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Strategies for Mainstreaming Education for Sustainable Development in Education Systems

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Abstract:

A meaningful and relevant "Excellence in Education Spaces" is imperative so that future generations can address societal risks. This inevitably requires education to integrate strategies to transform the current approaches and build on sustainability strategies. Education for sustainable development (ESD), considered a pivotal vehicle, is, nevertheless, relegated to science and environmental-related courses at most schools and universities. ESD is treated as one off-topic for discussion, creating an information deficit, implying that a few future leaders get knowledge about sustainability. The practices and attitudes about sustainable development goals (SDGs) are not universal, failing to achieve equitable SDGs. A few purposive studies from engineering were analysed to confirm that the ESD must be mainstreamed in education, allowing future generation delegates to build knowledge capital at the individual and institutional levels, equip future practitioners and decision-makers with strategic capabilities to resolve unforeseeable problems, drive societal transformation, and impact climate change, honouring SDGs.

1. Introduction

With radical revolutionary changes advocated for the future of education (UNESCO, 2022), transforming education with innovation as an integral part and accelerating 'excellence in education spaces' is undeniably enforced. The question, therefore, is what exactly does it mean to accelerate excellence in educational spaces while increasing operational flexibility and in the context of building a low-carbon, climate-resilient, just, and inclusive society understanding reality in a more systemic, integrated, inter and transdisciplinary way, as the sustainability paradigm demands? While incremental sustainable practices are growing simultaneously throughout the education systems resulting in some immediate benefits and some driving the dramatic transformative change, there remain a few meta-questions to answer for accelerating 'excellence in education spaces.'

'Excellence in Educational Spaces' transforms educational spaces for sustainable economies and societies. In this context, educational spaces are capable of fighting risks of unsustainable societal development, climate change and events such as the Covid19 pandemic simultaneously. The position paper 'The grand challenge: transforming the educational spaces for sustainable societies' [under review] from the Systemic Transformative and Resilient Interventional Drivers for Education for Sustainability (STRIDES) research project calls for a meaningful and relevant educational movement. It argues that the Covid-19 pandemic has widened inequalities in almost all areas, increased societal challenges and global risks to human health and well-being,

economies, and the environment. Climate change is still an existential threat to humanity. As the economies emerge from the pandemic, collective efforts are needed for clean growth, creating a zero-carbon society, reducing social, environmental, and economic inequalities, and increasing societal capacity and management capabilities to address climate change. This also requires due creation of global green economies and accountability. Therefore, the changes at strategic, tactic and operational levels through integrated all-inclusive bottom-up approaches and application of diverse education systems inherent to communities across the globe are demanded and the call for transforming research, governance, and education within higher education to support sustainable development.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) started education for sustainability as a key topic since its inception in 1992 during the United Nation conference on environment and development in Rio de Janeiro, Brazil (Draghici, 2019; UNESCO, 2015). The topic has been recognised by UNESCO as a top priority along with basic human rights, peacebuilding, and a driver for sustainable development. It, moreover, is entrusted to lead and coordinate the Education 2030 Agenda. There are 17 SDGs under this agenda and education is goal four which aims to *"ensure inclusive and equitable quality education and promote lifelong learning opportunity for all"* (Draghici, 2019; UNESCO, 2015). According to Mijanovic et al., (2020), Education for Sustainable Development (ESD) provides clarity on the relationship between nature and the society that we live in. It proposes a worldview that the environment is not solely owned or available only for man but creates a sense of sharing the environment with plants, animals, and the ecosystem. Therefore, if such education is stimulated in the academic curricula, it will increase students' awareness and engagement with how we live better con-jointly with nature and with the help of science and technology. Furthermore, as explained by Kohli (1995), aesthetic education gives man the power of judgement and the ability to understand the present opportunities (Kohli, 1995) and the destruction of nature by industrial activities (Mijanovic et al., 2020).

