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C O N T E N T S

Transforming Learning for Sustainable Progress: University of Technology Mauritius's Post-COVID Educational Strategy

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Abstract

The World Health Organisation (WHO) stated that education was one of the social areas most affected by the COVID-19 pandemic, posing unprecedented challenges in the field. The pandemic brought to light disparities and shortcomings in educational institutions, such as lack of resources, supportive environments, and availability to ICT for distance learning. These issues delayed the global adoption of the Sustainable Development Goals (SDG4) and Environmentally Sustainable Development (ESD). This study aimed to assess the effects of the pandemic on education, particularly SDG4 and ESD, the presence of ESD in University of Technology Mauritius (UTM) programs and courses, analyse the challenges preventing effective implementation, and recommend best practices to achieve better results. Research indicates that universities are playing a vital role in driving technological advancements throughout the Fourth Industrial Revolution. This is mostly due to the integration of intelligent technologies such as Artificial Intelligence (AI), 5G, Web 3.0, the Internet of Things, cybersecurity, and e-commerce. A survey was conducted among UTM students to measure sustainability across courses, and 352 responses were recorded for 60 courses. The study found that ESD is implemented broadly across different courses but does not imply a causal relationship with individual courses of study. A focus group was conducted to gather data on challenges in implementing ESD at UTM and possible solutions. Positive responses were gathered across the four schools of UTM, and interviewees discussed the purpose of ESD in courses, relevancy to curriculum and pedagogy, how ESD can guide students, strengthen partnerships, and promote innovation in the teaching-learning conceptual framework. Survey results indicated that students are open to incorporating Education for Sustainable Development (ESD) into their academic programmes in order to educate themselves about sustainability concerns and develop the skills necessary to contribute to a more sustainable future.

Keywords: Education for Sustainable Development, Sustainable Development, Sustainable Development Goals, COVID-19, Higher Education

Introduction

The COVID-19 pandemic severely impacted the education sector, leading to university closure and a significant loss of face-to-face education for over a year. Concerns were raised for students enrolled in various university programs, leading to the implementation of online classes so as to limit the virus's spread. Mauritius' education institutions faced flaws despite its efforts to meet the Sustainable Development Goals (SDGs) and provide quality education. The crisis has sparked interest in the role of Education for Sustainable Development (ESD) in fostering a more ecologically and symbiotic society. Rapid adjustments were made to teaching and learning experiences to ensure students are not penalised. Lecturers had to ensure online learning continuity and adapt to new pedagogical concepts. Students had to rely on their resources to continue studying remotely via the Internet. The role of education in a post-COVID-19 context is urgent for universities to cope effectively and sustainably (Evans et al., 2019). Students need more than theoretical and practical knowledge to acquire social competencies, creative thinking, and communication skills. Universities must reflect on the barriers and challenges encountered, such as a lack of financial and human resources and a shortage of skilled employees. By reviewing the curriculum, lecturers can better address fundamental problems and find solutions to new teaching methods.

Problem Statement

COVID-19 has significantly impacted the progress made towards Agenda 2030 and the Sustainable Development Goals (SDGs), particularly in the context of Education for Sustainable Development (ESD) (Taylor et al., 2020). Instructors had to shift to online learning, many of whom were not trained in using digital tools and platforms, and exams were cancelled or postponed, affecting the overall delivery of sustainability-related information (Finlayson et al., 2021). This crisis exposed limitations in ESD management worldwide, as almost all education institutions found themselves unprepared to deal with it. The focus has since then been to overcome these challenges and returning students to learning in the "new normal." UNESCO (2022) notes that while the pandemic has caused disruption in educational systems worldwide, it also offers opportunities for change and reshape for better resilience. As Dovletmurzaeva et al. (2021) concur, ESD is designed to help the global community find constructive solutions to present and future challenges, increasing the resilience and vitality of

societies. Investment in remote learning should mitigate the immediate disruption caused by COVID-19 and establish approaches to develop more open and flexible education systems for the future. University programs must be inclusive to ensure that the UN Development Goals are met. To successfully implement ESD, it is essential to evaluate students' learning process, teaching, and delivery modes. This research aimed to review the contributions of University of Technology Mauritius (UTM) programmes toward the promotion of sustainable development and identify challenges arising from new teaching and blended learning methods. It is crucial to understand the connection between sustainability from a learner's perspective and train students to analyse socio-environmental conflicts and find alternatives to participate in individual and collective decision-making in society.

