Royal Melbourne Institute of Technology	35
Universitas Padjadjaran	31
Bogor Agricultural University	29
Arizona State University-Tempe	26

Sebelas Maret University	26
Leuphana University Luneburg	25
Hochschule Angewandte Wissenschaft Hamburg	23
Universidade De Aveiro	21

Figure 3.3: Most Relevant Affiliations



As clear from the above data in figure 3.3, the University of Indonesia is the leading university, identifying and researching on the issue of sustainable higher education, Institute of Technology Bandung, Royal Melbourne Institute of Technology, Universitas Padjadjaran and other international universities. This data clearly shows that from the Indian perspective, there is huge scope for sustainable higher education and policy framework.

Country-wise citation also shows that India is not among the top ten cited countries in this area. This data is shown below in Table 3.4

Table 3.4: Total Citations

Country	Total Citation

USA	4406
United Kingdom	2514
Canada	1877
Australia	1631
Indonesia	1464
Spain	1249
Germany	1225
Brazil	1069
Netherlands	811
Portugal	768

Figure 3.4: Total Citations

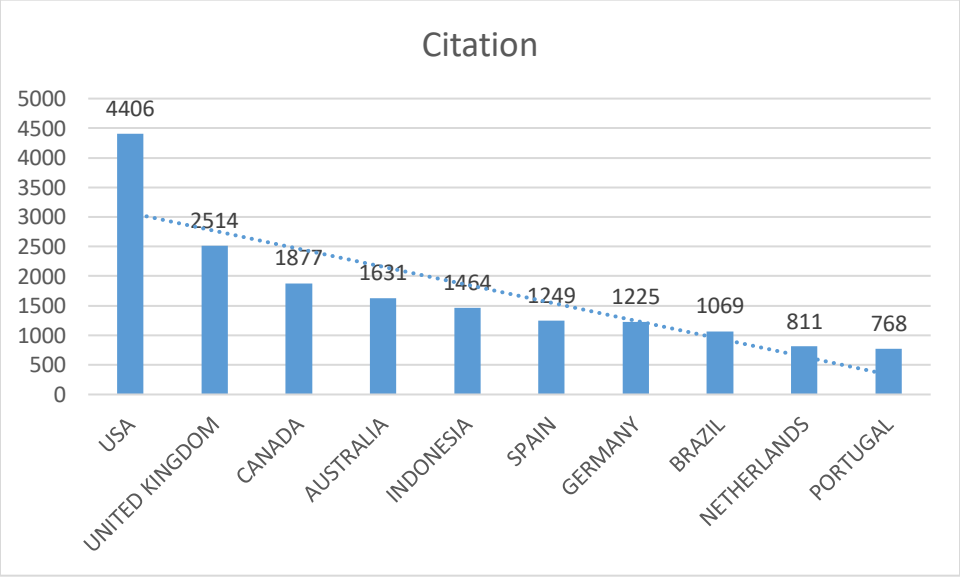


Figure 3.4 shows that the USA has topped the citations data with 4406 total citations, followed by the U.K. and Canada with total citations of 2514 and 1877. Here also, it is clear that in India, this topic is at a nascent stage and needs a lot of recognition.

Top studies in this area are listed in table 3.5 as mentioned below:

Table 3.5: Most Global Cited Documents

Paper	DOI	Total Citations
LOZANO R, 2013, Journal Clean Production	10.1016/j.jclepro.2011.10.006	540
Shephard K, 2008, International Journal of Sustainable Higher Education	10.1108/14676370810842201	381
Velazquez L, 2005, International Journal of Sustainable Higher Education	10.1108/14676370510623865	316
Brundiers K, 2010, International Journal of Sustainable Higher Education	10.1108/14676371011077540	292
Gunantara N, 2018, Cogent Engineering	10.1080/23311916.2018.1502242	282
Lambrechts W, 2013, Journal Clean Production	10.1016/j.jclepro.2011.12.034	249
Wals A, 2014, Journal Clean Production	10.1016/j.jclepro.2013.06.007	227
Lozano R, 2011, International Journal of Sustainable Higher Education	10.1108/14676371111098311	227
KARATZOGLOU B, 2013, Journal Clean Production	10.1016/j.jclepro.2012.07.043	219
STEINER G, 2006, Journal Clean Production	10.1016/j.jclepro.2005.11.054	219

Lastly, the word cloud (Figure 3.5) of the considered data also highlights the top five words as university, higher education, education, sustainability, and management.

Figure 3.5: Word Cloud

4. Conclusion, discussion, and future scope of the study

After reviewing the available literature, observations of sustainable education practices at the higher education level, and critically analyzing the role of various stakeholders, the following points can be highlighted:

4.1 Need to Envision the crucial role of Higher Education in Sustainable Development:

The initial stride involves heightening awareness of Higher Education for Sustainable Development (ESD). It is imperative to address the fundamental understanding of sustainability and education, intertwining the two concepts. Higher education institutions are mandated to embed the essence of transformative learning for sustainable development directly into their vision statements. Subsequently, an action plan should be meticulously drafted to realize this vision.

