A SURVEY OF FACILITY MANAGEMENT GREEN SKILLS COMPETENCY AMONG TVET EDUCATORS AND STUDENTS IN A PUBLIC UNIVERSITY IN MALAYSIA

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Abstract

Green skills are sometimes referred to as sustainable development skills because they are associated with technical skills, knowledge, values, and attitudes required in the workforce to produce and promote sustainable, social, economic, and environmental results in business, industries, and the community. Technical and Vocational Education and Training (TVET) plays an important role in promoting the development of a sustainable workforce by educating and training students through a more valuable sustainability-related curriculum, as well as contributing to the development of the Facility Management (FM) industry. The purpose of this study was to investigate the green skills competency of third- and final-year TVET undergraduate students and educators from a public university in Malaysia. Based on Pavlova's green skills competency and ecological modernization theory by Howes et al., this study constructs a conceptual framework. This study includes 40 Faculty of Technical and Vocational educators and 81 third- and final-year students from Engineering Technology, Agriculture, and Family and Consumer Science programmes. The data were collected using an online Google form. In this study, descriptive statistics such as frequency (f) and percentage (%) were used. Thematic analysis was also employed to categorise open-ended items. This study emphasises qualitative analysis findings to relate green skills competency of the respondents. The findings of this study reveal that the respondents' claims that they understood the green concept. They thought green skills as sustainability, green technology, recycling activities, and renewable energy. Most of the participants agreed that they possessed green knowledge and skills. They also stated the benefits of green technology which included creating sustainable environment, providing renewable energy, promoting recycling activities, saving operational costs, improving wellbeing, enhancing energy saving, providing more green jobs opportunities and encouraging the use of green materials. However, the most challenging barrier is inadequate facilities to support green skills related activities. Next, educators also highlighted the lack of proper green curriculum and the lecturers lack of motivation as the other barriers faced while teaching green skills. Finally, the respondents made suggestions to their institution on how to enhance green skills competency among TVET educators and students. They stated that educators should conduct seminar and training related to green skills to their students. Followed by need to restructure green curriculum, ensuring adequate resources are available, cultivating green attitude and ensuring policy is implemented at the institutional and national levels.

Keywords: *Green skills, Green Technology, TVET, Facility Management, Sustainable Development*

1. Introduction

Facility management (FM) is a multidisciplinary profession that integrates people, place, process, and technology to ensure the operation, comfort, safety, and efficiency of the physical environment (IFMA, 2022) [1]. Facilities Management has progressed from sustaining and adapting to the increasingly important job of contributing to work organisation productivity. This shift from the physical to the human aspect of the FM profession has occurred gradually over time, but as the cost of people, including recruiting, retention, and performance, rises, so does our influence on the firm (Michel, n.d.) [2]. The infrastructure of higher education institutions is defined as physical assets and facilities that directly contribute to the efficiency of the educational system's teaching and learning. Physical and non-physical facilities, as well as the surrounding environment, provide the institutions with the necessary structure and atmosphere for teaching and learning activities. Non-physical facilities include indoor air quality, acoustics, natural lighting, artificial lighting, temperature, ventilation, and cleanliness (Abdullahi & Yusoff, 2018) [3].

FM refers to the integration of processes within an organisation in order to maintain and develop agreed-upon services that support and improve the effectiveness of the organization's primary activities (IWFM, 2022) [4]. In summary, FM focuses on facility and consumer coordination requirements in order to meet standards. To ensure high-quality and effective FM, various disciplines such as engineering, architecture, business management, and behavioural science are required to achieve the best facilities management. As a result, being a facility manager is difficult because it requires a manager's abilities, competence, and extensive experience in managing and maintaining a facility (Isa et al., 2016) [5].

There are substantial advantages to green FM; moreover, this article focuses how green FM can monitor energy consumption while extending the life cycle of the building. Building maintenance can help to extend the life of the fabric, service, and structure of a building. A very well FM system has been installed in a building can save up to 15% of the structure's energy usage. In addition, the facility's expected life span will be increased. As a result, "green maintenance" has become an essential component of meeting sustainability initiatives (Keeping & Shiers, 1996) [6]. Simple cleaning and security services are unable to meet the market's demand for FM. The trend among stakeholders will be to provide more value-added solutions (Cant, 2004) [7].

Because of the growing governmental push towards sustainability, facility managers are expected to be in high demand. In 2020, 20,000 'green collar' PMETs, also known as professionals, managers, executives, and technicians, are expected will need training in green facility development, design, construction, operation, and maintenance (Sustainability, 2014) [8].

