

Exploring Generic Green Skills in Enhancing TVET Curriculum in Malaysia

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Abstract

This study explores the difficulties of incorporating generic green skills into Malaysia's Technical and Vocational Education and Training (TVET) curriculum. This investigation delves into the understanding of these competencies among educators and students, the current obstacles to their incorporation, and the extent of their integration within the curriculum. Data collection involved qualitative methods and semi-structured interviews conducted with experienced TVET lecturers. The results reveal that insufficient training, limited resources, and the curriculum need to be up-to-date are the main obstacles hindering the integration of green skills into the TVET curriculum. The study concludes with suggestions for policy reforms and improved educator training to ensure that graduates possess the necessary technical and sustainability skills to address the needs of an expanding green economy.

Keywords: Generic Green Skills, TVET Curriculum, Environmental Awareness, Curriculum Integration, Technical Education

Introduction

In today's world of interconnectedness and swift technological progress, the significance of sustainability has reached new heights. Countries worldwide are working diligently to modify their economic frameworks in response to environmental issues and foster sustainable practices. Malaysia's government is firmly committed to fostering a green economy, highlighting its importance in achieving long-term sustainable development. At the heart of this initiative is the need to prepare the workforce with essential green skills and capacities that aid in environmental conservation, resource efficiency, and reduction of the effects of climate change (Ngadiman et al., 2017; Rahim & Iqbal, 2022). These abilities are essential to

achieve the environmental goals established by national and international frameworks and equip people to succeed in the developing green sectors.

Technical and Vocational Education and Training (TVET) is paramount. TVET is structured to equip individuals with the skills necessary for particular trades and technical professions, thus significantly influencing future workforce development. However, despite Malaysia's progress in advancing technical education, incorporating green skills into the TVET curriculum poses a considerable challenge. Studies indicate that Malaysia's TVET institutions prioritise technical skills, while environmental sustainability receives minimal focus (Sern et al., 2021; Rahim & Iqbal, 2021).

The Malaysian government has set ambitious goals for creating green jobs through initiatives such as the Malaysia Green Technology Master Plan and the Eleventh Malaysia Plan (2016–2020), which aim to generate more than 200,000 green jobs by 2030 (Ibrahim et al., 2020). These policies highlight the importance of a workforce that excels in technical competencies and sustainable practices (Zulhasni et al., 2023; Iqbal et al., 2023; Naghipour et al., 2024). Nonetheless, the existing framework of Malaysia's TVET curriculum falls short of fully realising this vision. There are notable deficiencies in integrating green skills, resulting in numerous graduates being inadequately equipped for the requirements of the green economy (Ramli et al., 2022).

This study addresses the urgent need to equip Malaysia's workforce with green skills by identifying barriers in the TVET curriculum and offering insights for reform, aligning education with the demands of a green economy. It also aims to investigate the incorporation of generic green skills into the TVET curriculum in Malaysia. The focus is to examine the awareness levels of educators and students about green skills, identify the obstacles to incorporating these skills into current curricula, and explore the broader implications for workforce preparedness. This study's findings will play a significant role in the continuous efforts to harmonise Malaysia's vocational education system with the requirements of a sustainable economy.

Literature Review

The worldwide transition towards sustainability has exerted significant pressure on educational systems, especially in vocational education, to incorporate green skills into their curricula. As sectors progressively seek individuals with technical skills and a strong awareness of environmental issues, the need for educational frameworks to adapt intensifies. This section delves into the principal themes present in the current literature regarding green skills, concentrating on the challenges and opportunities associated with their incorporation into TVET curricula, with a particular focus on the Malaysian context.

Worldwide Perspective on the Integration of Eco-Friendly Skills

Globally, there is a growing acknowledgement among governments and industries regarding the significance of green skills in cultivating a sustainable workforce. In numerous nations, vocational education frameworks create curricula that align with industries' technical requirements while fostering sustainability (Pavlova & Chen, 2019). For example, in countries such as Germany and Australia, green skills have been integrated into TVET programs as part of a broader initiative to synchronise education with environmental objectives (Cabral & Dhar,

2019). This worldwide phenomenon is propelled by the understanding that sustainability is a moral obligation and a vital economic catalyst in the contemporary era.

