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IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT GOALS INTO TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING CURRICULA: REGIONAL DIFFERENCES IN SOUTHEAST ASIA AND SOUTH ASIA

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ABSTRACT

The implementation of Sustainable Development Goals (SDGs) into curricula is within the current discourse of education for sustainable development to maintain a curriculum relevant to SDGs. We present findings of a research study that investigated the implementation of SDGs into Technical and Vocational Education and Training (TVET) curricula in the Global South - Southeast Asia and South Asia. The objectives of the paper are to present findings on 1) the implementation of nine (9) SDGs into TVET curricula, namely, 1 – 'No Poverty', 2 – 'Zero Hunger', 3 – 'Good Health and Well-being', 10 – 'Reduced Inequalities', 11 – 'Sustainable Cities and Communities', 12 – 'Responsible Consumption and Production', 14 – 'Life below Water', 15 – 'Life on Land', and 16 – 'Peace, Justice, and Strong Institutions', b) the use of vertical and horizontal approaches for the implementation of SDGs into curricula, and c) the existence of significant differences in the implementations in terms of the geographic location of the countries in the Global South - Southeast Asia and South Asia. This explanatory research study was conducted in 11 countries in Southeast Asia (6) and South Asia (5), building on the positivist research paradigm. Data were collected by surveying TVET teachers engaged in tertiary-level science, technology, engineering, and mathematics (STEM) programmes. Total of 761 responses collected. The findings showed that by using both vertical and horizontal approaches, institutions were committed to implementing the nine SDGs. Still, the hypothesis testing showed that significant differences prevail in the implementation between Southeast Asia and South Asia. The differences by the geographic region of a country imply that regional context, even within the Global South, is a vital consideration when assessing a country's skill development systems. The findings have ample implications for research, practice, and policymaking not only in the Global South but also in the Global North.

Keywords: Education for sustainability, education for sustainable development, Global South, greening higher education, SDGs, sustainable development goals, progress, challenges

ABSTRAK

Implementasi Tujuan Pembangunan Berkelanjutan (SDGs) ke dalam kurikulum merupakan bagian dari wacana pendidikan untuk pembangunan berkelanjutan saat ini guna mempertahankan kurikulum yang relevan dengan SDGs. Kami menyajikan temuan dari sebuah studi penelitian yang menyelidiki implementasi SDGs ke dalam kurikulum Pendidikan dan Pelatihan Kejuruan (TVET) di Global South - Asia Tenggara dan Asia Selatan. Tujuan makalah ini adalah untuk menyajikan temuan tentang 1) implementasi sembilan (9) SDGs ke dalam kurikulum TVET, yaitu, 1 – 'Tidak Ada Kemiskinan', 2 – 'Tidak Ada Kelaparan', 3 – 'Kesehatan dan Kesejahteraan yang Baik', 10 – 'Pengurangan

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
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Ketidaksetaraan', 11 – 'Kota dan Komunitas Berkelanjutan', 12 – 'Konsumsi dan Produksi yang Bertanggung Jawab', 14 – 'Kehidupan di Bawah Air', 15 – 'Kehidupan di Darat', dan 16 – 'Perdamaian, Keadilan, dan Lembaga yang Kuat', b) penggunaan pendekatan vertikal dan horizontal untuk implementasi SDGs ke dalam kurikulum, dan c) adanya perbedaan signifikan dalam implementasi berdasarkan lokasi geografis negara-negara di Global Selatan - Asia Tenggara dan Asia Selatan. Penelitian eksploratif ini dilakukan di 11 negara di Asia Tenggara (6) dan Asia Selatan (5), berdasarkan paradigma penelitian positivis. Data dikumpulkan melalui survei terhadap guru TVET yang terlibat dalam program sains, teknologi, teknik, dan matematika (STEM) tingkat perguruan tinggi. Sebanyak 761 tanggapan dikumpulkan. Temuan menunjukkan bahwa dengan menggunakan pendekatan vertikal dan horizontal, lembaga-lembaga berkomitmen untuk mengimplementasikan sembilan SDGs. Namun, pengujian hipotesis menunjukkan bahwa terdapat perbedaan signifikan dalam implementasi antara Asia Tenggara dan Asia Selatan. Perbedaan berdasarkan wilayah geografis suatu negara menyiratkan bahwa konteks regional, bahkan di dalam Global South, merupakan pertimbangan penting ketika menilai sistem pengembangan keterampilan suatu negara. Temuan ini memiliki implikasi yang luas untuk penelitian, praktik, dan pembuatan kebijakan tidak hanya di Global South tetapi juga di Global North.
Kata kunci: Pendidikan untuk keberlanjutan, pendidikan untuk pembangunan berkelanjutan, Global South, pendidikan tinggi hijau, SDGs, tujuan pembangunan berkelanjutan, kemajuan, tantangan

1. Introduction

Since the introduction of Sustainable Development Goals (SDGs), significant resources have been poured into implementing, tracking, and assessing the progress made by the countries. Still, continuous dialogue between research, practitioner, and policymaking communities can shed some light on obstacles faced and strategies worked in the path of reaching the targets of SDGs (Morris et al., 2023). The dialogue sometimes is the most appropriate to reinforce the spirit of SDGs, inspire countries and regions to find ways to transform themselves to achieve the targets as well as find ways to accelerate efforts towards achieving global ambitions.

The education and training sector is the main supporter and the accelerator of the implementation of SDGs. Due to the SDG4 *Education 2030* agenda's interlinkages with several other SDGs, it is understood as a provider of synergetic effects as well as a multiplier of synergies (Bennich et al., 2023); the achievements in SDG4 lead to better achievements in almost all SDGs. Therefore, SDG4 is an enabler of transformation that provides a unifying agenda to address the pressing needs and challenges of a sustainable future (Horvath et al., 2022; Osman et al., 2017). We emphasise the importance of empirical studies on higher education institutions' engagement with SDG4 from the Global South. Although previous research provides evidence for TVET's engagement with SDG4 in the Global North and South (such as Persson & Hermelin, 2022; Wickramasinghe & Wickramasinghe, 2025a), these do not provide sufficient information on technical and vocational education and training (TVET) institutions' engagement with SDG4 with a holistic view where SDG4 is a supporter of achieving other SDGs. In this context, we provide findings of a study that investigated TVET's engagement with SDG4 to implement nine (9) SDGs into curricula in the Global South.