Malaysian production plants are innovating and becoming more inventive as automation systems are installed all across the manufacturing process. The FM system, power management, and other departments such as logistics, warehouse, quality, and maintenance will be linked to the production and manufacturing systems. Data can be transferred from one system to another, making manufacturing operations run more smoothly and efficiently. Furthermore, the production plant is globally connected via the Internet. As a result, control and monitoring may take place beyond the production plant, making smart factories more adaptable (Wang et al., 2016) [9]. The production line must be adaptable enough to the product it will produce (Weyer et al., 2015) [10]. The product

will be created using standard manufacturing procedures. Changes or updates to a product can be made quickly, and the entire manufacturing line does not need to be reconfigured.

TVET is a tool that enables to develop a long-term workforce. To address globalisation concerns such as climate change and other negative consequences, a workforce with sustainability ideals is required. Technical and vocational education is critical in educating students to be environmentally conscious through a more sustainability-related curriculum. As a result, green skills must be taught in TVET programmes. Malaysia's educational and training institutions must devise a strategy to inculcate a deep understanding of the importance of environmental preservation for everyone's well-being in the millennial population (Kamis et al., 2017) [11]. Greening an organization ensures the participation and collaboration of several key stakeholders and cannot be accomplished by a few dedicated individuals alone. Facility managers are among the relevant internal stakeholders who should be kept up to date on the TVET institution's greening initiatives on a regular basis because they can help or hinder the process to some extent. They must be applicable and relevant to the greening system (Mertineit & Huyen, 2016) [12].

The green paradigm is critical in work and life in the twenty-first century (Ramlee et al., 2019) [13]. The United Nations has established several international agendas and programmes, such as the Sustainable Development Goals and the Millennium Development Goals, to conserve and sustain the world. To achieve its goals, the 2030 Agenda for Sustainable Development, as well as the 17 Sustainable Development Goals (SDGs) adopted by the United Nations (UN) through member countries in 2015, place a strong emphasis on education and training (United Nations, 2015) [14]. The Sustainable Development Goals went into effect on January 1, 2016. They demand that measures be taken to promote prosperity and progress. At the same time, the environment is being safeguarded. Various social demands, such as education, health, social protection, and job opportunities, are being met while combating climate change and conserving the environment and reducing poverty through economic growth. The UNESCO Technical and Vocational Education and Training (TVET) strategy aims to assist member countries in transitioning to more sustainable communities and economies (UNESCO, 2016) [15].

As a substantial provider of skilled labour, TVET is responsible for incorporating green skills into teaching and learning practises in order to achieve a more sustainable future (Pavlova, 2014). Thus, according Pavlova (2014) [16], the need to address global issues such as climate change and carbon emissions, environmental degradation and pollution, health, and poverty requires developed countries to embrace innovation-driven growth initiatives, which TVET should promote. Economic gains from green restructuring should be accompanied by human capital development that has a significant impact on skills. Table 1 illustrates the targets for developing general green skills by delving seventeen SDGs into the ten SDGs (UNEVOC Network, 2019) [17].

TABLE 1 TEN SDGS IN BUILDING GREEN SKILLS

SDG	Goals
6	Clean Water and Sanitation
7	Affordable and Clean Energy
8	Decent work and economic growth
9	Industry, Innovation, and Infrastructure
11	Sustainable Cities and Communities
12	Responsible Consumption and Production
13	Climate Action

14	Life Below Water
15	Life on Land
16	Peace, Justice and Strong Institutions

Source: UNEVOC Network (2019)