Green skills are complex, involving various competencies tied to environmental consciousness, resource management, and sustainable practices. These skills are crucial for construction, manufacturing, and energy professionals as sustainability increasingly takes centre stage (Ramli et al., 2022). Nonetheless, incorporating environmentally sustainable skills into technical and vocational education and training curricula has progressed sluggishly, especially in developing nations where financial limitations and infrastructural challenges present considerable obstacles (Kamis et al., 2018).

The Experience in Malaysia

The government has undertaken significant initiatives to advance sustainability in Malaysia through various policy measures. The Malaysia Green Technology Master Plan and the Eleventh Malaysia Plan (2016–2020) emphasise the necessity for a proficient workforce to propel the nation's green economy (Ibrahim et al., 2020). Despite these efforts, incorporating environmentally-focused skills into the TVET curriculum has been uneven, with numerous institutions continuing to emphasise technical skills rather than environmental education (Abd Hamid et al., 2019).

A study by Sern et al (2021), indicates that although there is an increasing acknowledgement of the significance of green skills among educators, the actual application of these skills within the curriculum still needs to be improved. A notable obstacle is the need for more training provided to educators. Many TVET educators need help effectively teaching sustainability concepts due to inadequate professional development opportunities. Consequently, green skills frequently receive attention as secondary or additional subjects instead of being incorporated as essential competencies within the primary curriculum (Yunus et al., 2024).

Moreover, the curriculum framework must be revised to incorporate environmentally sustainable skills. In Malaysia, TVET programs have historically emphasised practical, technical training, leaving limited space for developing broader competencies like environmental awareness (Ngadiman et al., 2017). The limited scope restricts educators from integrating sustainability into their teaching practices, as they frequently face constraints imposed by inflexible curricula that emphasise technical skills rather than a comprehensive educational approach.

A notable obstacle is the need for more collaboration between TVET institutions and industries prioritising sustainability. Robust collaborations between educational institutions and businesses in advanced nations facilitate the alignment of curricula with the labour market's requirements for green skills (Cabral & Dhar, 2019). Nonetheless, these partnerships are scarce in Malaysia, resulting in a disconnection between TVET institutions and the green economy (Sern et al., 2021). This disconnect not only obstructs the incorporation of green skills but also restricts students' engagement with practical applications of sustainability practices.

Consequences for Workforce Advancement

The need for more incorporation of green skills into Malaysia's TVET curriculum poses significant challenges to workforce preparedness. Graduates from TVET institutions are anticipated to join the workforce equipped with technical skills and the capacity to support the nation's sustainability objectives (Kaliappan & Hamid, 2021). Nonetheless, the existing curriculum leaves numerous students needing to be equipped to address these challenges. A study conducted by Ramli et al (2022), revealed that multiple TVET graduates must possess the environmental competencies required for employment in industries shifting towards sustainable practices, thereby restricting their employability within the green economy. Despite increasing recognition of the importance of green skills within Malaysia's TVET system, substantial obstacles hinder their complete incorporation. These factors encompass insufficient educator training, an antiquated curriculum framework, and restricted collaboration with industry (Iqbal et al., 2024a; Iqbal et al., 2024b). To tackle these challenges, a unified approach from policymakers, educators, and industry leaders is essential to guarantee that TVET graduates possess the necessary skills to succeed in the green economy.