Given this context, the concerns related to ESD are widely recognised. However, there is still a knowledge gap regarding the relevance of ESD in the advancement of SDGs and sustainability agenda at the global level, especially among the future generation leaders of the world. The main aim of this article is to discuss the role of 'environmental education in practical projects' in advancing sustainability in education systems and offers strategies for mainstreaming ESD. This article attempts to answer the questions: What is the current context of the education systems – at what levels they are today, what level of excellence they need to achieve, and how can they get there – in a way that informs sustainability decisions capacity of the future generation leaders? This gap has not been adequately addressed in the transnational transdisciplinarity literature, as highlighted in the above section of the literature review. The purposive studies were selected for analysis, the methodology is discussed in the methodology section, and the case studies are presented. The analysis is presented in the discussion section. It includes the current situation for ESD, the outlook on the ESD, the transition pathways and the strategies for unlocking synergies from combinational effect in broader societal wellbeing. Finally, the article concludes with a few recommendations and future research.

2. Literature Review

A few definitions provide a systematic correlation between sustainability, sustainable development, and ESD. Sustainability, according to Meadowcroft (1997), ". . . refers to a process and a standard – and not to an end-state – each generation must take up the challenge anew, determining in what directions their development objectives lie, what constitutes the boundaries of the environmentally possible and the environmentally desirable, and what is their understanding of the requirements of social justice." (Meadowcroft, 1997). Sustainable development is the "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Brundtland, 1987), ESD is defined as a learning process (or approach to teaching) based on ideals and principles that prepare people of all walks of life to plan for, cope with, and find solutions for issues that threaten the sustainability of our planet (UNESCO, 2015). Therefore, ESD could be a critical vehicle to address issues of ecological unsustainability and promoting economic growth, but it ignores the environmental limits of planet earth (Whyte, 2020; Stein et al., 2022).

Engineers come in many shapes and forms. One thing the engineers have in common is that they are responsible for designing and manufacturing everything that is unnatural, from mundane things like everyday toilet rolls to the grand Olympic stadiums and everything in between. Engineers make the decisions about

the products, the material to use in manufacturing, how long it will last and whether, knowingly or not, what impact that product would have on the environment and society. The case of Thomas Middley Jr, a mechanical engineer is a cautionary tale about the engineer who "harmed the world the most" (Fourtané, 2018). At a time Middley was acclaimed for solving persistent industrial problems. These included fixing the knocking of an engine – by adding tetraethyl lead – and developing Chlorofluorocarbons (CFSs) as a new effective refrigerant (Viana & Porto, 2013). The use of these substances, despite the growing body of knowledge of the harm they caused, continued for decades before being taken out of service. This highlights the complex interconnections of science, society, politics, corporations, and ethics and solving engineering problems and the legacy of harm resulting from a lack of big-picture systems thinking. Scientists are voicing renewed concerns about unforeseen impacts from future growth, such as Space Tourism, that might harm our fragile atmosphere. Likewise, there are currently many unknowns (Pultarova, 2021).

Engineering education has the potential to play a critical part in the transition to sustainable futures. ESD is gradually being incorporated more into Engineering programmes worldwide. Engineers play an indispensable role in almost all forms of our life activities, making the world better, safer, and more enjoyable. From this perspective, engineers have the potential to make a significant contribution to sustainable transitions. Therefore, we need our education systems globally to provide engineers with the skills to think critically about sustainable development in their engineering careers. However, as is evident in the Middley case, current and new engineering solutions can always bring with them new problems.