UNESCO formally announced its TVET Strategy 2016-2021 on World Youth Skills Day, July 15, 2016, in Bonn. The plan takes into account the Education 2030 Framework for Action (FAA) for achieving SDG4, which focuses to mobilise all countries and partners around SDG4, its targets and provides solutions for implementing, coordinating, financing, and monitoring SDG4 (UNEVOC Network, 2019) [17]. The strategy supports UNESCO Member States' efforts to improve the relevance of their TVET systems in order to provide all youth and adults with the skills required for the job, stable employment, enterprise development, and continuous learning, as well as significantly contribute to the successful implementation of the 2030 Agenda for Sustainable Development. Suggestions for how countries can develop contextually relevant plans that take into account diverse national realities, capacities, and levels of development while remaining true to national goals and priorities (UNESCO, 2016) [15]. UNESCO could help to accelerate the transition to green economies and sustainable humanities by promoting green skills as one of the priority areas depicted in Figure 1.
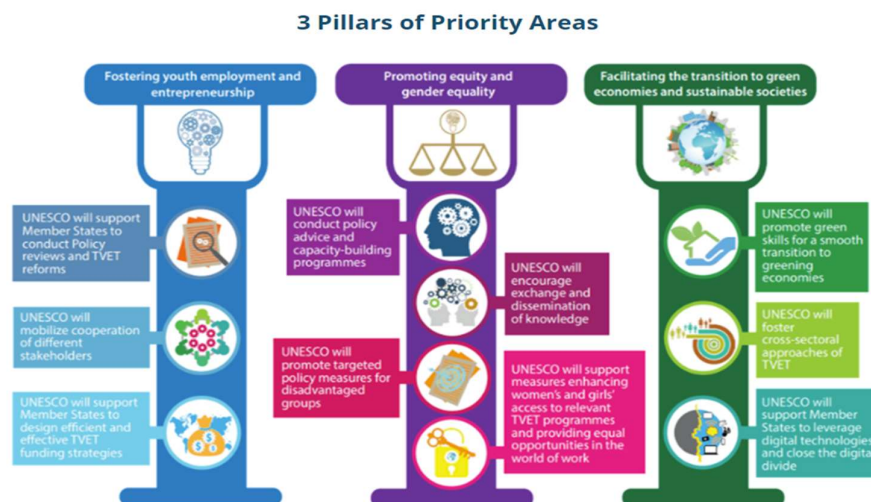

Figure 1. Three Pillars of Priority Areas for UNESCO Strategy for Technical and Vocational Education and Training (TVET) 2016-2021. *Source:* UNESCO (2016)

Centres of Vocational Excellence (CoVEs) are excellent hubs for training in specific sectors, from foundation training for novices to ongoing up-skilling and re-skilling for experienced workers. The centres, which operate locally and have regional solid innovation ecosystems, provide flexible and timely training to meet current industry requirements, acting as motivators for local company investment while ensuring a stable supply of competent employees. Furthermore, CoVEs provide business information and act as innovation hubs to support their trainees' entrepreneurial initiatives, particularly in Small and Medium Enterprises (SMEs). Excellence in vocational education and training (VET) confirms high-quality skills and competencies in committing to well-paying jobs and long-term opportunities that meet the requirements of a diverse, innovative, and

sustainable economy (European Commission, 2021) [18]. Learners can obtain vocational and vital capabilities through high-quality education by engaging in research, teaching, innovation, and collaboration with other educational, training, and industry sectors. Client satisfaction, the establishment of creative workplace collaborations, and the enhancement of continuous professional development of teaching and training personnel, innovative teaching techniques, mobility, and globalization initiatives all contribute to these efforts.

Green economy invention and urban greening of Three-Level Centres of Professional Excellence (3LoE) led by Hanse-Parlament in Germany, collaborated with Austria, Italy, Latvia, Lithuania, Poland, Spain, and associated with 60 European Union nations, emphasises the broad provision of green skills focusing on energy, climate, and environmental protection. The 3LoE strengthens CoVEs' green economies by implementing a wide range of green economies through digitalization, entrepreneurship, VET, and higher education initiatives. The primary goals are to continuously improve skills, ensure demand for early adopters and entrepreneurs, and boost SMEs' competitiveness in the green economy. By implementing dual vocational training between learning sites in businesses and centres, qualified and innovative SMEs achieve energy savings, renewable energy use, and environmental and climate protection in their industrial practises. As a result, long-term sustainable collaboration between CoVEs and SMEs increases the quantity and value of young entrepreneurs' practical activities while also improving the skills of SME experts and managers in applying green economy practises and promoting green economy entrepreneurship through secured business startups and transfers (3LoE, 2021) [19].

Since 2009, KeTTHA in Malaysia has strategized Green Technology Master Plan 2017-2030 by addressing numerous efforts that have demonstrated green technology can help decouple green economic growth from natural capital depletion. Figure 2 depicts the GDP contribution generated by adopting and implementing green technology-based practises, systems, and goods. The Green Technology Master Plan (GTMP) (2017-2030) concentrated on four key areas. The first step is for governments to develop green procurement policies and to examine all aspects of their operations for opportunities to implement green technology-based processes, systems, and items. The second step is to implement targeted programmes that encourage informed purchasing decisions based on increased environmental awareness via the use of green technologies. The third aspect emphasises R & D & C, which will shift Malaysia away from adopting and adapting non-domestic technology and towards establishing its global technical innovation. The fourth approach emphasised human capital development in order to achieve innovation and excellence in green economic expansion (KeTTHA, 2017) [20].
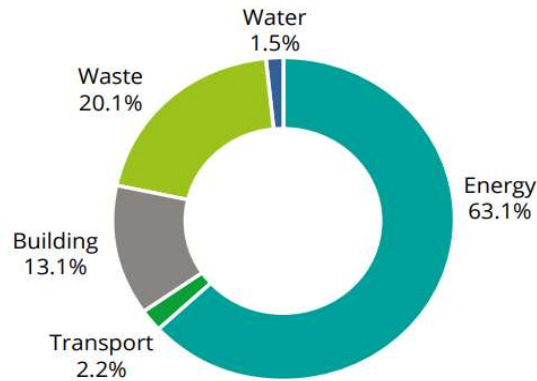
Figure 2. Contribution of Green Technology (by sector) to GDP in 2013. *Source:* KeTTHA (2017)