Aim and Objectives

The aim of the project was to determine the extent to which UTM programs on offer are supporting the promotion and sustainment of education for sustainable development and the current challenges that arise from a blended learning teaching mode.

The specific objectives of this study were

- To probe into the need and urgency to ensure the incorporation of sustainable developments goals and practices within programs of studies that are on offer
- To analyse the current UTM education model and to demonstrate how with challenges like the COVID-19 pandemic university teaching on sustainability is more than necessary.
- To assess programmes and courses relevant to sustainable development and determine how successfully teaching and learning objectives are being met.
- To determine the current challenges that UTM is facing while dispensing education for sustainable development.
- To recommend on the best practices to foster and maintain successful education for sustainable development.

Literature Review

Definition of Sustainable Development

Sustainable Development (SD) has begun as a visionary development model for different sectors of society that ensures a better quality of life for everyone and future generations. According to the World Commission on Environment and Development, "The Bruntland Commission of 1987" has defined sustainable development as: "Any development that meets the needs of the present without compromising the ability of the future generations to meet their own needs" (United Nations General Assembly, 1987, p. 43).

The Brundtland Commission Report is divided into three major sections: (i) shared concerns, (ii) common challenges, and (iii) common endeavours. Each of these sections requires working on the economic, social and environmental dimensions to maintain the entire life ecosystem (Spangenberg et al., 2002). Under this approach, many institutions target to balance these three long-term objectives. It needs to be pointed out that studies have added a fourth dimension of SD, which is the governance dimension (Stojanovic et al., 2016). They have shown that governance plays a vital role through which power is exercised to implement actions and policies for SD and that there is a mutual interaction between the other three dimensions. Other studies have also included the technological dimension (Penzenstadler and Femmer et al., 2013) and the cultural dimension (Brocchi, 2010). The SD concept is often graphically presented in a Venn diagram where the different pillars intersect and are as follows:

Figure 1: The difference pillars of sustainable development (Source: Venngage, 2022)

The combination of the different pillars of SD remains a challenge for many countries, and they should at least reach these expectations put forward. Education is a fundamental tool in practical implementation. Every person must have the learning opportunities to understand SD and align it with their everyday practices to facilitate ESD. With such a thorough understanding, students would be better equipped to make sustainable decisions while also being mindful of themselves and others. In brief, it prepares vast transmissive knowledge for the present and future generations.

The Sustainable Development Goals

The Agenda for Sustainable Development 2030 is a global framework with 17 interconnected goals, 169 targets, and 232 indicators aimed at reducing poverty, protecting the environment, providing quality education, reducing inequalities, and promoting peace, prosperity, and economic growth by 2030.

Figure 2: The 17 Sustainable Development Goals (SDGs) (Population Matters, 2020)

The Sustainable Development Goals (SDGs) are a global partnership aiming to achieve sustainable development by 2030. These goals define priorities and efforts for global sustainable development. 194 countries signed up for this framework face a challenge in delivering these SDGs and maintaining community engagement, connection, and empowerment. They must play a fundamental societal transformation. In other words, achieving the SDGs means that countries must understand where they are and where they are headed to "emerge stronger from the crisis and prepare for unknown challenges ahead, funding statistical development must be a priority for national governments and the international community" (The Sustainable Development Goals Report, 2022, p. 3).

SDG Goal 4: Quality Education

This research, based on SD principles, will focus on SDG 4 as a key pillar to address social, economic, environmental, and governmental challenges, emphasizing the need for students to become sustainability actors and rethinking pedagogy to address these complex issues. The fourth of the 17 Sustainable Development Goals (SDGs) is high-quality education, with its vision to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2022, p. 1). Quality education promotes socio-economic mobility, poverty eradication, and human capabilities development, thereby addressing global issues like climate change and biodiversity.