According to the definition of Sustainable development, it is the process of satisfying the requirements of the current generation without compromising the future generation's ability to satisfy their requirements (Abd Elkhalek, 2021). So, to secure the availability of natural resources and to offer the best possible quality of human life to future generations, countries must make joint efforts, and this must be the highest priority on their agenda (Abd Elkhalek, 2021). However, most countries face issues relating to sustainability and its integration into their economic development. It is argued that if the principles and knowledge about sustainability are introduced in formal and non-formal education, the aim of education in this context would effectively be alleviating poverty while increasing opportunities for jobs. Sustainability education must impact the economic growth rate and allocate sustainable resources to achieve socio-economic development and environmental protection (Afzal et al., 2012; Abd Elkhalek, 2021). The three – social, economic, and environmental dimensions need to be justified considering the availability of resources between present and future generations and required for the continuation of life on the planet (UNESCO, 2016). As all human beings are at the centre of the sustainable development issue, the contribution of education is immense toward developing human potential and social growth (Dewey, 2013). Thus, education has a role to play, bridging between sustainable development and preparing one for social competence, environmental stewardship, and political participation and in constructing the way forward towards sustainable development (Shohel & Howes, 2011). Sustainable development has become an essential part of the education system and is emerging in research and innovation. The desired goal of sustainable development can only be achieved through proper education (Kumar & Mohapatra, 2021).

According to several chapters authored by Devaki (2019), preparing the next generation with the ESD is crucial so they can participate in the sustainable development of society. Currently, two important challenges are being discussed in the global community. These are innovation and sustainability, and these are strongly interconnected. While innovation is in demand in every field of education, and sustainability explains how to satisfy the needs of future generations without compromising the demands of this generation; the enormous global challenges can be met by breaking the old paradigm of education and education delivery with motivation, creativity, and independence, and by developing a new educational paradigm. A new education system, thus combining the two foundations – innovation and sustainability – can form a new generation of citizens. The goal of modern education, therefore, must have an unambiguous correlation with the digitalisation of education in general and the introduction of innovation, e.g., artificial intelligence in education (Deivam & Devaki, 2016; Devaki, 2019). A country's competitiveness and productivity are the results of an educated workforce. Therefore, education in sustainability helps people to change the way they think and act more sustainably at all levels of the social context. The transformation in society can be facilitated by developing knowledge, skills, values, and behaviour needed for sustainable development leading to peace and prosperity for people and the planet (Devaki, 2019).

3. Methodology

Developing, demonstrating, and scaling a novel approach to leveraging systems transformation in the educational spaces is a complex challenge. Script and structured interface have a beneficial effect on the grounding discussions or in other types of complex problem solving (Schoonenboom, 2008). Therefore, in the initial phase, this study followed a journey of exploration and discovery, a systematic inquiry of what is possible, probable, and preferable. This article serves as the starting point in bringing educators, systems thinkers, innovation practitioners, change makers, and creative voices all to join in figuring out how to deploy excellence in educational spaces while increasing operational flexibility in the pursuit of what we hold for the future sustainable education and societal systems.

The objective of this article is to collect and highlight the latest innovative case studies or advances across disciplines to identify systemic transformative and resilient interventional drivers for education for sustainability to provide answers to a meta-question: What is the current context of the education systems – at what levels they are today, what level of excellence they need to achieve, and how they can get there – in a way that informs sustainability decisions? The rationale for collecting case studies was that *before delving into these systems and thinking about how we can change them, we need to do a reality check*, i.e., understand the stock of our education delivery.

Survey research is generally used for exploratory and explanatory research. Surveys are used to answer 'who,' 'what,' 'how much,' 'how many,' and 'where' research questions using a deductive approach (Harding et al., 2005). The survey research methodology is employed in education (Saunders & Bezzina, 2015). Online survey questionnaires are efficient tools for collecting quantitative and qualitative data (Corbin & Strauss, 2014). Therefore, the chosen research methodology facilitated actions to meet the research objectives. The objective of the survey was to collect publications that discussed exemplar studies exploring strategies for mainstreaming ESD in education systems.

A survey questionnaire was designed to collect relevant case studies. The participants were asked to submit one to three most innovative case studies or advances in their overarching field of research in recent times and the key articles and reports highlighting them. To consider a given topic, participants were requested a minimum of one article supporting advances in that topic. The attractive element of participation in the case study collection survey was that those involved and who participated in the survey were invited to co-author the publication collaboratively. Therefore, having declared their interest in contributing as co-authors, all 23 participants were invited, but only four of them co-authored this article.