Areas Needing Further Investigation

Although an increasing amount of literature highlights the significance of green skills, this study aims to tackle several gaps in the field. Firstly, studies are still being conducted regarding the awareness and comprehension of green skills among TVET educators and students in Malaysia. Many investigations emphasise policy-level initiatives or general discussions surrounding sustainability in education, yet they often need to examine the practical implementation of these skills thoroughly. Furthermore, although specific studies have investigated the obstacles to incorporating green skills in TVET, more research needs to be focused on how these challenges can be addressed through curriculum reforms, teacher training, and collaboration with industry. This investigation addresses these gaps by examining educators' views on green skills and pinpointing the obstacles they face in incorporating them into the curriculum. The study offers actionable suggestions for addressing these challenges and fostering a more sustainable and environmentally aware TVET system in Malaysia. The conceptual relationship among green skills, the TVET curriculum, and graduate preparedness is illustrated in Figure 1, emphasising the significant influence of external factors like government policies and industry collaboration on integrating green skills into vocational education.

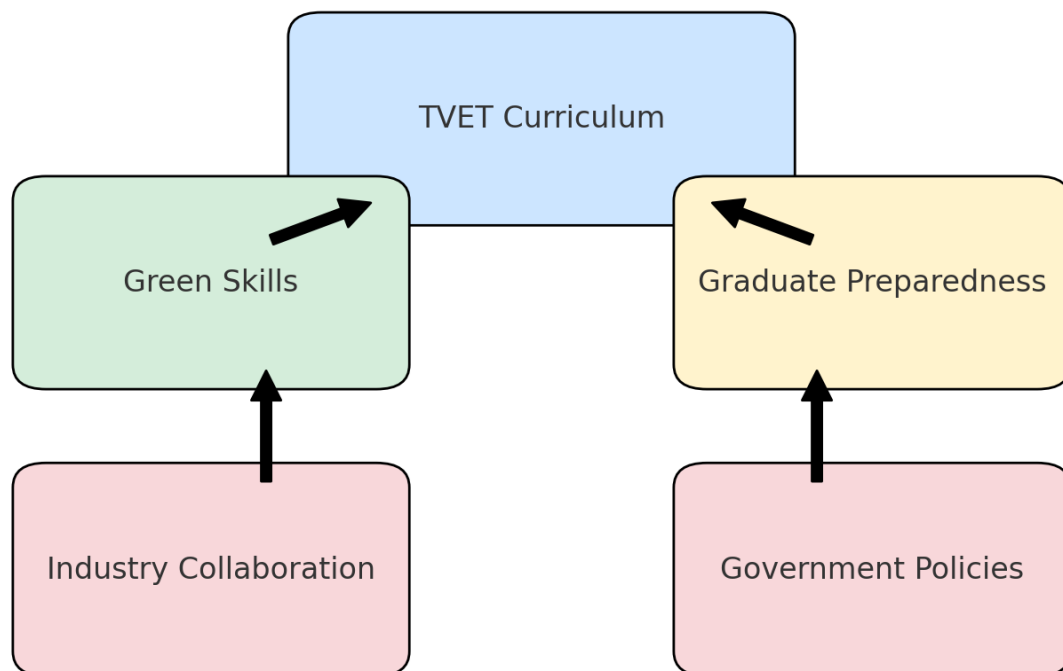


Figure 1: Conceptual Framework for Integrating Green Skills in TVET Curriculum.

Methodology

This study adopted a qualitative research design to explore the integration of generic green skills in the TVET curriculum in Malaysia. Given the exploratory nature of the research, qualitative methods were chosen to provide in-depth insights into the perceptions of TVET educators regarding green skills and the barriers to their integration. The methodology included semi-structured interviews with senior TVET lecturers from different institutions, allowing the collection of wealthy, descriptive data on the subject.

Research Design

A basic qualitative inquiry approach was employed in this study. According to Merriam & Tisdell (2015), qualitative inquiry is particularly suited for understanding individuals' experiences and the meanings they attribute to those experiences. In this case, the research aimed to capture the educators' perspectives on integrating green skills, focusing on the practical challenges they face in incorporating these competencies into the curriculum. This design allowed for flexibility in the data collection process, enabling the researcher to probe deeper into the participants' responses as needed.