The present study is built on the education for sustainable development (ESD) discourse involving what learners should be taught when providing quality education, which is mainly concerned with curricula and pedagogy (Leal Filho et al., 2025; Lewin, 2019; Kopnina, 2020; Poza-Vilches et al., 2025). Policy directives are available for the implementation of SDGs into curricula at all levels, i.e., primary, secondary, and tertiary, in support of ESD (such as Osman et al., 2017; UNESCO – ICEE, 2023). The TVET system of a country, which is the main focus of our study, involves developing technical and transversal skills of youth and adults for medium-skilled occupation-specific, cross-sectoral, or across-business sector job roles (Fernando & Wickramasinghe, 2024; Legusov et al., 2022). The TVET system of most countries is mainly financed by the state (McGrath et al., 2019; Persson & Hermelin, 2022). When TVET is

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
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provided as a public spending, McGrath et al. (2019, vii) wrote, TVET learners must 'be prepared to cope with change, grow their knowledge, skill, and creativity, and contribute to developing new products and processes'. Therefore, improving and strengthening skill development related to science, technology, engineering, and mathematics (STEM) in TVET institutions is vital for better achievements in many other SDGs. Further, the TVET system of most countries is currently under pressure to respond to changes required in curricula.

Building on the above arguments and the detailed review of the relevant literature in the next section, our paper provides findings of a study conducted in the Global South. The specific objectives are to present findings in relation to:

1) the implementation of SDGs into curricula.
2) approaches used to implement SDGs into curricula.
3) differences in the implementation of SDGs into curricula in the Global South - Southeast Asia and South Asia.

When the first objective is considered, SDG4 target 4.7 states the importance of equipping 'relevant knowledge and skills for sustainability through ESD' (UNESCO 2016, 13). Hence, we identified 'relevant' knowledge and skills as those involving SDGs in line with policy directives for the implementation of SDGs into curricula (Osman et al., 2017; UNESCO – ICEE, 2023). We have not come across previous research that investigated the implementation of SDGs into TVET course curricula. We use the term 'course' to represent any type of education and training offerings and present findings for the implementation of selected elements of the nine (9) SDGs into curricula. These nine SDGs were: 1 – 'No Poverty', 2 – 'Zero Hunger', 3 – 'Good Health and Well-being', 10 – 'Reduced Inequalities', 11 – 'Sustainable Cities and Communities', 12 – 'Responsible Consumption and Production', 14 – 'Life below Water', 15 – 'Life on Land', and 16 – 'Peace, Justice, and Strong Institutions'.

Regarding the second objective, the use of vertical and horizontal integration approaches for the implementation of SDGs into curricula is within the current discourse in the realm of SDGs (Dean et al., 2019; Strachan et al., 2023; Venkiteswaran & Cohen, 2018; Weiss et al., 2021). Almost all previous research has been confined to present findings of universities' engagement with vertical and horizontal integration approaches. Hence, there is a gap in the understanding of how other higher education institutions use these approaches. Our study, specifically, investigated the use of vertical and horizontal integration approaches in implementing SDGs into curricula.

When considering the third objective, the literature suggests differences in the implementation of SDGs between the Global South and the Global North (Pineda & Mishra, 2023; Sepúlveda et al., 2022). The main argument is that context, priorities, and real-world conditions experienced and lived in the Global South differ significantly from those in the Global North (Pineda & Mishra, 2023; Sepúlveda et al., 2022). However, little is available in the mainstream literature about the experiences of the Global South (McGrath & Yamada, 2023). Therefore, it is vital and timely to obtain insight from the research on SDGs conducted in the Global South. Most importantly, recent research suggests the way SDG4 is addressed by countries could vary even within the Global South – Southeast Asia and South Asia (Maclean et al., 2018; Wickramasinghe & Wickramasinghe, 2025a). Hence, the present study argues that even within the Global South, regional differences (i.e., Southeast Asia and South Asia) could prevail due to differences in the context, priorities, and conditions experienced.

Our study intends to make significant contributions. First, we support the discourse on ESD. Policy directives propagate the importance of implementing SDGs in all course curricula to support sustainable development (Levin et al., 2024; Lewin, 2019; Osman et al., 2017; UNESCO – ICEE, 2023). Hence, investigating how education and training institutions engage with SDGs is a valid and important concern. However, the existing scholarly literature is mainly interested in universities' (such as Albareda-Tiana et al., 2018; Cuesta-Claros et al., 2023; Leal Filho et al., 2025) and elementary up

Volume 13 No 2, July- December 2025
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to K-12 schools' (such as Crawford & Montague, 2017; Okubo et al., 2021) engagement with SDGs. The literature on TVET institutions' engagement with SDGs with reference to course curricula is very difficult to find. To date, only a few studies have investigated the ways SDGs have been embedded into TVET curricula, such as Legusov et al. (2022) and Poza-Vilches et al. (2025) in the Global North and the Global South. However, literature reviews (such as Poza-Vilches et al., 2025) or case studies (such as Legusov et al., 2022) provide limited avenues for generalisations about countries or regions.

Second, by implementing SGDs in the curricula of STEM courses, TVET can provide a viable option to enhance the skills of youth and adults on urgent sustainability concerns, as well as promote equality and inclusivity. This allows TVET to play a key role in a country's development in terms of economic, social, and humanitarian. However, previous research showed that SDG1 'no poverty' was not referenced in any university degree programme (refer to Aleixo et al., 2020). We have not found previous studies that investigated TVET courses' engagement with specific SDGs either from the Global North or the Global South. The present study investigated the implementation of nine SDGs into curricula in the Global South and the use of vertical and horizontal integration approaches for this purpose.

Third, despite the efforts to address SDGs (Levin et al., 2024), the understanding of the implementation of SDGs into curricula in the Global South is very limited in the scholarly literature. The present study proposes that even within the Global South, regional differences prevail, i.e., Southeast Asia and South Asia. We believe such an analysis is novel, interesting, and provides valuable information about the Global South.

2. Literature Review

2.1 SDGs for People and Planet, and the Future of Skills

Sustainability is understood to have interconnections with economic, social, and ecological systems. Hence, strategies targeting sustainability have implications for people, planet, and prosperity, and require individual, social, and national-level changes in the approaches to sustainability or adapting to changes brought about by the movements of sustainability (Crawford & Montague, 2017; Hales & Birdthistle, 2024; Horvath et al., 2022). The SDGs provide a global, ambitious framework as well as a global objective to plan, implement, measure, and react. Due to the interconnections, SDGs must be addressed simultaneously to better achieve triple objectives concerning people, planet, and prosperity (Bennich et al., 2023). For example, education and training targets of SDG4 can be found across SDGs, and these are interlinked in one way or another (Bennich et al., 2023; Horvath et al., 2022; Kopnina, 2020; Szymańska & Zalewska, 2021). Hence, education and training are key to developing capacities required to successfully achieve almost all SDGs, and ultimately achieve the triple objectives concerning people, planet, and prosperity.