4. Results

The survey responses

In total, twenty-three (23) responses were received at the end of the 4 weeks. In all, twenty-three (23) case studies were submitted by the researchers, many of which were based on participants' research. The synthesis of the contents of the case studies presented by the participants identified five themes:

Theme 1: **Environmental Education with Practical Projects**

Theme 1 refers to the projects that impact the development of several combined competencies such as technical skills with social and environmental skills. This includes the students' communication, teamwork, ethics, and sustainability, helping them to develop advanced skills such as designing and problem-solving. With the few successful demonstrable projects, it is considered an emerging strategy for mainstreaming ESD, and practical environmental projects must be tuned into the formalized teaching of systems engineering.

Theme 2: **Critical Pedagogy with Systems-Thinking and Design Thinking**

Theme 2 refers to the ecosystemic approach to research and teaching programmes to be instituted in the education system around the world. The demonstrable projects show that the ecosystemic approach increases the people's intimate (individuals), interactive (groups), social (society) and biophysical (biophysical) dimensions, favourable to the development of healthy societies, encourage investing in each other rather

than investing in energy-intensive activities and develops the worldviews that care for values and perceptions (Pilon, 2019).

Theme 3: **Transnational Education**

With the technological advances and the growing challenges of travelling overseas due to climate change and COVID-19, online education has become common worldwide. In spite of several challenges, such as no or low internet connectivity and infrastructure to support online education, many advantages are demonstrated through successful projects, connecting multi-disciplinaries, may it be students, academics or researchers. The remote connections between two or more countries increase the opportunities for collaborative learning for students and all those who connect. They learn skills from each other, interact actively to evaluate each other's notions towards climate change and learn many perspectives on stimulating sustainability and intellectual impact (Arthur & Brafi, 2013).

Theme 4: **Synergies and Trade-Offs in Reaching the SDGs**

17 SDGs 2030 Agenda calls for action to ensure the delivery of the 169 Targets. Nerini et al. (2018) established that 143 synergies and 65 trade-offs could be accomplished by achieving only one SDG, SDG 7. It also establishes that there are other knocks off positive effects simultaneously, such as realising greater welfare and well-being, building infrastructures (physical and social) for SDGs, and managing environmental and natural resources sustainably7 (Nerini et al., 2018). Numerous scholars argue that acquiring potentially synergistic targets can lead to superior shareholder value for SDGs. There is an urgent need to integrate such teaching and practical projects in education to achieve sustainable development (Maas et al., 2019).

Theme 5: **Developing whole School Pedagogical Values**

Several studies view that integrating literacy learning through play-based pedagogies, e.g., drama-based, induces strategic management skills and prepares them to address future problems proactively. Such skills guarantee a secure sustainable future against climate change and uncertainties such as COVID-19, as the future managers will be practical decision-makers with the right skills.

Case studies and analysis related to Theme 1

Case 1 Chalmers University of Technology – Integrating sustainable development into a Mechanical Engineering programme.

The Chalmers University of Technology, Sweden, purposefully sought to integrate sustainable development into its accredited mechanical engineering programmes. The outcomes include the ability to solve problems, including a holistic assessment to have environmental and social impacts (Enelund et al., 2013). The undergraduate and master's programmes included at least one mandatory course in sustainability, including integrated learning experiences on sustainability and options to choose a sustainability-focused programme. Its existing programmes were reformed, making several changes in existing teaching to include sustainability learning experiences such as materials and process, manufacturing technologies, simulation of production, thermodynamics and energy, design modules and logistics. New electives were also introduced including Industrial Ecology and Sustainable Energy Systems.

The success factors for this programme change included

1. Discipline-specific learning outcomes
2. The creation of specific courses or/and the integration of sustainability into existing courses
3. The development of legitimacy for educators and students on the inclusion of sustainability into courses and projects.