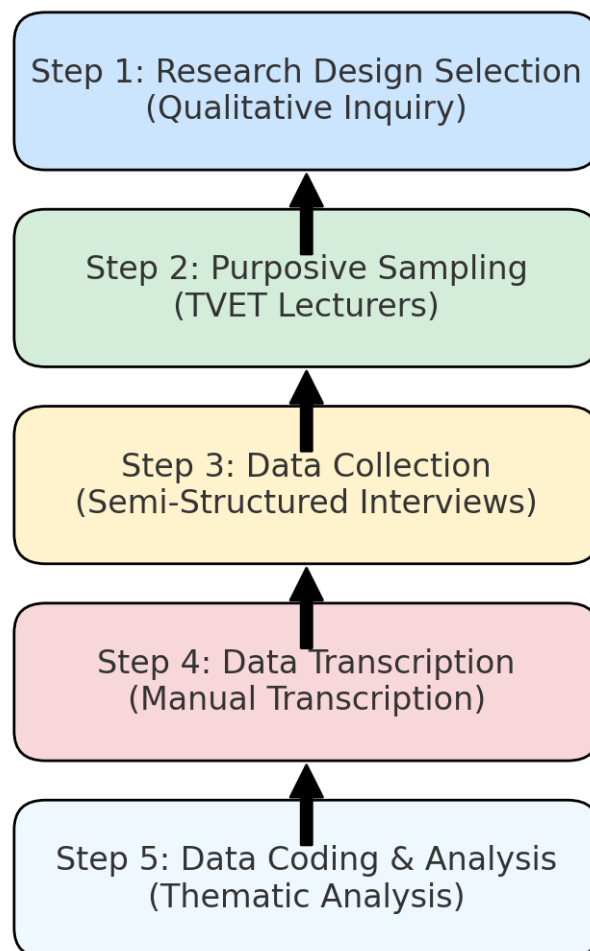


Figure 2: Process Flowchart of Research Design and Data Analysis

Sampling Approach

The selection of participants for this study was conducted through purposive sampling. This approach was selected to guarantee that only individuals possessing pertinent expertise and experience in the TVET curriculum and the integration of green skills were part of the study. The sample included five senior lecturers from polytechnics and community colleges in Malaysia. Participants had at least five years of experience in TVET teaching and curriculum development, guaranteeing they had the expertise to offer valuable insights into the research problem.

Purposive sampling was ideal for this study as it focused on participants actively involved in teaching and curriculum development, ensuring their insights were directly relevant to the research objectives (Creswell, 2013). The relatively small sample size aligns with the principles of qualitative inquiry, focussing on collecting detailed, in-depth data rather than striving for statistical generalisability.

Methods for Collecting Data

The primary method of data collection involved semi-structured interviews. Semi-structured interviews offered flexibility, enabling the investigator to delve deeper into intriguing points

brought up by participants while ensuring that essential topics were addressed (Bryman, 2016). The interview questions aimed to draw insights into the participants' comprehension of generic green skills, their experiences integrating them into the curriculum, and their challenges. Each interview ranged from 60 to 90 minutes, conducted in person or through video conferencing, based on the participants' availability and preferences. All interviews were audio-recorded with the participant's consent to ensure data accuracy and detailed notes were taken during the interviews to capture non-verbal cues and other relevant contextual information.

Some of the guiding questions included:

- "What is your understanding of green skills, and how do they relate to the TVET curriculum?"
- "What methods are being employed to incorporate environmental competencies into the educational framework at your institution?"
- "What obstacles have you faced when integrating sustainable skills into your instructional methods?"

The semi-structured format enabled participants to elaborate on their responses and share comprehensive narratives of their experiences. Understanding the complexities of integrating green skills in TVET was essential.

Analysis of Data

The interview data underwent thematic analysis, a method commonly employed in qualitative studies to identify and interpret patterns or themes present within the data (Braun & Clarke, 2006). Thematic analysis was selected due to its adaptability and capacity to comprehend the data thoroughly. The initial phase of the study involved transcribing the interviews. The team then immersed themselves in the data by reviewing the transcripts several times, which aided in pinpointing recurring themes associated with green skills awareness, curriculum integration, and obstacles to implementation. The coding process involved inductive and deductive approaches: codes were generated inductively from the data. In contrast, deductive codes were established based on the existing literature regarding integrating green skills (Ramli et al., 2022).