SDG Target 4.7

SDG Target 4.7 is one of the key targets that address Education for Sustainable Development (ESD) and Global Citizenship. ESD may be referred to as "a critical mechanism for moving towards a more sustainable future" (Adams et al., 2020) because it has been included in Agenda 2030 since 2015 as a Sustainable Development Goal (SDG 4.7). In short, ESD is a crucial facilitator of the SDGs and accomplishes its goals by transforming society. Moreover, it is necessary to highlight where SDG progress has and has not been made. With the COVID-19 pandemic, more efforts have been put into healthcare, and in the case of education, digitalisation has gained a more upper hand in preventing learning losses. Similarly, inequalities and injustices in developed, developing, and less developed countries have increased awareness.

The Three Means of Implementing SDG Target 4.7 are:

- Effective learning environment - Building education facilities in a non-violent, inclusive, safe, and effective learning environment for learners.

- Scholarships - To expand the number of scholarships available to developing and least developed countries for enrolment in higher education, including vocational training, engineering and scientific programmes, and information and communications technology.
- Teachers and Educators - To increase the supply of qualified educators and offer them training if required in developing and least developed countries.

The Importance of Quality Education for Universities

Quality education is crucial for achieving the 17 SDGs by 2030 and is increasingly recognized as essential in the context of sustainable development, especially in light of challenges like climate change and the COVID-19 pandemic. Universities play a crucial part for all stakeholders, and the significance of this sector for the SDGs is emphasised in several studies (Torres, 2021). Quality education fosters critical thinking skills and community engagement, while encouraging open dialogue and active participation. Universities can act as catalysts for sustainability and support the 2030 Agenda by fostering a shift towards sustainability and encouraging individuals to bring new incentives towards sustainability.

Considering the broader reach to attain the 2030 Agenda, UNESCO (2022, p. 13) has stated that universities should contribute to these three interrelated themes:

- "The need to move towards inter- and transdisciplinary modes of producing and circulating knowledge."
- "The imperative of becoming open institutions, fostering epistemic dialogue and integrating diverse ways of knowing."
- "The demand for a stronger presence in society through proactive engagement and partnering with other societal actors."

Leal Filho et al. (2021) recognise that universities are developing initiatives to reach the SDGs. Universities alone cannot transform communities; they require the cooperation and support of other institutions and organizations working together towards these goals. Siegel and Bastos (2020) assert that the Sustainable Development Goals (SDGs) hold immense potential for fostering inclusive and revolutionary transformation. Universities are implementing teaching and learning practices that significantly impact students' lives. As UNESCO (2022, p. 13) puts it, "It is also time for universities to make sustainability and SDGs core requisites for all faculty members. Sustainability education should connect students with real-world problems and immersive experiences."

A. Definition of Education for Sustainable Development (ESD)

According to UNESCO (2019, p. 1), Education for Sustainable Development (ESD) is a source of empowerment for learners "to make informed decisions and responsible actions for environmental integrity, economic viability, and a just society, for present and future generations, while respecting cultural diversity. It is about lifelong learning, and is an integral part of quality education. ESD is holistic and transformational education which addresses learning content and outcomes, pedagogy and the learning environment. It achieves its purpose by transforming society."

The Berlin Declaration on Education for Sustainable Development (UNESCO, 2022, p. 3) has declared that ESD should "promote intercultural understanding, cultural diversity, a culture of peace and non-violence, inclusion and the notion of responsibility and active global citizenship". ESD is a continuous process that guides individuals to have positive changes. It includes knowledge, skills, values, attitudes, competencies, and critical thinking changes. For instance, there are challenges in individuals' daily activities, and ESD helps them reflect upon their current activities. ESD aspires to empower present and future generations to satisfy their needs or requirements by using an integrated approach to sustainable development's economic, social, and environmental elements (Leicht et al., 2018). ESD is a promising approach if youth participation is collective in society. By 2030, ESD must ensure that "all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development" (UNESCO, 2022, p. 1).