However, some challenges included ensuring that the course undertaken was not "too easy" as students felt that some of the courses could downgrade the engineering education experience.

Case 2 Where there is no Engineer – Designing for Community Resilience

Engineers without borders Ireland has developed a flexible module to reimagine engineering education to "bring the world into the classroom" in its Where there is no Engineer (WTINE) offering to education

institutions (Hadgraft & Kolmos, 2020). The module explores the relationship between people, technology, and the environment. It works in partnership with community organisations (both in Ireland and in developing nations, such as Zambia, Nepal and India) (Mc Carton & O'Hógáin, 2018). The programme has set out to expose participants to the complex nature of global challenges and to engage engineering student teams as global citizens to work on a design project and meet a community need (Mc Carton & O'Hógáin, 2018). In a recent analysis of 23 engineering programmes in Ireland, humanitarian engineering and community engagement were present in only 1% of programmes from all (Martin et al., 2020). The WTINE programme addresses critical gaps in the delivery of engineering ESD.

Case 3 The GEEC (Galway Energy Efficient Car) as a model for engineering ESD

Engineers love to make things, and of course, learning by doing is what students expect when entering an engineering programme. The school of mechanical engineering at NUI Galway runs a unique horizontally integrated project centred around the design, build, test and driving of the GEEC Galway Energy Efficient car. To top this off, the student has also raced in the Shell Eco Marathon, a global challenge to create and race an energy-efficient car. In 2018 the GEEC won the award for technical innovation when the car reached an efficiency of 16,000 km per gallon (Gorey, 2018). The project brought twenty-five engineering students from the disciplines of electronic, mechanical and informatics to work on the project across different years of the degree. The University's president praised them that "Problem-solving at the service of society is at the very heart of our student's learning experience.

5. Discussion

In framing what the excellence in education spaces must be, the case studies were instrumental in providing situational analysis for ESD, what advances are possible, what could be the transitional pathways and how synergies can be unlocked for combinational effects in wider societal wellbeing.

Situation analysis for ESD

ESD has been relegated to science and environmental-related course at the university level, such as engineering, biology, physics, and Environmental science (Corrêa et al., 2020). In primary and high schools, ESD is treated as one off-topic that is discussed here and there (Timm & Barth, 2021). There is limited education on Sustainable Development (ESD) in Higher Education Institutions (HEIs) (Corrêa et al., 2020). While the Bologna accord (http://www.ehea.info/) has brought greater harmonisation in higher education, it is not without challenges, such as limiting the knowledge areas with higher levels of specialization (Heitmann, 2005; Buelin et al., 2016; Felgueiras et al., 2017;). This can harm engineering education and may result in evading systems thinking and not considering everything, which can be a critical component in solving complex issues as documented by early scholars (Von Bertalanffy, 1950). Engineer education in its application to modern problems needs to arise from its conservative model of focusing excessively on engineering sciences but towards a more interdisciplinary approach (Kamp, 2016; Felgueiras et al., 2017).

Engineers are already engaged in problem-solving within complex systems, such as infrastructure systems (civil), bodily systems (biomedical), and mechanical and information systems. However, that does not necessarily extend to the habits of systems thinkers, such as more significant picture thinking, the circular nature of cause and effect (feedback loops), including long and short-term consequences of actions and decisions (Meadows, 2008; Zelinka & Amadei, 2017). Some of the challenges of integrating sustainable development into engineering education include providing knowledge about the SDGs, their linkages and the consideration of nature when designing and building our stuff (Zelinka & Amadei, 2017). These issues are complex, such as balancing the cessation of fossil fuel use for energy alongside solving the unpredictability of some forms of renewables and managing these variable electrical loads (Felgueiras et al., 2017). As well as technical issues, for example, there is also the need to develop engineering professionals to understand people's behaviours alongside the energy systems.