From 2011 to 2015, the Tenth Malaysia Plan (10th MP) would prioritise 12 National Key Economic Areas (NKEAs) with high income potential. The government introduced the AFFIRM framework of Awareness, Faculty, Finance, Infrastructure, Research, and Marketing during the 10th MP. It emphasised the government's holistic ecosystem development strategy for environmental sustainability. This framework concept emphasises the importance of all Malaysians recognising environmental protection and conservation as a shared responsibility on how the Twelfth Malaysia Plan 2021-2025 (12th MP) prioritised critical areas for environmental sustainability (The Edge Market, 2021) [21]. The 12MP is organised around three key goals: (a) resetting the economy, (b) strengthening security, and (c) wellbeing and inclusion, with four policy enablers addressed: nurturing future talent, increasing technology adoption and innovation, improving connectivity and transportation infrastructure, and reinforcing government while accepting the new benchmark.

Green skills are the basis of the green transition and the key to unlocking the human capital required to successfully move it forward. More opportunities for those with green expertise, on the other hand, are required. Employees who do not possess green skills must be retrained. As a result, green skills should be included in 21st-century skill sets for current and future generations (Kamis et al., 2016) [22]. Greener jobs necessitate the acquisition of greener skills. LinkedIn's new green skill taxonomy can quantify the extent to which different countries, sectors, and jobs use current and recent evolution of green skills, known as green skill intensity, in meeting demand and developing supply in each sector and country. In 2019, the tide shifted in favour of green workers, with green hiring rates outperforming overall hiring rates in the majority of economies around the world, implying that green workers were hired at a higher rate than non-green workers globally. Simultaneously, the proportion of green talents in the global workforce has increased from 9.6 percent in 2015 to 13.3 percent in 2021, with a 6% annual growth rate and a 38 percent cumulative growth rate (LinkedIn, 2022) [23].

TVET stands for Technical and Vocational Education and Training and is administered by the Malaysian Ministry of Education. TVET is an educational and training platform that prepares candidates for the real world of work and exposes them to competent employability skills through practical, psychomotor, and industrial exposure. By integrating knowledge technological advancement and meeting global employability mobility, TVET contributes to the country's economic growth (Ismail et al., 2021) [24].

Green skills are the abilities required to participate in the green economy by creating new and innovative occupations with specific skill profiles, qualifications, and training frameworks, modifying current jobs to include green experience, and participating in multiple positions that can incorporate green skills and green technology in R&D.

The 11th Malaysia Plan (11MP) is commendable and a step in the right direction by proposing that TVET become a dual-track system equivalent to an academic pathway through the Malaysian Qualification Framework, while also increasing the efficiency and effectiveness of TVET in meeting industry demand now and in the future (Da Wan et al., 2018) [25]. Green skills can be integrated into occupational competencies such as engineering, technology, science, maintenance, repair, operation (MRO) management, monitoring, and other relevant fields, according to Vona et al. (2015) [26]. Table 2 shows data on green occupations classified by greenness level, which helps determine the importance of green skills within each profession. Vona et al. (2015) [26] also emphasised the importance of a comprehensive set of green skills to supplement green jobs and educational programmes. As shown in Table 2, TVET is critical in this regard.

TABLE 2 GREEN OCCUPATIONS BY LEVEL OF GREENNESS

Occupations Category	Level of greenness equals to 1	Level of greenness greater than 0.5 and equals 0.3	Level of greenness lesser than 0.3
Green enriched occupations	Environmental Engineers and Technicians, Hazardous Material Removers	Engineers in Aerospace Technology, Atmospheric Scientists, Automotive Technicians, Roofers	Construction workers, Maintenance & Repair Workers, Inspectors, Marketing Functional Managers
Innovative green occupations	Wind Energy Engineers and Technicians, Fuel Cell Technicians, Coordinators in Recycling Centre	Supply Chain Managers, Biochemical Engineers, Technicians in Precision Agriculture	Occupations related to Traditional Engineering, Transportation Organizers, Safety and Compliance Managers