Further, SDG4 is a main contributor to creating equal opportunities for all, with diversity and inclusivity in mind. The diversified workforce passing out from education and training institutions can offer different viewpoints in solving issues surrounding economic, social, and ecological systems by offering creative solutions and promoting entrepreneurship (Hales & Birdthistle, 2024; McGrath & Yamada, 2023; UNESCO – ICEE, 2023). For example, a diversified workforce can better understand and articulate solutions for protection against natural disasters and can be creative in applying sustainable consumption and production patterns. Further, a workforce with capabilities to design, develop, implement, and maintain low-energy and carbon emission systems is a must to transform into a decarbonised and resource-efficient future. The required transformations make a profound impact on the labour market and skill development systems (IOE, 2023). This echoes the vital support that education and training institutions can provide.

As such, recent literature emphasises the need for the education and training sector to take the lead in developing capabilities of human resources in achieving inclusive and sustainable green growth (Buerkle et al., 2023; Maclean et

Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
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al., 2018; Morris et al., 2023; Ramsarup et al., 2023). Overall, these suggest that the sustainable development agenda, along with SDGs, has far-reaching consequences for the education sector. Among these, curricular challenges need to be urgently tackled to realise the world that we are longing to live in (Szymańska & Zalewska, 2021). Hence, it is important to understand how education and training systems interface and interact with the sustainability agenda to develop appropriate capabilities for achieving inclusive and sustainable green growth.

2.2 Education for Sustainable Development – Implementing SDGs into Curricula

The concept of ESD articulates what should be taught when providing quality education. ESD mainly concentrates on the discourse on curricula and pedagogy. ESD reflects engagement with the question 'learning for what?' and challenges to 'undertake the kind of curricula and pedagogic reforms that are needed … if future (the next) generations are to behave differently and revalue the future' (Lewin, 2019, 367). Education for sustainable development differs from sustainable education development (SED), which articulates what conditions should be fulfilled to provide quality education involving the discourse on teachers, software, equipment, and infrastructure (Lewin, 2019; Kopnina, 2020). Of the two, ESD is within the scope of the present study.

As coined by the United Nations with reference to ESD, 'knowledge, skills, values and attitudes required by citizens to lead productive lives, make informed decisions, and assume active roles locally and globally in facing and resolving global challenges can be acquired through ESD' (UNESCO, 2016, 14). Hence, the education sector should fulfil its role to achieve triple objectives concerning people, planet, and prosperity by equipping the workforce with new knowledge, skills, values, and attitudes (Osman et al., 2017). The policy frameworks are in place to implement SDGs into curricula (Lewin, 2019; Osman et al., 2017; UNESCO – ICEE, 2023). For example, Osman et al. (2017, p. 5) emphasise that 'SDGs must be addressed through a holistic, life course approach at all levels - early childhood care and education, primary education, secondary education, TVET, tertiary education, and adult education and learning'. In this regard, UNESCO – ICEE (2023) identifies the 'need to transform STEM education curricula to meet the challenges of the SDGs'. However, most of the empirical studies on the experiences of implementing SDGs into curricula are from universities (such as Albareda-Tiana et al., 2018; Cuesta-Claros et al., 2023; Dean et al., 2019; Leal Filho et al., 2025), followed by school curricula (elementary to K-12) (such as Crawford & Montague, 2017; Okubo et al., 2021). However, the engagement of schools with SDGs in the curricula is different since emphasis is mostly on solely conveying SDGs as the teaching content, i.e., teaching SDGs (one goal, selected few goals, or all 17 goals). This type of engagement is beyond the scope of the present study.

With regard to TVET, the middle-level manpower it produces makes a vital contribution to overcoming and finding solutions to create a sustainable future across business sectors, such as renewable energy, sustainable agriculture, and climate change mitigation (Levin et al., 2024; Maclean et al., 2018; McGrath & Yamada, 2023; Misko et al., 2021). The literature also provides evidence that TVET courses incorporating SDGs, such as SDG1 and SDG3, for marginalized youth and adults were more effective in alleviating poverty (Buerkle et al., 2023; Hales & Birdthistle, 2024). Therefore, it is important and must become a priority for TVET to find ways to implement SDGs into curricula. In this regard, policy directions are available for the implementation of SDGs into TVET curricula, such as Osman et al. (2017) and Levin et al. (2024). However, compared to the experiences of universities and schools in the implementation of SDGs into curricula, the experiences of TVET are very limited in the mainstream literature (refer to McGrath & Yamada, 2023).

2.2.1 Approaches to Implement SDGs into Curricula

Vertical and horizontal approaches are commonly identified in the literature as the mechanisms for implementing SDGs into curricula (Strachan et al., 2023; Weiss et al., 2021). The implementation of SDGs is vertical when sustainability is incorporated by

Volume 13 No 2, July- December 2025
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introducing new specific courses (e.g., MSc in Renewable Energy, MSc in Environment and Sustainability Studies). Previous research provides evidence for vertical integration in universities at undergraduate as well as postgraduate degree programmes (such as Aleixo et al., 2020; Cuesta-Claros et al., 2023; Leifler & Dahlin, 2020). The implementation of SDGs is horizontal when sustainability is incorporated by making curriculum revisions to already existing courses or making changes to pedagogical means to already existing courses (Weiss et al., 2021). The intention is to embed sustainability-related knowledge, skills, values, and attitudes into existing courses. Within horizontal approaches, Chang and Lien (2020) provide evidence for curriculum revisions to existing courses. Within horizontal approaches, a variety of pedagogical means were used to implement SDGs into already existing courses (Dean et al., 2019; Fields et al., 2023; Strachan et al., 2023). For example, organising guest lecturers on sustainable development-related topics, using action-oriented learning methods, using integrated projects, and using digital storytelling were commonly identified as pedagogical means to embed sustainability-related knowledge, skills, values, and attitudes into existing courses in universities, without curriculum revisions (Buerkle et al., 2023; Dean et al., 2019; Strachan et al., 2023; Venkiteswaran & Cohen, 2018).

In a nutshell, the implementation of SDGs into curricula of tertiary-level STEM courses in TVET institutions can be achieved by way of introducing new specific courses or adding SDGs into already available courses by making curriculum revisions or making changes to existing pedagogical means in teaching. However, details or empirical evidence for such are lacking in the mainstream literature. Although not specifically on the implementation of SDGs, UNESCO - UNEVOC (2024) provides evidence for embedding concepts of the circular economy into existing courses through curriculum revisions at TVET in Africa. Levin et al. (2024) and UNESCO - UNEVOC (2024), in general, report that most TVET institutions are insufficiently responsive to skills demanded by the green economy and are faced with numerous challenges in mainstreaming sustainable agendas in teaching.