After identifying the initial codes, they were organised into more prominent themes that reflected the study's main findings. The concluding themes underwent a thorough review and refinement to guarantee they faithfully reflected the data. The primary themes identified from the analysis included (1) insufficient awareness of environmentally sustainable skills, (2) obstacles to incorporating these skills into educational programs, (3) the practical technical emphasis of vocational training programs, and (4) the necessity for improved training for educators.

Ethical Considerations

Approval from the appropriate institutional review board was secured before data collection. All participants received comprehensive information regarding the study, encompassing its objectives, the data collection methodology, and their rights as participants. Before the interviews, consent was secured from each participant, ensuring that their responses would be kept confidential and that pseudonyms would be employed to safeguard their identities.

Findings

The thematic analysis of the interview data uncovered several significant insights regarding incorporating green skills into the TVET curriculum. The results are categorised into four primary themes: (1) insufficient awareness and comprehension of sustainable skills, (2) obstacles to incorporating these concepts into the curriculum, (3) the practical technical emphasis of vocational education programs, and (4) the necessity for improved training for educators.

Theme 1: Insufficient Awareness and Comprehension of Eco-Friendly Skills

An important theme from the interview was the limited awareness of green skills among educators and students. Various participants observed that even if they were familiar with broad ideas of sustainability, they needed to understand precisely green skills, including the generic green skills involved and the methods to convey them. Participant 1 said: "Sustainability is often discussed, but the right definition of Green skills or generic skills, especially in vocational education, is still elusive." Teaching something can be challenging if one does not have a complete understanding of the matter.

The absence of clarity has resulted in uneven incorporation of green skills throughout TVET institutions. Some educators have noted the inclusion of environmental education elements in their teaching practices; however, these initiatives frequently need a systematic approach to be integrated into a cohesive curriculum. This discovery corresponds with the current body of work, emphasising the necessity for more precise definitions and frameworks for incorporating green skills in TVET (Kaliappan & Hamid, 2021).

Theme 2: Obstacles to Curriculum Integration

The participants were aware of the various barriers to incorporating environmentally sustainable skills into the TVET curriculum, such as financial constraints, which are bound by curriculum delivery time, and institutional support that still needs to be improved. 3 participants expressed dissatisfaction about sufficient resources to revise the curriculum to incorporate the concept of sustainability:

"We are tasked with equipping students with essential skills for the future, yet we lack the necessary resources and support to fulfil this responsibility." The current curriculum must be more relevant, and funds must be allocated for updated materials or training opportunities. Several participants shared this perspective, highlighting that the curriculum frequently needs more flexibility to integrate new content, especially about broader competencies like environmental awareness. While significant, the current emphasis on technical skills in the labour market needs to pay more attention to integrating green skills (Ramli et al., 2022).

Theme 3: Practical Technical Emphasis of TVET

A notable discovery was the practical technical emphasis of TVET programs, favouring technical skills over broader competencies like sustainability. Participant 2 noted: "The primary objective of TVET is to cultivate graduates with strong technical skills." There needs to be more focus on instructing them in the sustainable application of these skills.

This finding highlights the significant challenge TVET institutions face globally, where the focus on practical, job-specific training frequently limits the opportunity to incorporate green skills

into the curriculum. Existing studies indicate that integrating sustainability into TVET necessitates a transformation in curriculum design and instructional methods (Ngadiman et al., 2017).

Theme 4: Necessity for Improved Training for Educators

All participants concurred on the urgent necessity for improved training for educators to facilitate the incorporation of green skills into the TVET curriculum. Many educators expressed that they needed to be equipped to teach sustainability concepts, citing insufficient professional development opportunities in this field. Participant 4 remarked: "I aspire to educate my students on sustainability, yet I am uncertain about the initial steps." More training and support are needed for educators to teach sustainable skills.