Furthermore, ESD for 2030 calls for more critical thinking and reflective actions (Kopnina, 2020). Individuals require values, attitudes, creativity, skills, and social abilities to make decisions for local and global challenges. ESD prepares youth for job markets, community participation, and improving their lives by supporting learners across all academic disciplines to balance economic, social, and environmental factors. Universities face challenges in implementing post-COVID reality, shifting from traditional teaching and learning to a post-COVID reality, and navigating the new focus on education structures and practices remains challenging. The ongoing discourse on Sustainable Development Goals (SDGs) and ESD widens the gap between formal and informal education, prompting discussions on sustainable education systems, particularly in the post-COVID-19 era, amidst the rise of AI, digitalization, and climate crisis.

Universities are urged to rethink their education model and examine their role in society. According to Ottersen (2019), universities contribute to the Sustainable Development Goals (SDGs) through teaching, research, and participation in external leadership, culture, and organizational governance. The goal is to equip students with critical thinking, collaborative decision-making, and responsibility for present and future generations. Universities should also serve as forums for debating ideas, research, and innovation, as they have academic freedom to convene different sectors of society. Sustainability challenges are relatively new in developing nations, especially in higher education, and there is a lack of in-depth analysis of programs offered. Sustainability science as a standalone subject is yet to gain acceptance in educational systems, despite specific environmental sciences being included in the agenda. Priyadarshini and Abhilash (2020) found that no courses offered sustainability science, and only half of higher education institutions provided environmental sciences in India.

The Mauritian context faces the challenge of fully integrating ESD principles into teaching programs with limited funding and strong management support. To achieve this, continuous good practices, infrastructure development, stakeholder dialogue, course reorientation, and increased awareness among lecturers and staff are needed. Strengthening cooperation and exchange with other universities is also crucial for incorporating ESD principles in higher education institutions.

B. Education in the Post-COVID 19 era

Today, educational systems are characterised as the 'new normal' where blended learning or hybrid learning has gained importance and is considered a suitable educational strategy to improve the potential of students' learning (Megahed and Ghoneim, 2022). From an academic perspective, blended learning combines the advantages of traditional learning and online teaching (Bokolo, 2021). Higher education institutions are rethinking the purpose of education, pedagogical concepts, and fostering more democratic, sustainable, and just societies as they transition from traditional to blended learning, necessitating innovative curricula and strategies. The post-pandemic era has seen a shift towards digital technologies, with universities playing a crucial role in accelerating technological innovations during the Fourth Industrial Revolution. This includes logistic, technical, digital infrastructure, and pedagogical perspectives, incorporating intelligent technologies like AI, 5G, Web 3.0, IoT, cybersecurity, and e-commerce. Mauritius' educational systems require time to evolve, necessitating efficient lesson planning by lecturers to improve student performance and skills for sustainable transformation (Yang et al., 2022).

Higher education is crucial for students as it serves as the final step before entering professional careers. Universities should emphasize the possibilities, strengths, and challenges of achieving the Sustainable Development Goals (SDGs) and enhance student engagement in learning to become problem solvers. Students should reflect on their values and improve themselves to contribute to a sustainable society. Universities should encourage openness among lecturers, researchers, administrators, and stakeholders to find solutions in teaching practices and curriculum that address ESD concepts. The COVID-19 crisis has complicated ESD, forcing universities worldwide to reassess their educational purpose. A global model of ESD is challenging as each country has its own goals, priorities, plans, and evaluation methods. ESD goes beyond educating on sustainable concepts; many institutions are implementing curriculum innovation to equip students with the necessary competencies and participation in sustainable development. Digital skills are considered one of four areas that will help students thrive in their future work. Universities must view themselves as learning sites, incorporating new content into courses and training for students.

Academics in various faculties are reorienting their curriculum towards sustainability, with some universities implementing green campus events and programs to address sustainability challenges. To achieve the Sustainable Development Goals (SDGs), lecturers must encourage their departments to make instructional content relevant to the current situation. They should also encourage students to consider the linkages between the post-COVID-19 era and the curriculum. However, universities must continue to reflect on post-COVID-19 context, teaching socio-emotional learning opportunities and re-considering education objectives through ESD.