2.3 Regional Differences within the Global South

Although skill development is vital for sustainable growth, the education and training sector's approach could vary due to a variety of factors, where one of such factors could be the geographic location/region of a particular country (Maclean et al., 2018; Reeve, 2016). A country's TVET system's engagement with SDGs could vary depending on its participation in regional skill transfer agreements that allow skill migration, involvement in regional trade and investment as well as the common understanding and encouragement for climate change mitigation (Maclean et al., 2018; Oketch, 2024; Reeve, 2016). The establishment of common regional skill development systems as well as skill recognition systems compel a country to have more interactions with other countries of the same region and establish systems with many similarities within the same region (Maclean et al., 2018; Reeve, 2016). Further, inter-country dialogue encouraging the sharing of best practices and lessons learned can better inform regional policy making on trade and investment, skill development, and skill migration (Maclean et al., 2018; Schröder, 2019). The Association of Southeast Asian Nations (ASEAN) and Asia South Pacific Association for Basic and Adult Education (ASPBAE) are examples of regional associations in Southeast Asia that influence how education and training institutions design, develop, and deliver skill development courses, including TVET. The South Asian Association for Regional Cooperation (SAARC) is the South Asian regional framework for socio-economic and skill development. However, it has been inactive since 2014. This is a result of geopolitical issues India continues to have with its neighbouring countries in South Asia. Further, BIMSTEC or the Bay of Bengal Initiative, which has 5 of the 8 South Asian (or SAARC) Countries (i.e., Bangladesh, Bhutan, India, Nepal, and Sri Lanka), and 2 of the 11 Southeast Asian (or ASEAN) countries (i.e., Myanmar and Thailand), does not qualify to be

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
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a regional cooperation within the scope of the present study.

When considering countries' engagement with ESD, the literature suggests that ESD is not uniform across the world (Maclean et al., 2018; UNESCO – UNEVOC, 2024). The implementation of the Paris Agreement and decarbonization strategies in the European Union (EU) has created a common understanding, promotion, and policy coherence within the EU, with much emphasis on the development of relevant skills (UNESCO – ICEE, 2023; UNESCO – UNEVOC, 2024). For example, UNESCO – ICEE (2023) provides a specific reference to the implementation of SDGs into TVET curricula in the EU. UNESCO - UNEVOC (2024) shows examples from Africa to convey that differences between countries prevail even within the Global South, irrespective of the prevalence of global agendas and targets. In Southeast Asia, ASEAN plays a prominent role in greening the region by creating policy agendas, implementation plans, and favourable conditions (Maclean et al., 2018). The evidence of UNESCO – ICEE (2023) for the EU and Schröder (2019) for Southeast Asian countries suggests that skill development priorities of TVET could vary by common priorities for skill development within the respective region. Further, Legusov et al. (2022) provide evidence for the role of regional skill recognition systems in standardising TVET offerings. When considering the specific aspects of TVET in South Asia, Maclean et al. (2018) and Naziz (2019) state that TVET institutions are reputed to be second-tier institutes providing an inferior route to obtain employment, which hinders the development of the TVET sector in the region. Overall, the above literature suggests that differences between countries can prevail based on the geographical region to which a particular country belongs. Therefore, it is important to understand the differences by the geographical region of the country for informed decision- and policymaking. The third objective of our study was to investigate any differences in the implementation of SDGs between Southeast Asia and South Asia. In line with the first and second objectives of our study, we propose that differences may exist in the implementation of SDGs into TVET curricula even within the Global South, which are reflected by the geographic region of the respective countries – Southeast Asia and South Asia. Therefore, it is proposed:

H1: The implementation of SDGs into curricula differs by the geographic region of the country

H2: The approaches used for the implementation of SDGs into curricula differ by the geographic region of the country

3. Methodology

3.1 Instrument

The study investigated the level of implementation of 9 SDGs into curricula of tertiary-level STEM courses offered by TVET institutions using vertical and horizontal approaches. The instrument developed consisted of 17 items, as shown in Table 1. The Likert scale was on five (5) points ('Not at all [1], Little, Somewhat, Much, and To a great extent [5]').

Table 1. Sustainable development goals in TVET curricula

Item	Approach	Item description	Corresponding SDG
1.1	NC	New courses were introduced in non-traditional areas to respond to current job market demand	1
1.2	NC	New courses were introduced on sustainable food systems	2
1.3	NC	New courses were introduced in new areas of agriculture, such as farm management, agribusiness development, and supply chain food safety management systems	2
1.4	EC	Existing courses now incorporate competencies that can be used to improve basic infrastructure and economic opportunities for poor people	10
1.5	EC	Existing courses now incorporate values that promote serving disadvantaged communities in my country	10

Volume 13 No 2, July- December 2025
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1.6	EC	Existing courses now address global challenges in relation to health, well-being, and disease prevention	3
1.7	NC	New courses were introduced to support the practice of health practitioners and of public health	3
1.8	EC	Existing courses now develop values that promote sustainable communities	11
1.9	EC	Existing courses now develop awareness of green spaces and their importance for well-being	11
1.10	EC	Existing courses now develop values that promote responsible consumerism	12
1.11	EC	Existing courses now develop an understanding of the behaviour of consumers and their environmental impact	12
1.12	NC	New courses were introduced on marine and coastal ecosystems and their sustainable management	14
1.13	EC	Existing courses now incorporate marine resources and sustainable marine practices for economic potential	14
1.14	EC	Existing courses now emphasise the importance of biodiversity	15
1.15	EC	Existing courses now develop an awareness of cybersecurity	16
1.16	EC	Existing courses now enhance values that promote global security	16
1.17	EC	Existing courses now enhance values that mitigate bribery and corruption	16

Note: EC: Existing courses were used for the implementation of sustainable goals, NC: New courses were introduced for the implementation of sustainable goals; Goal 1 – 'No Poverty', Goal 2 – 'Zero Hunger', Goal 10 – 'Reduced Inequalities', Goal 3 – 'Good Health and Well-being', Goal 11 – 'Sustainable Cities and Communities', Goal 12 – 'Responsible Consumption and Production', Goal 14 – 'Life below Water', Goal 15 – 'Life on Land', and Goal 16 – 'Peace, Justice and Strong Institutions'.