Future outlook on ESD

The engineer of the future needs to be proficient in understanding the bigger picture of the wider world, and how everything is connected, from relatively simple systems like buildings to extremely complex systems such as the health of our planet (Kamp, 2016; Felgueiras et al., 2017). Engineering is not unique in facing challenges with integrating sustainability into higher education. Engineers need to be trained to think more critically and acquire competence in dealing with complex global challenges that can be chaotic and unpredictable (Hadgraft & Kolmos, 2020). This is now being reflected in Engineer Accreditation bodies globally, such as Engineers Ireland[1] (IEA, 2021). Engineers Ireland states the importance of engineers being exposed to the UN SDGs in a discipline-specific manner. The competencies for achieving the SDGs include critical thinking and reflection, envisioning, systemic thinking, building partnerships and participation in decision-making.

ESD needs to be mainstreamed in primary and high schools and higher education institutions (Leal Filho et al., 2019). The effect of mainstreaming at the University level would lead to having all future leaders know and, consequently behaviour change related to sustainable development in respective professionals (Corrêa et al., 2020). This will stimulate more comprehensive societal transformation as every discipline will have research components and informed decision-making based on knowledge gained on climate change and sustainable development, e.g., from the law, accounting, social sciences, and humanities. HEI can play an essential role in Research and Development by piloting sustainable practices and innovation on climate change and sustainable development with transdisciplinarity and participatory approaches with future practitioners and decision-makers, including innovative companies, municipalities, civil society, and policymakers.

Transition pathways

It is recognized that national and international governments need to drive the acceleration of integrating SDGs into higher education (Ramirez-Mendoza et al., 2020). Reports such as the Swedish National Agency for Higher Education have long since recognised the lack of effective engineering education to include applications incorporating social and environmental considerations and applications which have led to specific actions to integrate sustainability into engineering curricula (Högskoleverket, 2006; Enelund et al., 2013). However, the development of the SDGs has not involved engineers and scientists and was formed from a political rather than an academic or scientific consensus, lacking multidisciplinarity (Zelinka & Amadei, 2017). Transitioning towards complex changes in complete programmes can be managed through consensus. In the case of Chalmers, to transition successfully, it needed a broad range of drivers and support, including the national degree programme requirements and chartered engineer model, the resources to develop new courses and to engage with a broader ESD group on campus (Enelund et al., 2013). The vision of the University was also cited as critical, which is also aligned with (Staniškis & Katiliūtė, 2016). The practice of problem-based learning (PBL) has been an effective pedagogical approach in integrating sustainability into engineering education as it has the potential to develop critical skills such as interdisciplinary knowledge, collaboration, communication, problem-solving, critical thinking, and self-directed learning (Guerra, 2017).

Mainstreaming ESD in the school curriculum for primary and high school calls for integrating aspects of ESD in the existing subjects, but not as a stand-alone. At the University level, it would require having compulsory modules on ESD for all first-year students. All courses in Arts and sciences would mainstream ESD to have innovative ways of practically implementing ESD in professional careers (Corrêa et al., 2020). Participating in ecological projects at higher education institutions translates theory into practice (Manolis & Manoli, 2021). For future scientists to address challenges on sustainability, the training in higher education institutions needs to adopt a problem-oriented learning approach (Lehmann et al., 2008; Manolis & Manoli, 2021).

[1] Accreditation body for engineering graduates in Ireland, with global alignment to the Washington Accord (https://www.engineersireland.ie/Professionals/Membership/Become-a-member/Accredited-third-level-courses/Accreditation-criteria-procedure-and-training)

Mobilisation of knowledge capital for ESD: institutional and global sustainable development goal perspectives

Science and engineering professionals were not consulted when setting the SDGs goals and targets. However, engineers have the potential to link the decisions of policymakers and influence the implementation (or not) of the SDGs (Zelinka & Amadei, 2017). Engineering ESD is a complex challenge for educators. Challenges include the strict curriculum of engineering programmes, as well as educators influencing the direction of projects, which limits self-directed learning (Guerra, 2017). By mainstreaming ESD in the entire educational system, the knowledge capital will be built at the individual and institutional levels for sustainable development (Corrêa et al., 2020).