4.2 Policy Recommendations for Integrating Sustainability into Educational Systems via an Effective Curriculum:

An effective ESD curriculum should concentrate on imparting proper attitudes, skills, and behaviors concerning sustainability issues to students and stakeholders. The curriculum ought to stimulate behavioral change and must be accessible, concise, and easily implementable. Incorporating sustainability-related activities into the ESD curriculum is paramount.

4.3 Advocacy for Community Involvement:

Ensuring local context and relevance is integral in curriculum design, and the curriculum review committee should involve local representatives, industry stakeholders, and policymakers in its meetings and planning sessions. Special emphasis should be placed on engaging each stakeholder in educating and supporting sustainability. Organizing sustainability forums within institutions, creating or reorganizing committees, and leveraging existing forums will foster community engagement. Training and incubation centers should actively organize seminars, conclaves, exhibitions, and visits to rural and underprivileged segments of society to ensure their contribution to sustainable education. Involving all relevant stakeholders, including students, teachers, parents, and community members, in such activities will enhance participation.

4.4 Networking, Partnerships, and Collaborations:

Effective implementation of ESD requires robust collaboration between the government, private sector, civil society organizations, institutions, and other key players. This collaborative effort will enhance capabilities and help overcome resource and budget constraints.

Future Scope of the Study

Undoubtedly, education is a cornerstone in achieving sustainable development and serves as a powerful tool. Higher education institutions can instigate the necessary shifts in attitudes, behaviors, and skills essential for problem-solving and decision-making in the future. The substantial contribution to ESD would materialize if educational institutions integrate sustainability as a key component of instruction practically and realistically. This article aims to assess the current progress in ESD, present best practices, identify existing barriers, and propose ways to overcome them. It articulates the requisite actions and stages toward sustainability, demonstrating how transformative education can catalyze sustainable development in education and contribute to achieving the ESDs. A limitation of this study is that while sustainable challenges in higher education are thoroughly examined, the role of sustainable issues in primary education remains an area for future investigation.

In light of the above review literature, the scope of exploring transformative learning in higher education towards attainment of SDGs can be as mentioned as below:

- Promoting policy
- Changing educational contexts

- Enhancing educators' capabilities
- Empowering and organizing young people
- Action at the local level
- Collaboration and partnership

The above scope areas are explained in the next sections. The next section covers the sustainable issues to be attained through various ongoing and proposed practices being followed at higher education institutions. The practices mentioned below are based on the experience and observations of the authors.

The Role of Higher Education in Shaping Sustainable Mindsets

Cultivating sustainability as a fundamental principle within academic institutions through the formulation of innovative policies.

Casarejos, F., Frota, M.N., and Gustavson, L.M. (2017) discussed various strategic innovations for sustainable higher education. Further, India's inaugural 21st-century education policy, the National Education Policy (NEP), was introduced in 2020. Geared towards delivering inclusive and comprehensive education, the NEP aims to propel India towards achieving Goal 4: Quality Education. Infused with a perspective on Education for Sustainable Development, the NEP recognizes the imperative to reshape the entire national educational framework by revisiting existing policies for timely attainment of established goals. NEP 2020 places significant emphasis on integrated environmental and social education, encompassing subjects like sustainable livelihood, waste reuse and management, environment protection, biodiversity, ecosystem and natural resource protection, sanitation, and climate change. Beyond the outlined agenda, higher education institutions are encouraged to incorporate critical thinking and systems-oriented approaches into their program educational objectives. Prioritizing the development of learners' critical thinking abilities enables future leaders to identify current and impending sustainability challenges and propose strategies for achieving Sustainable Development Goals (SDGs). Furthermore, integrating ethical values into the curriculum is deemed an integral part of an institution's vision and mission, fostering responsible decision-making among students. Reisch, O.C. et al (2023) recommend developing a sustainable strategic performance map by higher education institutions.

Transformation of the curriculum to promote Sustainability

Taking clues from the study of Shephard K. (2008), new strategies, methods, and techniques for curriculum design can be adopted. However, as per the study of Velazquez, L., Munguia, N., and Sanchez, M. (2005), successful implementation of sustainability initiatives, following the vision, is subject to many obstacles and hiccups in higher education institutions.

Reimagining conventional academic disciplines to seamlessly incorporate sustainability is imperative for higher education institutions. This involves a thorough review and revision of the curriculum, ensuring the introduction of courses aligned with this vision. As an illustration, environmental education is now a mandatory component to be instructed by trainers specializing in environmental development. The National Education Programme (NEP) aims to impart education in a manner that not only sustains livelihoods but also fortifies the national economy. Additionally, the curriculum can embrace inclusive education, addressing both social and environmental justice issues for a more comprehensive approach to sustainability. Integrating service-learning programs into the curriculum benefits both students and communities, fostering a sense of civic responsibility. To gauge the transformative impact of education, it is essential to develop indicators and frameworks for assessing sustainable development learning, utilizing progressive assessment tools. Both qualitative and quantitative methodologies should be employed to evaluate the transformative impact of education on sustainable development. Annabi, C.A. and Wilkins, S. (2016) studied the impact of online MOOCs in curriculum, as an initiative towards sustainable higher education initiative.