The absence of adequate training hinders educators from effectively incorporating green skills into their instruction, exacerbating the overarching problem of uneven curriculum execution. The participants emphasised the necessity for more organised professional development initiatives that concentrate specifically on teaching sustainability within vocational education (Yunus et al., 2024).

The thematic analysis identified several significant obstacles to incorporating green skills in TVET programs, such as educators needing more awareness, institutional limitations, and inadequate training opportunities. The results are encapsulated in Table 1, offering a comprehensive overview of the primary themes identified from the interviews and corroborating evidence drawn from participant quotes.

Table 1

Thematic Analysis of Findings: Barriers to Integrating Green Skills in TVET

Theme	Description	Supporting Quotes from Participants
Lack of Awareness and Exposure	Limited understanding of green skills among educators and students	"Many of my colleagues have less understanding of what generic green skills are, let alone how to teach them." (P1)
Barriers to Curriculum Integration	Financial constraints on implementing the program, time limits set in the curriculum, lack of resources and Institutional support	"We don't have the resources to update our curriculum... Right now, we less the budget." (P4)
Hands-On Technical Focus	Emphasis on technical proficiency with limited attention to sustainability	"The goal is to make sure the students are technically competent... There's limited space to talk about sustainability." (P3)
Need for Enhanced Educator Training	Lack of professional development and training for teachers in green skills	"I've never received any training on how to teach these skills, and institutions give priority to other things." (P1)
Low Preparedness of Graduates	Graduates lack readiness to address environmental challenges in the workforce	"Our graduates are technically proficient, But they still need to be prepared to think about how their work impacts the environment" (P3)

The findings from this study reveal several critical barriers to integrating green skills in Malaysia's TVET curriculum. These barriers include a need for more awareness among educators and students, financial constraints, the curriculum's rigid and technically focused nature, and insufficient training opportunities for educators. The result is a workforce that, while technically skilled, needs to be equipped to address the environmental challenges that will shape future jobs. The following section will discuss these findings in light of the existing literature and propose recommendations for overcoming these barriers.

Discussions

This study presents essential insights regarding the difficulties in incorporating green skills into Malaysia's Technical and Vocational Education and Training (TVET) curriculum. Given the increasing necessity for sustainability skills in the job market, inadequate preparation of students for green employment poses severe consequences for both the economy and the environment. This section will analyse the study's findings, juxtapose them with the current literature, and suggest approaches for addressing the identified barriers.

Insufficient Awareness and Comprehension of Sustainable Skills

A key finding from this study is the need for more awareness among educators regarding the definition of green skills and the appropriate methods for teaching these competencies. This aligns with earlier findings that emphasise the unclear characteristics of green skills and the

challenges educators encounter in converting them into actionable, teachable curriculum elements (Ramli et al., 2022). Green skills are diverse and complex, involving knowledge and practices that support sustainable development, including resource efficiency, waste management, and renewable energy technologies. Nonetheless, the individuals involved in this study hesitated regarding integrating these skills into their current teaching methodologies, pointing to an absence of definitive guidelines and training.

The results are consistent with the research conducted by Kaliappan and Hamid (2021), who contend that a significant obstacle to incorporating green skills into the curriculum is the need for a well-defined framework. Lacking a clear framework or defined learning objectives concerning green skills, educators find it challenging to integrate sustainability into their lessons meaningfully. This highlights the necessity of establishing national standards or guidelines that articulate green skills within the framework of TVET, offering educators the guidance required to impart these competencies effectively.

Moreover, the results of this study highlight the necessity of increasing awareness regarding green skills among educators and students. Prior studies indicate that awareness campaigns, workshops, and seminars may significantly enhance comprehension of the significance of sustainability in vocational education (Yunus et al., 2024). Integrating green skills into the educational discourse allows TVET institutions to transition from a narrow focus on technical training to a more comprehensive approach that prioritises sustainability as an essential competency.