Unlocking synergies from combinational effects in broader societal wellbeing

Having ESD in primary and high schools improves knowledge and changes the attitudes toward sustainability and consequently brings about better practices in the young generation of our society (Leal Filho et al., 2019). ESD is HEI that fosters sustainability concerns for the future decision-makers of the world. Integrating sustainable development into engineering education with a multidisciplinary and transdisciplinary approach has the potential to be effective (Staniškis & Katiliūtė, 2016; Guerra, 2017; Tejedor et al., 2018; Tejedor et al., 2019; Martin et al., 2020); however, this multidisciplinarity is often lacking. Despite the acknowledgement of the potential for transdisciplinary aspects of sustainability to be transformative, oftentimes engineering educators are quite unfamiliar with the social sciences (Tejedor et al., 2018). However, purposefully establishing the complementarity of teaching and research on sustainable development on campus can improve this (Ramirez-Mendoza et al., 2020). There is a need to consider the dynamic nature of students and pre-knowledge on sustainability issues. It is increasingly recognised and must continue for higher education to be sufficiently challenging, responding and ensuring engagement (Enelund et al., 2013). More bespoke models of curriculum design are emerging to meet the growing demand of learners (Hadgraft & Kolmos, 2020).

6. Conclusion

Future engineers need to be able to contextualise sustainable and technological solutions for sustainable development, Engineering education can play a critical role in sustainable transitions because future engineers will need the competencies to work in an increasingly complex and chaotic world as well as a global perspective to ensure decisions on how the stuff we make and build results in positive impacts on sustainable development. Successful interventions have seen the critical success factors to include support through the overall institutional vision, a programme-level approach aligned and driven by governing authorities conducting sustainable development, incorporation of problem-based learning, a system-thinking mindset and purposeful consideration of the inclusion of sustainability paradigms, and not to exclude humanitarian and community aspects. We need an education system that mainstreams ESD at all levels, primary education, high school, and university. At the University level, all first-year students have a compulsory module on ESD. This would sensitise future decision-makers. All University courses will have to mainstream ESD for innovative and practical ways of implementing the acquired knowledge.

In line with Selby & Sterling (2010), the analysis of the case studies confirms that the role of universities is profound in learning for sustainability and sustainable development, and they must function as research places. Higher education is not accepted just to perform in learning but also in practice, but to perform in sustainable purchasing, sustainable investments, and sustainable facilities. integrated with teaching and learning. In higher education, there should be an emphasis on experiential, inquiry-based, problem-solving, interdisciplinary systems approaches and critical thinking. Finally, curricula should include content, materials, and tools such as case studies and provide knowledge through best practices.

The need for repurposing education in learning institutions for sustainable societies and climate change is global and urgent. This is a call to unfold from the simple to the complex challenges based on a grounded theoretical framework so that education can play a meaningful and relevant role in society. Future managers and decision-makers should be able to fight risks such as the recent Covid19 pandemic. The current

education framework seems to be operating at a strategic level without the bottom-up approach and innovative approaches. It has no focus on the core principle of the SDGs, 'leave no one behind.' Great thinking at the strategic level leads to numerous beneficial changes in policies in educational institutions, while poor evaluation or slow implementation processes overtaken by events such as COVID-19 lead to chaotic policy changes. To address human needs within the context of promoting a positive attitude toward climate change, this article suggests an all-inclusive approach rather than the existing fragmented one, which does not seem so much palatable. Thus, the scope of the future desired state is an envisaged approach to reduce all externalities on the environment through the application of technical and vocational education systems that must be inherent in all communities across the globe. Human capital development is key to the transformational processes in which every society needs to implant human-centred designs to address their needs within the scope of appropriate technology and cultural dimensions. Thus, internationalisation of the education process in line with SDGs may help to build the desired strategies to embrace the future with a mind that supports sustainability and climate change. Future publications will focus on the research findings from the other themes.

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