There are skills and infrastructural gaps in universities, and it is crucial for lecturers to help learners and bridge traditional learning gaps. Issues such as educational inequalities and online teaching methods are significant challenges. Some universities are investing in developing positive attitudes, critical thinking, dialogue, and problem-solving skills. A more in-depth research is needed to determine the best education or pedagogical model for long-term support for learners and staff. This holistic approach should increase students' knowledge and reflective thinking while providing a comprehensive system for ESD development.

C. UTM as a Case Study

The University of Technology Mauritius (UTM) aims to enhance students' lives through teaching, knowledge and skills development, research, and innovation. It offers undergraduate and post-graduate academic programs, equipping local and international students with diverse skills to contribute to key Mauritian industries and

participate in regional and international activities. UTM aims to enhance collaboration among students, staff, and stakeholders by addressing social, environmental, and economic issues. In the post-COVID-19 'new normal', it is crucial to empower learners and staff to integrate the Sustainable Development Goals (SDGs) for common solutions. UTM is adapting to existing learning and pedagogy, using different resources, changing curriculums, and building capacity to create a better world. Higher Education Institutions play a crucial role in achieving the Sustainable Development Goals (SDGs) by providing research, technological innovation, and solutions through university management and public and private partnerships. They promote sustainable growth considering social, environmental, and economic factors. Universities deliver knowledge, competencies, values, skills, and critical thinking to students and academic staff, helping them keep pace and achieve the SDGs. Students are expected to become tomorrow's leaders and apply their professional and social skills competencies to reach ESD goals (Weiss et al., 2021). Universities develop students to effectively engage in sharing learning approaches with society.

Universities should promote sustainability through their programs, curriculum, and extra-curricular activities, encouraging students to create their own opinions and cope with sustainability concerns (Leal Filho et al., 2019). They should recognize the organization's needs in a sustainable manner, considering economic, social, and ecological factors. Universities should interact with stakeholders to identify areas where Environmental, Social, and Governance (ESD) has not been applied. Institutional support should be provided to integrate ESD into curricula. Investing in resources and having high academics who make the most of these resources are critical for creating a culture of sustainability (Rosati and Faria, 2019). ESD should be integrated into the institutional framework through vision and mission in campus operations, education and research, and assessment and reporting by staff, students, employers, and administration.

Implementing the blended learning approach in lockdown and post-lockdown period at UTM

The University of Technology Mauritius (UTM) has implemented the Blended Learning Unit (BLU) to enhance its education and research services during the COVID-19 pandemic and post-lockdown. The BLU uses blended learning materials like WhatsApp Group, Google Meet, Zoom Meeting, emails, Facebook, and LinkedIn for coherent communication. Blended learning is considered a viable alternative for gradual change due to its efficiency and effectiveness during the pandemic (Lapitan et al., 2021). UTM is implementing a "learning by doing" approach to foster cooperation among staff, administration, stakeholders, and students. To prevent COVID-19 contamination, they have implemented a "Bring Your Own Device-BYOD" policy, allowing students without necessary facilities to seek support from the Student Affairs Office for funding and resource access.

The research investigates the implementation of ESD in the University and its impact on achieving the UN SDGs. ESD aims to develop critical thinking, innovative problem-solving, empathy, and problem-solving skills among students, while also promoting awareness of the need for change agents to achieve a sustainable future. The University of Technology Mauritius (UTM) has emphasized sustainability in its four schools, adopting a holistic approach that aligns with the Sustainable Development Goals (SDGs). UTM acknowledges the interconnectedness of social, economic, and environmental dimensions and incorporates Environmental Sustainability (ESD) principles in various programmes. These programs involve staff and students discussing local issues, promoting learner-centered and participatory societal approaches. UTM also organizes co-curricular activities, such as student clubs, field trips, internships, workshops, and debates, to facilitate learning opportunities and develop students' creative and professional competencies for sustainable actions.

Higher education institutions are recognizing the need for further research to tackle sustainability implementation challenges, particularly in terms of student-perceived service quality. Achieving SDG 4 requires enhancing student satisfaction. Chen et al. (2022) conducted a study on factors affecting student satisfaction through surveys. This approach could help identify factors affecting students' performance and satisfaction with learning delivery modes, which are often the focus of addressing education's complex challenges. This research highlights the challenges faced by academics, students, researchers, and staff in finding solutions to barriers in the literature. To adapt to new priorities in a post-COVID-19 context, it is necessary to investigate these issues using various materials and methods to support UTM's learning approaches using different materials and methods.