3.2 Sample and Data Collection

Description of the countries in the sample and their regional classification as per UNESCAP (2018, 3) is shown in Table 2. Regarding regional cooperation, the countries in Southeast Asia are in the ASEAN group, while the countries in South Asia are in the SAARC group (UNESCAP, 2018). The TVET teachers responded to the survey questionnaire in 2024. The requirements to be included in the sample were 1) they should be teaching for tertiary-level STEM courses, and 2) they should have a minimum of two years' experience in the current capacity as a TVET teacher. The email list maintained by the Colombo Plan Staff College (CPSC) in Manila, Philippines, was used. It is an intergovernmental organisation founded in 1973 to provide training for TVET teachers from 26 countries covering both Southeast Asia and South Asia. The Google form survey link was emailed to TVET teachers, who had undergone training courses of CPSC within the last three years, from the countries in Table 2. Respondents participated in the survey anonymously and voluntarily. As shown in Table 2, 761 responses were received. Table 3 shows additional sample characteristics.

Table 2. Countries in the sample

Region	Country	% responses (N = 761)	
Southeast Asia	Cambodia	6.40	56.85
	Indonesia	11.04	
	Malaysia	9.46	
	Philippines	11.03	
	Thailand	9.98	
	Vietnam	8.94	
South Asia	Bangladesh	8.94	43.23
	India	10.9	
	Nepal	6.96	
	Pakistan	9.07	
	Sri Lanka	7.36	

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

Total	100	100

Table 3. Additional sample characteristics

Characteristic	%
Sex:	
Male	62.4
Female	37.4
Highest education:	
Doctorate	14.4
Master's degree	45.6
Bachelor's degree	27.3
Higher diploma	12.8
Age in years:	
Mean	39.71
Std. deviation	9.11
Minimum	28
Maximum	52

3.3 Data analysis techniques used

The 17-item scale was subjected to Principal Component factor analysis with varimax rotation. The significant Wilks' Lambda statistic ($p < .05$) showed significant differences by country for all items. The significant differences were tested by region to test the hypotheses. For this, the compare means procedure was used. Partial eta squared (partial η^2) and associated effect sizes were used to interpret results.

4. Results

Table 4 shows the mean values together with the standard error of the mean (SE, given in brackets) for all 17 items investigated, country-wise. Table 4 also shows the corresponding SDG and the approach used to implement SDGs into curricula – vertical (i.e., introduction of new courses) or horizontal (i.e., implemented into already available courses). Mean values given in Table 4 show the level of implementation of each aspect by each country. The item total is also provided in Table 4. The data in Table 4 are interpreted based on the significance of the F-value and associated Partial η^2. All 17 items show significant differences between countries. Partial eta squared values give the associated effect size. For example, the Partial η^2 value of .165 suggests that 16.5% of the variance in item 1.15 is accounted for by country-wise differences.

Table 4. SDGs in the curricula and country-wise differences

Approach	SDG	Item	Southeast Asian countries						South Asian countries					Item Total	F	Sig.	Partial η^2
			1	2	3	4	5	6	7	8	9	10	11				
NC	1	1.1	3.97 (.16)	3.95 (.19)	4.06 (.11)	4.30 (.09)	4.19 (.09)	3.93 (.15)	3.73 (.16)	4.10 (.11)	3.35 (.22)	3.80 (.12)	3.24 (.21)	3.91 (.04)	3.43	.000	.097
NC	2	1.2	3.59 (.20)	3.73 (.22)	3.41 (.16)	4.06 (.13)	4.15 (.10)	3.89 (.20)	3.51 (.18)	3.76 (.16)	3.15 (.29)	3.55 (.19)	3.24 (.20)	3.60 (.05)	3.92	.000	.109
NC	2	1.3	3.65 (.19)	3.72 (.21)	3.35 (.17)	4.07 (.12)	4.31 (.10)	3.81 (.16)	3.49 (.19)	3.84 (.14)	3.30 (.25)	3.39 (.18)	3.08 (.22)	3.60 (.05)	5.05	.000	.137
EC	10	1.4	4.03 (.14)	3.95 (.20)	4.30 (.10)	4.37 (.11)	4.19 (.08)	4.30 (.13)	3.98 (.16)	4.08 (.11)	3.60 (.24)	3.90 (.16)	3.27 (.16)	4.02 (.04)	3.91	.000	.109
EC	10	1.5	4.02 (.15)	3.82 (.22)	4.00 (.10)	4.35 (.12)	4.38 (.07)	4.04 (.18)	3.78 (.17)	3.94 (.13)	3.50 (.25)	3.69 (.17)	2.92 (.19)	3.85 (.04)	5.73	.000	.152
EC	3	1.6	3.62 (.17)	3.50 (.26)	3.44 (.15)	4.06 (.13)	4.17 (.09)	3.85 (.24)	3.45 (.20)	3.82 (.15)	3.20 (.30)	3.53 (.20)	2.57 (.18)	3.55 (.05)	5.58	.000	.149
NC	3	1.7	3.71 (.19)	3.59 (.28)	3.72 (.15)	4.17 (.12)	4.23 (.08)	3.70 (.23)	3.61 (.21)	3.85 (.15)	3.20 (.32)	3.57 (.19)	2.70 (.20)	3.65 (.05)	5.20	.000	.140
EC	11	1.8	3.97 (.17)	3.68 (.25)	3.80 (.13)	4.10 (.11)	4.31 (.08)	4.00 (.21)	3.57 (.19)	3.79 (.14)	3.05 (.29)	3.61 (.18)	2.78 (.19)	3.71 (.05)	5.38	.000	.144