Source: Green Skills (Vona et al., 2015)

Green technology includes environmentally friendly solutions that set new usability and sustainability standards, as well as improved physical and financial efficiency when compared to traditional businesses, and incorporates green functions for long-term business survival (United Nations, 2019) [28]. Green technology adaptation includes industrial emissions reduction, recycling activities, wastewater management and treatment, self-sufficient buildings, converting waste particles to energy, wave energy generation, hybrid vehicles, solar energy application, vertical gardens and farms, and natural gas boilers. Green technology innovation gives us the best chance of mitigating the effects of climate change and pollution. Natural resources are limited; in many cases, the majority of the resources have been depleted or consumed. These resources are divided into two categories: renewable energy and non-renewable energy. Non-renewable sources of energy include nuclear, natural gas, fuel, coal, and hydrogen. Hydro, wind, geothermal, and biomass are examples of renewable energy sources that have enormous potential to be used as limitless resources to improve our quality of life (Koh & Ammar, 2019) [28].

Kamis et al. (2017) conducted a study that emphasised the importance of incorporating green skills and green technology into TVET programmes to contribute to sustainable development. Green skills and technology provide competent labour that can

act as a sustainable development agent by protecting and conserving environmental, economic, and social activities for skilled workforce development. Pavlova (2018) [29] emphasised the importance of implementing green skills and technology in the TVET system and skill development in response to government policy, reducing climate change, and providing new employment opportunities for novice workers. As a result, TVET programmes interact with green skills integration and green technology by exploring the skill set required for sustainable development by establishing, sustaining, adapting, and implementing new environmental industries, services, and practises in the context of developing a holistic approach.

According to Mustapha (2015) [30], the issues of green economic integration can be overcome by evolving TVET in Asia by developing the green mindset, green financial, green training, green education, green lifestyle, green sustainability, and green employability by ensuring that countries' policies, best practises, and limitations are corrected and resolved for continuous business, industry, and social development. Ramli et al. (2018) [31] agreed with Mustapha's research on the importance of incorporating green skills for sustainable development by emphasising green technology. During the fourth industrial revolution, competent individuals, green economic education and skills, and social and environmental factors were ideal. TVET is critical in promoting the development of a sustainable workforce by educating and training students through a more fantastic sustainability-related curriculum. In order to achieve the fourth industrial revolution, these efforts must also combat poverty and promote equitable economic growth.

Thirupathy and Mustapha (2020) [32] argue that understanding our actions towards the environment necessitates a high level of awareness. Students must be educated on the negative effects of irresponsible behaviour on the environment. Environmental sustainability beliefs and skills should be taught together so that educational institutions can produce employees who are more than just knowledgeable. Yeung (2015) [33] discussed how positive mindset can improve students' positive thinking and transversal competence as part of their lifelong learning skills. As a result, this study identifies the mindset and awareness of TVET students and educators in a public higher education institution regarding green skills.

Furthermore, green attitudes are being identified in this study. Green attitudes, according to Samarasinghe (2015) [34], are individuals' intentions to apply norms related to green skills in the form of encouragement, attention, response, resources, and relevant aspects. This study determines the green skills competency of TVET students and educators, in addition to their green attitudes. According to Jordan et al. (2012) [35], if implemented effectively, competency-based education can improve quality and consistency, reduce costs, shorten the time required to graduate, and provide accurate assessments of student learning and educators' teaching. Green competencies, according to Cabral and Dhar (2020) [36], are a comprehensive construct that includes green knowledge, skills, abilities, attitudes, behaviours, and awareness.

Majumdar (2010) [37] identified five dimensions for greening the TVET framework through green elements at the institutional level. Greening TVET is regarded as one of the holistic frameworks for a smooth transition of the TVET sector to a sustainable and low-carbon environment. A proposed framework based on five green elements is intended to embed concepts of sustainable development in TVET institutions (Setiawan, 2017) [38]. Green campus, green curriculum, green research, green community, and green culture are the five elements. These five elements align with this study in determining

green elements in the TVET curriculum based on the perspectives of TVET students and educators.

The purpose of this study is to identify green skills competency among Agriculture, Engineering Technology, and Family and Consumer Sciences students and educators in a public higher education institution as a case study. Green skills constructs derived from this case study include mindset and awareness, attitude, competency, green elements in the TVET curriculum, green integration during teaching practice, and competency in green technology. As an initial study, this case study is carried out in a public higher educational institution. The findings of this study are expected to provide guidance for future in-depth and extensive research.