Methodology

This research aimed to assess sustainable development programs and courses, determine teaching and learning objectives, and identify challenges faced by UTM in dispensing sustainable development education. A mixed methodology was used, providing comprehensive, rich information and enabling flexible collection of existing data. However, mixed methods are often labor and resource-intensive and require collaboration with third parties, making them challenging to implement effectively.

The project utilized two methodologies for its analysis. The first involved adapting a sustainability questionnaire from the EDINSOST project, aiming to enhance sustainable development in universities and equip future graduates with the skills to implement change. The questionnaire revealed the strengths and weaknesses of ESD

curricula, enabling decision-makers to propose solutions for more effective implementation. The second method involved a focus group discussion to gather ideas on the challenges faced by school members in implementing ESD and discuss possible recommendations. Twelve members from four schools participated, sharing their views on the challenges faced by UTM in delivering sustainable development education.

Data Collection

The EDINSOST questionnaire, originally designed for engineering students at the Barcelona School of Informatics, was modified to assess digital competences in sustainability in ICT engineering degrees in Spain (Urrea-Solano et al., 2021). The final instrument consisted of three socio-demographic questions and 15 Likert type questions with a scale range of Strongly disagree – 0, Disagree – 1, Agree – 2, and Strongly agree – 3. Confidentiality and voluntary participation were ensured throughout the process. An online Google Form was created and sent to all UTM students, recording responses from May 9th to June 6th, 2023. Google Form offers benefits such as reduced paper use, unlimited response recording, and free and automatic data storage (Mondal et al., 2018). This study focuses on UTM students from four schools: SBMF, SSDT, SHS, and SITE.

Sample Size

The UTM student population consists of 3579 students from all schools and levels of study. To obtain a comprehensive view of the study, the Cochran Formula is used to calculate the sample size, accuracy level, margin of error, and confidence level. This method is crucial for obtaining comprehensive survey information and ensuring a comprehensive understanding of the study.

The Cochran Formula is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

e Margin of error
p Population proportion
z Use Z Table

Where:

n o is the sample size

e stands for margin or error, or the desired level of precision is 5% (i.e. e= 0.05)

p is the estimated proportion of the population (i.e. p=0.5)

q is 1-p

the value of z is in the statistical tables, which contain the area under the normal curve, that is, Z= 1.96 for a 95% level of confidence

n= ((1.96)2 (0.5) (1-0.5))/ (0.05)2= 348

The study has a sample size of 348 students, including those who participated in pilot testing. The non-response value is oversampled to 350. The Cochran Formula is applied to consider the population structure of students at UTM, with the sampling methodology considering SITE, SBMF, SSDT, and SHS schools. The total sample size for this research is 350.

C. Focus Group Discussion

The study conducted a focus group discussion at UTM to gather staff opinions on ESD challenges. The principal investigator moderated the discussions, while the research assistant took notes. UTM's blended learning approach made online group discussions suitable for interviewees' availability time, as the study aimed to understand participants' experiences and knowledge of the topic. The study targets UTM faculty members from four schools, SBMF, SSDT, SHS, and SITE, with an ideal focus group size of 8-10 subjects, a moderator, and a note taker, as per Krueger and Casey (2009).

Questions of interest are listed in table below:

Research questions	Barriers	Dimensions of quality education
1. Does ESD improve educational purposes and outcomes?	Purpose	Effectiveness
2. How can ESD help to improve and enrich school curriculum development?	Curriculum and pedagogy	Effectiveness
3. How can ESD guide students to have the knowledge, skills and value to care for and solve the sustainable development issues that will arise in the future?	Students	Equity, relevance and sustainability
4. How can ESD help strengthen the partnerships between schools and other stakeholders including the surrounding community?	Community	Efficiency
5. How can ESD promote innovation in the teaching-learning conceptual framework?	Teachers	Reflexivity and responsiveness