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

EC	11	1.9	3.74 (.18)	3.68 (.23)	3.56 (.14)	4.14 (.12)	4.17 (.09)	3.89 (.22)	3.61 (.18)	3.84 (.14)	3.20 (.30)	3.65 (.19)	2.84 (.22)	3.66 (.05)	4.41	.000	.121
EC	12	1.10	3.61 (.17)	3.68 (.22)	3.54 (.13)	3.95 (.13)	4.16 (.09)	3.93 (.20)	3.55 (.19)	3.76 (.15)	3.40 (.29)	3.67 (.17)	2.78 (.19)	3.63 (.05)	3.55	.000	.100
EC	12	1.11	3.47 (.19)	3.45 (.24)	3.43 (.15)	3.97 (.13)	4.25 (.08)	3.89 (.22)	3.43 (.21)	3.58 (.15)	3.25 (.29)	3.45 (.19)	2.62 (.17)	3.53 (.50)	4.85	.000	.132
NC	14	1.12	3.56 (.21)	3.45 (.28)	3.19 (.17)	3.73 (.16)	4.10 (.11)	3.30 (.26)	3.39 (.19)	3.42 (.16)	2.40 (.31)	3.39 (.19)	2.63 (.20)	3.33 (.06)	4.60	.000	.126
EC	14	1.13	3.41 (.21)	3.27 (.25)	3.18 (.16)	3.63 (.17)	4.23 (.09)	3.37 (.25)	3.22 (.21)	3.45 (.17)	2.20 (.30)	3.22 (.20)	2.46 (.19)	3.24 (.06)	5.77	.000	.153
EC	15	1.14	3.71 (.21)	3.32 (.26)	3.30 (.14)	3.95 (.15)	4.21 (.10)	3.44 (.24)	3.43 (.20)	3.74 (.15)	3.40 (.31)	3.35 (.19)	2.57 (.20)	3.47 (.05)	4.87	.000	.132
EC	16	1.15	3.79 (.18)	3.32 (.27)	3.89 (.13)	4.06 (.12)	4.23 (.07)	3.74 (.19)	3.65 (.18)	3.89 (.14)	3.15 (.25)	3.33 (.21)	2.56 (.17)	3.64 (.04)	6.32	.000	.165
EC	16	1.16	3.85 (.15)	3.59 (.25)	3.85 (.11)	4.16 (.10)	4.19 (.08)	4.00 (.21)	3.69 (.17)	3.92 (.13)	3.45 (,23)	3.39 (.17)	2.68 (.16)	3.71 (.04)	6.07	.000	.160
EC	16	1.17	3.71 (.18)	3.82 (.24)	3.56 (.13)	4.35 (.11)	4.17 (.09)	3.96 (.20)	3.49 (.17)	3.98 (.12)	3.20 (.29)	3.45 (.17)	2.92 (.19)	3.71 (.05)	4.77	.000	.130

Note: EC: Existing courses were used for the implementation of sustainable goals, NC: New courses were introduced for the implementation of sustainable goals; Country: 1= Cambodia, 2 = Indonesia, 3 = Malaysia, 4 = Philippines, 5 = Thailand, 6 = Vietnam, 7 = Bangladesh, 8 = India, 9 = Nepal, 10 = Pakistan, 11 = Sri Lanka

The 17-item measure covering 9 goals was subjected to factor analysis to understand the underlying dimensions. Factor analysis converged into four factors, as shown in Table 5. Total variance explained by the four factors was 79.90%. These four factors were named as 'Reduce poverty, hunger, and inequalities', 'Promote well-being, responsible consumption, and sustainable communities', 'Life on land and below water', and 'Strong institutions'.

Table 5. Factor analysis - SDGs in the curricula

SDG	Item	Reduce poverty, hunger, and inequalities	Promote well-being, responsible consumption, and sustainable communities	Life on land and below water	Strong institutions
1	1.1	.808			
2	1.2	.852			
2	1.3	.829			
10	1.4	.784			
10	1.5	.816			
3	1.6		.906		
3	1.7		.821		
11	1.8		.902		
11	1.9		.910		
12	1.10		.908		
12	1.11		.906		
14	1.12			.929	
14	1.13			.951	
15	1.14			.897	
16	1.15				.886
16	1.16				.901
16	1.17				.822
Eigenvalue		3.347	4.781	2.571	2.272
% of variance explained		26.111	24.673	18.771	10.341
Cronbach's Alpha		.874	.948	.917	.838

To further explain the variables by country, Table 6 was created with these four factors. The results showed significant differences between the countries for all four factors. For example, the Partial η^2 value of .184 for strong institutions suggests that 18.4% of the

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

variance is accounted for by the country-wise differences.

Table 6. SDGs in the curricula by four factors

Country	Reduce poverty, hunger, and inequalities	Promote well-being, responsible consumption, and sustainable communities	Life on land and below water	Strong institutions
Cambodia	3.85 (.13)	3.69 (.15)	3.56 (.19)	3.78 (.15)
Indonesia	3.84 (.19)	3.60 (.22)	3.35 (.25)	3.58 (.24)
Malaysia	3.82 (.09)	3.58 (.12)	3.22 (.14)	3.77 (.09)
Philippines	4.23 (.09)	4.07 (.11)	3.77 (.15)	4.19 (.09)
Thailand	4.25 (.07)	4.22 (.08)	4.18 (.09)	4.20 (.07)
Vietnam	3.99 (.13)	3.88 (.20)	3.37 (.23)	3.90 (.17)
Bangladesh	3.70 (.15)	3.54 (.18)	3.35 (.19)	3.61 (.15)
India	3.94 (.11)	3.77 (.13)	3.54 (.15)	3.93 (.12)
Nepal	3.38 (.20)	3.22 (.25)	2.67 (.26)	3.27 (.23)
Pakistan	3.67 (.17)	3.58 (.17)	3.32 (.18)	3.39 (.17)
Sri Lanka	3.15 (.16)	2.72 (.16)	2.55 (.17)	2.72 (.14)
Total	3.80 (.04)	3.62 (.04)	3.34 (.05)	3.69 (.04)
F	5.78	5.94	5.67	7.18
Sig.	.000	.000	.000	.000
Partial η^2	.153	.157	.151	.184

Tables 7 to 10 show the implementation of SDGs into curricula by region. When mean values are considered, for all items (refer to Table 1 for item description), Southeast Asia had higher levels of implementation. When differences in implementing SDGs into curricula are considered for each item and factor by region, as shown in Tables 7 to 10, differences are significant. For example, the Partial η^2 value of .043 suggests that the region accounts for 4.3% of the variance in reducing poverty, hunger, and inequalities.

Table 7. SDGs in the curricula - reduce poverty, hunger, and inequalities

Region	Item					Reduce poverty, hunger, and inequalities
	1.1	1.2	1.3	1.4	1.5	
Southeast Asia	4.04 (.04)	3.72 (.06)	3.77 (.06)	4.17 (.04)	4.04 (.05)	3.95 (.04)
South Asia	3.73 (.07)	3.42 (.08)	3.37 (.08)	3.82 (.07)	3.60 (.07)	3.59 (.06)
Total	3.91 (.04)	3.59 (.05)	3.59 (.05)	4.02 (.04)	3.85 (.04)	3.80 (.04)
F	16.01	9.00	16.33	20.99	26.13	25.33
Sig.	.000	.003	.000	.000	.000	.000
Partial η^2	.028	.016	.028	.036	.044	.043

JURNAL VOKASI INDONESIA
Journal of Vocational Program University of Indonesia
Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

Table 8. SDGs in the curricula - promote well-being, responsible consumption, and sustainable communities