Challenges to Curriculum Integration

Investigations reveal various critical barriers to incorporating eco-friendly skills into the TVET curriculum, such as financial limitations, inflexible curriculum, and inadequate institutional support. The results align with existing research on sustainability education, emphasising educational institutions' difficulties when integrating new materials into the predetermined curriculum (Ibrahim et al., 2020). What matters is the number of participants in this study expressed dissatisfaction with the inflexibility of the existing TVET curriculum, which emphasises technical skills at the expense of broader competencies such as environmental Awareness.

This finding illustrates the prevailing direction in vocational education, emphasising the importance of providing students with job-specific skills that align with the current demands of the labour market (Ngadiman et al., 2017). While technical proficiency is undoubtedly essential, the increasing focus on sustainability in manufacturing, construction, and energy requires a more comprehensive skill set that encompasses applying these technical skills to reduce environmental impact.

The individuals involved in this study highlighted the need for more institutional support as a significant obstacle to integrating the curriculum. With sufficient resources and financial support, it becomes easier for educators to refresh their teaching materials or participate in professional development initiatives centred on sustainability. This finding aligns with the work of Kamis et al (2018), who highlight that financial constraints represent a significant obstacle to integrating sustainability within TVET programs, especially in developing nations.

Overcoming these obstacles necessitates a unified approach from those in positions of authority, academic organisations, and leaders within the industry. A viable strategy is to offer financial incentives to TVET institutions that effectively incorporate green skills into their curricula. Furthermore, it would benefit the government to increase funding for professional development initiatives centred on sustainability, thereby equipping educators with the necessary knowledge and resources to effectively impart green skills. Figure 3 summarises the key barriers to integrating green skills in TVET, illustrating the interconnected challenges educators and institutions face. The obstacles include a deficiency in awareness, inadequate training for educators, and more extensive systemic challenges, like the curriculum's emphasis on practical application and financial limitations.