ESD's Effectiveness in UTM Courses and Programmes

Results from the current study show that in general, the questionnaire was reliable in capturing information on ESD in courses that UTM offers. As a whole, learners at UTM have a good knowledge of the interrelations between the environment, social and economic spheres as they pertain to sustainability. Students at the University of Technology (UTM) understand the impact of their everyday choices on the environment and how to mitigate them. However, they are less active in community activities promoting sustainable development, possibly due to limited post-COVID activities. Despite their understanding of sustainable development and ethical principles, students from diploma to graduate levels are not actively engaged in promoting sustainable practices. This suggests that while students are well-prepared to address future issues, they are not actively participating in community processes aimed at making society more sustainable. The data from Shapiro-Wilk's test shows a normal distribution except for questions 10 and 11 about reducing environmental and societal impacts, such as using public transportation or participating in local projects. This uneven distribution may be due to respondents agreeing strongly with the questions and students disagreeing, causing the data to shift towards the positive. The Pearson's Correlation Analysis revealed weak relationships between courses and student responses, with most being moderately to very weak. The overall r value of 0.419 suggests a moderately strong positive correlation between the variables, indicating a weak correlation between the variables. The study found a strong correlation between students' knowledge of reducing negative impacts of their actions, their understanding of the relationships between society, economy, and the natural environment, their ability to implement actions that reduce their impact on the environment and society, and their choice of projects that manage resources in a better way. While sustainability is present in UTM courses, it does not necessarily indicate a causal relationship with individual courses of study.

Challenges UTM Face in Implementing ESD and Possible Recommendations

The main barriers to implementing ESD in universities include a lack of understanding and misconceptions about sustainable development, discipline-oriented program structures, procrastination, fear of extra work, lack of awareness on ESD, unwillingness to change current practices, lack of support from the university community, over jammed curricula, and political aspects within the university community (Disterheft et al., 2013; Leal Filho, 2011; Lozano, 2006; Dahle and Neumayer, 2001; Leal Filho, 2000). The study highlights the importance of identifying the purpose of Environmental Education and Design (ESD) within institutions for effective implementation. Interviewees agree that ESD improves educational outcomes by training students to address sustainability issues like climate change. It also enriches curriculum development by providing a theoretical framework, promoting awareness of the importance of a sustainable world among children of all ages. The implementation of Education for Sustainable Development (ESD) can be complex, especially in areas like programming. To address the global post-COVID challenges, it is suggested that introducing ESD-related subjects as electives or restructuring the entire curriculum could help remove barriers. ESD can guide students to develop knowledge, skills, and values to address future sustainable development issues. Increased ESD awareness among students can prepare them to become future ambassadors of sustainable development, focusing on developing competencies, reflection power, and problem-solving skills. Cultivating a mentality of ESD among students is crucial as all industries are now geared towards sustainability, such as hotels, which require

sustainability certifications. This approach is essential for fostering a sense of community relevance and promoting sustainability in various sectors.

The study suggests promoting a community approach to education by harmonizing curricula, syllabi, and school activities, and encouraging students to participate in community-related projects. This approach can help students understand their expectations and become advocates for sustainable development. ESD can promote innovation in the teaching-learning conceptual framework by enhancing skills and values related to a sustainable world. It allows teaching professionals to incorporate global issues in the curriculum and be flexible in their methods. It is crucial to ensure that both teachers and learners understand ESD. Before implementing a curriculum change, it is essential to train those delivering knowledge in understanding ESD principles and relevance across all subjects and fields. Lozano (2006) suggests overcoming barriers in universities by engaging top-level support, setting goals, providing necessary information, and identifying dedicated individuals to champion ESD.

Conclusion

The COVID-19 pandemic has significantly impacted education, causing millions of children to lose valuable school time and mental wellbeing. This research aimed to analyse the UTM education model and integrate ESD in all areas, measuring its effectiveness across courses and programs. For effective implementation, course conveyors need to be trained in ESD and encouraged to guide students in sustainability practices. ESD in the teaching-learning environment is now a necessity, as leaders and decision-makers are being modelled in the university environment. This study provides groundwork on ESD in UTM's courses, identifies gaps in proper implementation, and offers solutions to overcome these barriers using a methodology that any university or organization can implement.

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