Region	Item						Promote well-being, responsible consumption, and sustainable communities
	1.6	1.7	1.8	1.9	1.10	1.11	
Southeast Asia	3.76 (.06)	3.85 (.05)	3.93 (.05)	3.83 (.06)	3.77 (.05)	3.74 (.06)	3.81 (.05)
South Asia	3.30 (.09)	3.39 (.08)	3.42 (.07)	3.45 (.08)	3.45 (.07)	3.25 (.08)	3.38 (.07)
Total	3.56 (.05)	3.65 (.05)	3.71 (.04)	3.66 (.05)	3.63 (.04)	3.53 (.03)	3.62 (.04)
F	21.28	20.94	29.86	15.35	12.26	25.42	25.93
Sig.	.000	.000	.000	.000	.001	.000	.000
Partial η^2	.036	.036	.050	.027	.021	.043	.044

Table 9. SDGs in the curricula - life on land and below water

Region	Item			Life on land and below water
	1.12	1.13	1.14	
Southeast Asia	3.50 (.06)	3.45 (.07)	3.62 (.06)	3.52 (.06)
South Asia	3.10 (.08)	2.96 (.09)	3.27 (.08)	3.11 (.08)
Total	3.32 (.05)	3.23 (.06)	3.46 (.05)	3.34 (.05)
F	13.77	18.75	10.83	16.80
Sig.	.000	.000	.001	.000
Partial η^2	.024	.032	.019	.029

Table 10. SDGs in the curricula - strong institutions

Region	Item			Strong institutions
	1.15	1.16	1.17	
Southeast Asia	3.84 (.06)	3.90 (.05)	3.91 (.05)	3.88 (.05)
South Asia	3.39 (.08)	3.49 (.07)	3.47 (.08)	3.45 (.08)
Total	3.64 (.05)	3.72 (.04)	3.71 (.04)	3.69 (.04)
F	22.48	21.43	23.24	29.99
Sig.	.000	.000	.000	.000
Partial η^2	.038	.037	.040	.051

Table 11 shows the implementation approaches - the introduction of new courses (i.e., vertical) or implementation into already available courses (i.e., horizontal). When mean values are considered, Southeast Asia had higher levels of implementation using both approaches. When differences are considered by region, the differences are significant. The partial η^2 value of .052 suggests that the region accounts for 5.2% of the variance in the use of horizontal integration approaches.

Table 11. Approaches used for the implementation

Region	EC	NC
Southeast Asia	3.83 (.04)	3.78 (.05)
South Asia	3.40 (.06)	3.40 (.07)
Total	3.64 (.04)	3.61 (.04)

Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

F	30.48	20.52
Sig.	.000	.000
Partial η^2	.052	.035

Note: EC: Existing courses were used for the implementation of sustainable goals, NC: New courses were introduced for the implementation of sustainable goals

Overall, H1 proposed that the implementation of SDGs into curricula differs by the geographic region of the country. The results shown in Tables 6 to 10 support H1. H2 proposed that approaches used for the implementation of SDGs differ by the geographic region of the country. The results shown in Table 11 support H2 (refer to Table 1 and Table 4 for item-wise categorisation).

5. Conclusion, Contribution, and Implications

The study investigated the implementation of selected elements of nine SDGs into curricula, building on SDG4 targets 4.3, 4.4, and 4.7 within ESD discourse. SDG4 target 4.3 emphasises the provision of vocational and tertiary education for youth and adults. TVET is recognised worldwide for its capacity to supply middle-level skilled and sub-professional manpower for a country's development while addressing the interests of inclusion and diversity. Therefore, TVET attracted immense interest for its capacity to cater to middle-level skilled and sub-professional manpower for the world of work. Several policy directives (such as Levin et al., 2024; Osman et al., 2017; UNESCO – ICEE, 2023) recommend implementing SDGs into curricula to support ESD, in line with SDG4 target 4.7.

Sustainable ideologies and green agendas, while creating new jobs in new areas such as renewable energy and sustainable agriculture, disrupted many jobs in traditional areas such as fossil-fuel-dependent or carbon-intensive sectors. For example, move away from waste incineration to recycling. As such, TVET, while providing skill development options incorporating the sustainability agenda for those who enter the labour market for the first time, can also provide new skills for working adults who are at risk of losing jobs due to the sustainability agenda. That is, TVET must play a pivotal role in providing the breadth and depth of relevant knowledge, skills, values, and attitudes involving SDGs in middle-level manpower for them to be instrumental in reaching SDGs. Hence, the present study identified 'relevant' knowledge, skills, values, and attitudes as those involving SDGs in line with SDG4 target 4.4 and argued for the importance and urgency of implementing SDGs into curricula. The findings of the present study showed the implementation of selected elements of nine (9) SDGs into curricula to support ESD, the use of vertical and horizontal approaches to implement SDGs, and the prevalence of significant differences in implementations between Southeast Asia and South Asia. The findings have several contributions and implications for research, practice, and policy making.

5.1 Contributions of the Study to the Existing Literature

When considering the contributions of the study to the existing literature, first, SDG4 target 4.7 states the importance of promoting sustainability through ESD. Although 'there is always a time lag between curricular design and application' (McGrath & Yamada, 2023), since the introduction of SDGs and the recommendation for the implementation of SDGs into curricula, higher education institutions should have taken efforts to make curricula relevant to SDGs. Still, irrespective of the immense importance and the world is living on the verge of reaching the 2030 deadlines, we have not seen previous studies detailing the experiences of many SDGs getting implemented into curricula in any type of higher education institution, such as TVET, in the Global South. The present study investigated the implementation of selected elements of nine (9) SDGs into curricula, making a vital contribution to the existing literature.

Second, the findings showed that TVET institutions have taken steps to implement SDGs into curricula using both vertical and horizontal

Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

approaches. Although recommendations have been available for some time (such as Lewin, 2019; Osman et al., 2017), the evidence for the approaches used in implementing SDGs in higher education curricula is very limited. The present study addressed this gap by providing evidence for implementing selected elements of nine SDGs into TVET curricula using vertical and horizontal approaches. We argue that it is important to understand whether SDGs 1, 2, 10, 3, 11, 12, 14, 15, and 16 have been implemented into curricula, to what extent these SDGs have been implemented (refer to Tables 4 to 10), and what approaches have been used for the implementation (refer to Tables 4 and 11). The contribution of the present study lies in that it is one of the very first empirical studies to present the implementation of SDGs into TVET curricula in the Global South. On the one hand, most of the research on the implementation of SDGs into curricula using vertical and horizontal approaches is highly confined to universities. On the other hand, most of such studies provide insights into exclusive case studies without opportunities for generalisations. Therefore, the present study makes an important contribution to the literature.