Purpose and Objectives of the Study
This study aims to identify the green skills competency among TVET educators and students in a public higher educational institution. Specifically, the objectives of this study are as follows:
RO1: To identify the respondents' ideas about green skills and green technology.
RO2: To identify barriers faced while engaging in teaching and learning green skills.
RO3: To provide suggestions to enhance green skills competency among respondents.

Research Questions
Several issues were identified through this case study related to green skills competency among Agriculture, Engineering Technology and Family and Consumer Sciences programmes in Faculty of Technical and Vocational students and educators in a public higher educational institution's Faculty of Technical and Vocational. The issues examined are as the following:
RQ1: What are the respondents' ideas about green skills and green technology?
RQ2: What are the barriers faced while engaging in teaching and learning green skills?
RQ3: What are the suggestions to enhance green skills competency among respondents?
Conceptual Framework
The purpose of this study is to identify green skills competency among TVET educators and students from a selected higher educational institution's Faculty of Technical and Vocational Agriculture, Engineering Technology, and Family and Consumer Sciences programmes. The conceptual framework of the study is developed using relevant theories and models. The green skills competency (Pavlova, 2017) [39] and ecological modernization theory (Howes et al., 2010) are used as theoretical frameworks in this study. According to Pavlova (2017) [39], integrating TVET education with the nature of green skills/competencies contends the development of the green economy. Many regions and countries see significant holistic integration of the environment and development recognition as a future-oriented approach. As a result, green skills should be considered essential competencies for inclusion in TVET education. It is critical to place a special emphasis on developing values and attitudes in order to achieve greening. As a result, competence-based training should be broadened on occasion. Individuals and societies could improve students' general understanding of environmental concerns and develop their readiness for green restructuring if vocational and professional education programmes were realigned to meet the current and future demands of a greener economy.

According to Abd Hamid et al. (2019) [40], when most people hear the word "green," they immediately think of the environment and exhibit generic green skills and actions.

Unlike generic skills, generic green skills have received little attention. Higher education students regard education as the most exemplary medium for sharing knowledge, experience, awareness, and practise of general green skills. Generic green skills are additional skills that focus on protecting, conserving, and sustaining a beautiful environment, in addition to the generic skills that have already been established. Through teaching and learning practises, general green skills will be instilled in future manpower employability, particularly in the green labour marketplace. Educators and students in higher education must be aware of generic green skills and be able to apply them effectively. More research is required to identify more specifics and explicit general green skills implementation concepts among educators and university students.

Howes et al. (2010) [41] emphasised ecological modernization theory (EM), which states that economic development can be separated from environmental impact through a variety of technological and institutional innovations. As a result, EM is a significant theory chosen for the study due to its significant impact on environmental policy, planning, and management systems in many industrialised nations over the previous two decades. EM transforms science and technology by serving as both a cause and a solution to environmental problems. These innovations can be realised by replacing polluting materials with more sustainable alternatives, improving resource use effectiveness through waste and recycling minimization, and shifting the proportion of production away from resource-intensive and towards those that cause less environmental damage. The goal is to incorporate community feedback mechanisms into institutions' power in order to better connect decision-makers with communities. EM has three major advantages. The first is to promote a more holistic approach to environmental concerns by conceptually linking ecological goals with other policy domains. Second, EM helps to achieve the widely acknowledged policy goal of sustainable development. Third, it may create change initiatives that positively engage with the power of existing institutions.

As a result, the main construct in this study was green skills competency for TVET students and educators. Green skills mindset and awareness, green attitude, competency in saving/alternative energy, water conservation, 3R waste management skills, green curriculum, green landscaping skills and energy-saving technologies, green elements in TVET curriculum, green integration during teaching practise, and competency in green technology are all part of this competency. Demographic factors such as age, gender, respondents' category, and programmes were selected.

2. Methods

In this study, third- and fourth-year undergraduate students and teachers from the Engineering Technology, Agriculture, and Family and Consumer Science programmes in the Faculty of Technical and Vocational of a public university were assessed for their proficiency in green skills.

The research design used in this study is a case research method in single side and multiple cases. A case study is an empirical investigation that examines a current phenomenon within its actual setting, particularly when the distinctions between phenomenon and setting depend on several sources of information. This definition was provided by Yin (1994) [42]. As Yin pointed out, if someone wants to purposefully analyse contextual conditions, they should employ a case study technique. A case study, according to Gomm, Hammersley, and Foster (2000) [43], is research that examines a small number of cases in great detail.