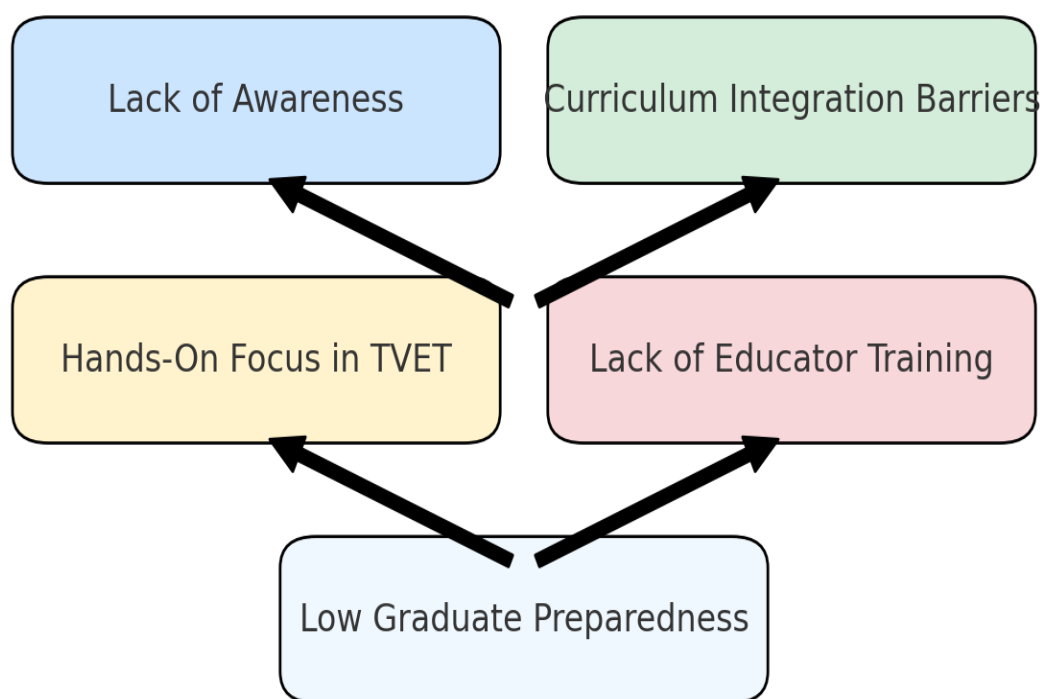


Figure 3: Barriers and Challenges to Integrating Green Skills in TVET

The Hands-On Focus of TVET

A significant discovery from this study is the difficulty presented by the practical technical emphasis of TVET programs. The participants highlighted that TVET has historically focused on practical, job-specific training, which limits the opportunity to integrate broader competencies like sustainability. This issue is prevalent globally in vocational education systems, where the main goal is to generate graduates ready for immediate employment in their selected fields (Abd Hamid et al., 2019).

As industries progressively adopt sustainable practices, the demand for individuals capable of utilising their technical skills in an environmentally responsible manner is becoming increasingly evident. The existing literature indicates that incorporating green skills into technical and vocational education and training necessitates a significant transformation in the approach to vocational education. Sustainability ought to be integrated into the core of technical education, allowing students to acquire the skills necessary to conduct their work in harmony with environmental objectives (Ramli et al., 2022).

This transition will necessitate modifications to the curriculum and the organisation and implementation of TVET programs. For instance, vocational institutions might integrate project-based learning that addresses sustainability issues, enabling students to utilise their technical skills in environmentally friendly contexts. This method has proven effective in various nations, where learners are engaged in creating solutions to sustainability challenges as a component of their education (Pavlova & Chen, 2019).

The necessity for improved training for educators surfaced as a key finding from this study. With sufficient training, educators may feel confident and competent in incorporating green skills into their instructional practices. The broader body of literature supports this finding, emphasising the significance of professional development in facilitating the effective incorporation of new competencies into educational curricula (Yunus et al., 2024). Many individuals involved in this study indicated a strong interest in enhanced training programs that specifically address sustainability teaching within the framework of TVET.

Training programs for educators that emphasise green skills should encompass both the theoretical foundations of sustainability and the practical implementation of these principles in vocational environments. For instance, training programs could be developed for educators to instruct students on implementing sustainable practices in sectors such as construction, automotive repair, and manufacturing, where environmental factors are gaining significance (Cabral & Dhar, 2019). These training programs may be implemented through collaborations with industry leaders and environmental organisations, guaranteeing that educators can access the most current knowledge and best practices in sustainability.

Furthermore, professional development opportunities must be available to all educators, irrespective of their geographical location or financial limitations. The government has the potential to significantly contribute to the funding of these initiatives, thereby guaranteeing that all TVET educators are afforded the chance to improve their skills and knowledge in this essential field.

Considerations for Policy and Implementation

The results of this study carry significant consequences for both policy and practice. At the policy level, more comprehensive national frameworks are necessary to delineate and encourage incorporating green skills into the TVET curriculum. The government has the potential to significantly influence the establishment of standards for environmentally friendly skills and offer financial assistance to institutions that effectively incorporate sustainability into their educational programs.

TVET institutions should adopt a more proactive stance in integrating green skills into their curricula. This will necessitate partnerships with leading figures in sustainability, guaranteeing that students acquire the skills most pertinent to the green economy. Furthermore, institutions must emphasise the importance of professional development for educators, equipping them with the necessary knowledge and resources to impart green skills effectively.

Conclusions

Incorporating sustainable skills into the Malaysian TVET curriculum is essential to equip students to cope with the challenges of a rapidly changing job market. However, these investigations have revealed various barriers to this integration, such as lack of awareness, financial limitations, curriculum that needs to be flexible, and Educator training that is constantly being improved. Facing these challenges requires a unified approach from those in influential positions, including policymakers, educators, and industry leaders.

By revising the curriculum to incorporate sustainable skills, providing focused professional development for educators, and enhancing collaborations with industry, Malaysia's TVET institutions can more effectively prepare graduates to engage in the nation's green economy. This initiative will contribute significantly to Malaysia's sustainability objectives while equipping its workforce for future employment opportunities.

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