Third, the literature suggests the importance of understanding the underlying meanings of SDGs using qualitative or quantitative methodologies (Pansare et al., 2023; Rockström & Sukhdev, 2016). Pansare et al. (2023) empirically showed the necessity of classifying the SDGs into fitting groupings so as to understand and implement these better, and classified 17 SDGs into three groupings, i.e., social, biological, and industrial. Rockström and Sukhdev (2016) showed that the 17 SDGs can be divided into groupings of biosphere, economy, society, and partnerships. Overall, the argument is that, instead of looking into isolated 17 SDGs, a broader picture can also be gained through classification. We have subjected the 17-item scale representing the selected aspects of nine SDGs to factor analysis. The analysis yielded four underlying factors: 'Reduce poverty, hunger, and inequalities', 'Promote well-being, responsible consumption, and sustainable communities', 'Life on land and below water', and 'Strong institutions'. In this regard, under the umbrella of SDG4, Morris et al. (2023) suggest several broadly defined purposes of education, such as economic development, well-being and flourishing, building national identities and civic engagement, and liberation and critical conscientization. At the end of the day, the SDGs are for the achievement of noteworthy upgrading of people's socioeconomic situation around the world by simultaneously addressing triple objectives concerning people, planet, and prosperity. Hence, the present study also contributes to the literature with an alternative classification of SDGs 1, 2, 10, 3, 11, 12, 14, 15, and 16 when implementing these into curricula.

Fourth, one of the main purposes of the study was to investigate regional differences by the geographic location of countries. All 11 countries come under the label 'developing' and are located in the Global South. The intention was to deepen the scope of the inquiry on the implementation of SDGs into curricula of the Global South by further diagnosing differences within the Global South. Almost all countries in the world should strengthen TVET for skill development, considering its importance to economic development (refer to Wickramasinghe & Wickramasinghe, 2025b). Findings showed the prevalence of significant differences between countries from Southeast Asia and South Asia in the implementation of SDGs in TVET curricula. As reviewed in the literature, these differences could have stemmed from the regional context, priorities, and conditions in terms of trade and investment, skill migration, and skill recognition experienced by the countries of the two regions that directly influence skill development priorities. Still, the implementation of SDGs into TVET curricula is a mandate for a sustainable future concerning people, planet, and prosperity and should be a vital component of the skill development strategy of all countries. That is, it should not be conditioned by the geographic region of a particular country. We have not come across previous studies that compared two regions of the Global South in the implementation of SDGs. The present study proposed selective observable and quantifiable indicators for the implementation of SDGs into curricula to assess the progress made towards the overarching

Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

sustainable future concerning people, planet, and prosperity. We expect our findings to prompt dialogue on skill development priorities and strategies of the Global South, the breadth and depth of research assessing achievements made towards the SDGs in the Global South, and the sharing of research findings of the Global South. We believe this is one of the best avenues to ensure that the spirit of SDGs is addressed in an authentic way to spark dialogue in the Global South. Hence, the present study makes a valuable and novel contribution to the literature.

Fifth, the present study, building on SDG4, investigated transformations in curricula to implement SDGs using a replicable methodology. The novel methodological approach proposed in the study allowed for diagnosing SDG implementations into curricula that can be applied in many other contexts and to make comparisons. The higher education institutions can understand their level of adherence to the requirement of implementing SDGs into curricula and identify the approaches available for such implementations. Such understanding can lead to higher education curricular transformations as well as pedagogical renewal within the SDG implementation mandate. Such a contribution to the literature is within the arguments of Poza-Vilches et al. (2025). The novelty in the present study's approach is that it investigated 'what is already implemented in courses' as opposed to 'potential to be addressed in courses', which many previous studies have adopted, such as Gómez-Martín et al. (2021).

5.2 Implications of the Study for Practice and Policymaking

When considering the implications of the study for practice and policymaking, first, TVET institutions must identify that the implementation of SDGs into curricula is a mandate for a sustainable future and a driver for SDG implementation at TVET. The timing is also important with the imposed 2030 target. Hence, on the one hand, higher education institutions must revisit their commitments to the implementation of SDGs in the curricula and must take action to implement them. On the other hand, when the quality of education provision is understood as imparting relevant knowledge, skills, values, and attitudes involving SDGs, policy-level adherence is a must for the implementation of SDGs into curricula. A country's policy and regulatory framework at the national level has enormous influence when introducing new courses and revising/updating existing curricula to accommodate global mandates.

Second, when considering the approaches for the implementation, the introduction of new courses or making curriculum revisions to the existing courses or making pedagogical changes to embed SDGs come with considerable investments involving funding, teacher training, and time commitments, to name a few. As highlighted in the literature, fulfilling such requirements can be overwhelming for institutions like TVET that are largely driven by public funding unless partnerships to stimulate investments by donor agencies or industry sponsors are available. Many countries in the sample, such as Sri Lanka, have a long way to go in the implementation of SDGs into curricula. Hence, the findings of the study imply the need to ensure an industry-led or stakeholder-led approach for skill development. When the implementation of SDGs into curricula is a mandate, industry partners can provide crucial support for curriculum development and updates. In this regard, Levin et al. (2024) and Senadeera and Wickramasinghe (2005) stated that challenges TVET institutions face are particularly more pronounced in the Global South.

Third, the progress down the line could also depend on a country's obvious conditions – national or regional - that are outside of TVET. For example, industrial processes in use, the pace of development, and the level of development of a country as well as the regional agendas for development and the extent of partnership for such regional agendas. These may directly determine achievements by skill development systems in terms of quality and quantity. In simple terms, a necessity should exist for the development of policy coherence for the engagement of higher education institutions with SDGs. This may apply to the initiatives for the implementation of SDGs into curricula, irrespective of the global mandates.

Volume 13 No 2, July- December 2025
P-ISSN 2355-5807
E-ISSN 2477-3433

6. Limitations of the Study and Future Research

The study collected 761 responses across 11 countries in East and South Asia. When the reference is for the Global South, as continents, Africa and South America have been excluded. Still, the replicable methodology proposed in the present study could be useful to expand research in breadth and depth in the future. Second, the investigation was on whether SDGs were implemented into curricula and whether vertical and horizontal approaches, in broad terms, were used. This limited the investigation into 'how' vertical and horizontal approaches were used. This suggests another avenue for future research. Third, the study was built on ESD. Still, SED is important and helps to understand barriers for the implementation of SDGs into curricula, such as the availability of funding, assistance for curriculum development, and teacher development. Future research building on the discourse of SED could broaden the understanding of the implementation of SDGs into curricula.

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