Educators serving as agents for transformative change.

The National Education Policy (NEP) places particular importance on the education and preparation of teacher educators and trainers. The integration of faculty development programs focused on teaching sustainability and transformative learning will become a routine part of higher education institutions' annual academic activities. Promoting interdisciplinary collaboration and fostering cross-faculty partnerships at both national and international levels will enhance comprehension of the broader paradigm within the realm of sustainability. Additionally, acknowledging and incentivizing research and teaching efforts centered on sustainability will serve as a motivational factor for teachers and educators to actively engage in Education for Sustainable Development.

Fostering student leadership to drive sustainable initiatives.

Incorporating experiential and project-based learning into all domains of pedagogy is essential for real-world problem-solving. Students should actively engage in conducting surveys involving stakeholders to address various issues related to sustainable development goals. Poon, J. (2012) studied the student's learning experience through MOOCs. Subsequently, they can present their solutions and recommendations to local authorities for implementation. Additionally, integrating various certificate courses into subjects is crucial. Student participation in sustainability initiatives and campus projects is encouraged, and institutes should establish incubation cells to support student-led sustainable entrepreneurship and innovations. Financial aid and support can be facilitated through institute funds, cloud funds, government aid, and donations. This approach enables students to learn and contribute to self-sustainable business activities for the benefit of society. Regulatory bodies such as AICTE and UGC can organize national and international competitions centered around the SDGs, fostering the development of future leaders dedicated to sustainable practices. Furthermore, international collaborations for sharing best practices in sustainability education will enhance the skills of future managers in sustainable development. Gallifa, J. and Batallé, P. (2010) studied students' perception towards transformative sustainable education. Wilkins, S. and Stephens Balakrishnan, M. (2013) studied students' satisfaction after implementing sustainable practices in higher education and concluded that students of UAE branch campus were more satisfied with the policies and emerged as better leaders.

Active involvement with communities through service-based learning

In India, numerous companies are currently dedicated to producing environmentally friendly products and establishing sustainable brands to contribute to environmental conservation. The experiences of these entrepreneurs can serve as valuable case studies, providing insights for potential partnerships between academia and local communities. These successful entrepreneurs can act as a connecting bridge, facilitating collaboration and knowledge exchange. Some illustrative examples are outlined below:

- *Ather Energy*

To mitigate air pollution, Tarun Mehta and Swapnil Jain established Ather Energy in Bengaluru in 2013. Ather Energy specializes in manufacturing electric vehicles. Their innovative approach

involves introducing electric scooters powered by artificial intelligence (AI) and the Internet of Things (IoT), aiming to revolutionize the automotive industry and enhance the overall efficiency of our lives. In addition to developing technologically advanced electric scooters, the company has strategically installed over 350 'Ather Grid' charging stations across 38 cities in India.

- *Phool*

Established in 2017, Ankit Agarwal and Prateek Kumar launched a biomaterials startup in Kanpur with a primary emphasis on repurposing discarded flowers from temples. The company specializes in converting these flowers into a range of products, including incense cones, incense sticks, and Phool vermicomposting. Ankit and Prateek's awareness of the potential environmental risks associated with damaged flowers from temple waste management prompted their innovative approach to sustainable resource utilization.

- *ZunRoof*

ZunRoof, established in 2016 by Pranesh Chaudhary and Sushant Sachan, stands as one of India's leading solar rooftop companies. Operating from its corporate headquarters in Gurugram, Haryana, ZunRoof is dedicated to empowering Indian consumers with improved, cleaner, and cost-effective energy consumption through solar solutions.

- *Yulu*

Bengaluru-based Yulu, a technology-driven micro-mobility platform founded in 2017 by Amit Gupta and other cofounders, offers a comprehensive urban mobility experience by seamlessly integrating both public and private transportation modes. Renowned for its environmentally conscious transportation choices, Yulu has emerged as a prominent player in the industry.

- *Banyan Nation*

Mani Vajipey, the visionary behind Banyan Nation, conceived the notion of transforming industrial plastic into a superior-quality material, surpassing the quality of virgin plastic. This innovative initiative arises from the challenges associated with achieving a plastic-free society in the country. Banyan Nation proudly stands as the nation's first vertically integrated plastic recycling enterprise, pioneering advancements in sustainable plastic recycling practices.

Other than collaborating and following the above-mentioned successful sustainable businesses, long-term impact can be ensured through visible alumni contributions to sustainable development.

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