Cherry (2020) [44] asserts that a case study focuses on the factual or opinion information of respondents and is a generally regarded method for gathering information and describing the existence of a phenomenon. The architecture of the case study makes it possible to collect a lot of data quickly. Through this design, data about demographics, experiences, views, and hypothetical situation can be gathered. A questionnaire is used in this study as an instrument to gather pertinent information regarding green skills competency. In addition, open-ended questions were embedded at the end of the questionnaire.

The open-ended questions typically focus on "how or why" a phenomenon occurred in a real-life setting. According to Jones et al. (2013) [47], the instrument used to collect the data should take into account the qualitative aspect.

The respondents in this study consisted of two groups. A group of 81 third- and fourth-year undergraduate students were chosen from the Engineering Technology, Agriculture, and Family and Consumer Science programmes and 40 educators were selected.

There are ten open-ended questions in this part designed to elicit information about the respondents' suggestions regarding green skills competency. Respondents must express their suggestions by answering the open-ended questions from No. 94 to No. 103. Table 3 lists the ten open-ended questions developed in this part. Open-ended items were categorized by using the thematic analysis technique. The results are tabulated in table form using frequency, percentage, mean, and standard deviation. Braun and Clarke (2006) [54] used theme analysis to evaluate open-ended data. Section C contained open-ended items meant to study students' and educators' ideas about green skills and green technology

TABLE 1 DISTRIBUTION OF THE QUESTIONNAIRE ITEMS IN SECTION C

No.	Item
94.	Provide a brief definition of green skills according to your knowledge.
95.	Have you ever attended any course/seminar/training about green skills?
96.	How would you rate your green knowledge?
97.	How would you rate your green skills competency?
98.	List 3 benefits of green technology.
99.	List 3 benefits of green skills competency among TVET students.
100.	List 3 barriers you have faced while teaching green skills in your institution.
101.	Provide 3 suggestions to your institution to enhance green skills competency among TVET educators.
102.	Provide 3 suggestions to your institution to enhance green skill competency among TVET students.
103.	State any commands related to this survey (if any).

3. Results and Analysis

Ten open-ended questions have been constructed in this study. Discussion in this chapter was based on several themes derived from the students' and educators' answers to the open-ended items in the questions based on thematic analysis.

Following the thematic analysis, nine themes for the first open-ended item had been identified. Braun and Clarke (2006) [54] mentioned that thematic analysis was used to categorized the results of the open-ended items. The following tables display the responses of 81 students and 40 educators to open-ended questions on the definition of green skills. As indicated in Table 4, the qualitative data from the first open item may be divided into six themes namely sustainability, knowledge of green technology, recycling

activities, knowledge of green jobs, non-renewable and non-renewable resources and green curriculum.

TABLE 4 OPEN-ENDED ITEM ABOUT MEANING/DEFINITION OF GREEN SKILLS (STUDENTS)

Item	Theme	Frequency (f)
Provide a brief definition of green skills according to your knowledge	Sustainability of economy, environment and human activities	26
	Knowledge of Green Technology	24
	Recycling activities	16
	Knowledge of Green Jobs	7
	Renewable and non-renewable resources	2
	Green Curriculum	1

Brief definition of green skills according to educators' knowledge is presented through Table 5. Six themes were extracted from the definition provided, namely promoting environmental sustainability as the highest frequency, enhancing quality of life, encouraging recycling, related to green technology, opportunities to engage in green jobs and associated with renewable energy, green products, research and development as the least obtained.

TABLE 5 OPEN-ENDED ITEM ABOUT MEANING/DEFINITION OF GREEN SKILLS EDUCATORS)

Item	Theme	Frequency (f)
Provide a brief definition of green skills according to your knowledge	Promote environmental sustainability	15
	Enhances quality of life	10
	Promotes recycling	7
	Related to green technology	7
	Opportunities of engaging in Green Jobs	3
	Related to renewable energy, green products and, research and development	2

The next item required students to response regarding their engagement in course/seminar/training about green skills. Figure 4 shows that only 21 percent of the educators attended course/seminar/training about green skills. Large group of students, 79 percent of the them are yet to attend course/seminar/training.
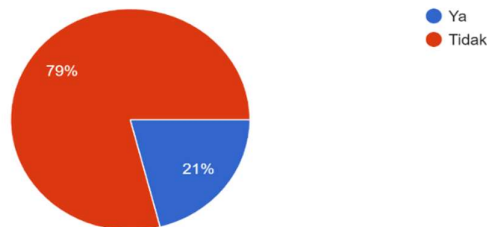

Figure 4. Percentage of students engaged in courses/seminar/training about green skills.

Figure 5 shows that 37.5 percent of the educators attended course/seminar/training about green skills. However, another 62.5 percent of the educators are yet to attend course/seminar/training.
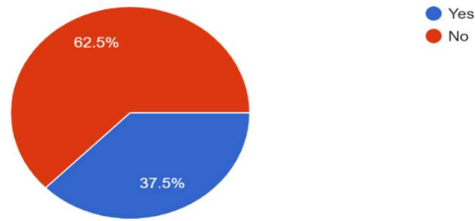
Figure 5. Percentage of educators engaged in courses/seminar/training about green skills.

Figure 6 shows that 7.4 percent of students rated very good, 69.1 percent of students had rated good, 21 percent rated poor and 2.5 percent very poor on their green skills knowledge. Majority of the students acquired good knowledge in average regarding green skills knowledge.
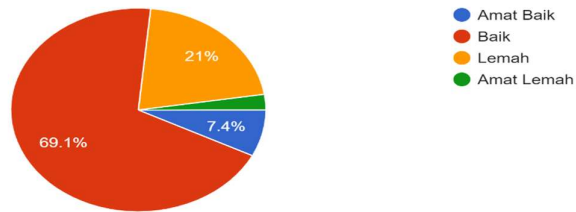

Figure 6. Percentage of students rating their green knowledge.

Whereby, Figure 7 shows that 15 percent of educators rated very good, 52.5 percent had rated good, 25 percent rated poor and 7.5 percent very poor on their green skills knowledge. Majority of the students acquired good knowledge in average regarding green skills knowledge.
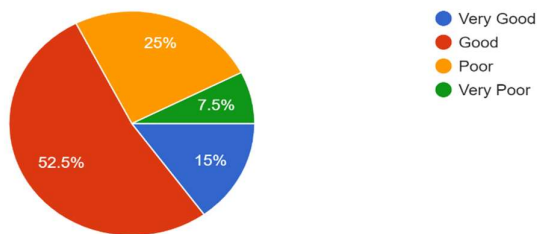
Figure 7. Percentage of educators rating their green knowledge.

Figure 8 presents students rate about their green skills competency. From the chart, 6.2 percent of students possess very good green skills competency. Majority of the students rated they possess good green skills competency which recorded 72.8 percent. Only 19.8 percent of students are poor and 1.2 percent very poor in green skills competency.

Apakah tahap kompetensi kemahiran hijau anda?
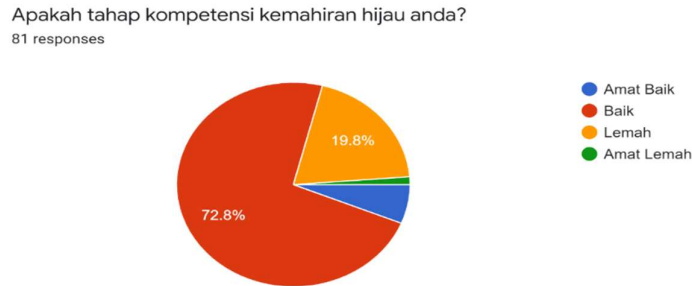81 responses

Figure 8. Percentage of students rating their green skills competency.

Figure 9 indicates educators rating on their green skills competency with 2.5 percent possess very good competency. There are 47.5 percent of educator good in green skills competency, 40 percent poor and 10 percent very poor.

How would you rate your green skills competency?
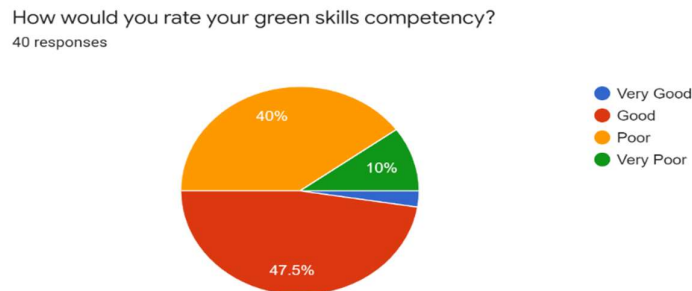40 responses

Figure 9. Percentage of educators rating their green skills competency

Table 6 shows the benefits of green technology are divided into six themes namely promoting sustainable environment, encouraging recycling activities, enables energy saving, promoting quality of life, green technology adoption and promoting green economy. As each student had to provide three benefits, frequency of the promoting sustainable environment seems to be the highest.

TABLE 6. OPEN-ENDED ITEM ABOUT BENEFITS OF GREEN TECHNOLOGY (STUDENTS)

Item	Theme	Frequency (f)
List 3 benefits of green technology	Promoting sustainable environment	73
	Encouraging recycling activities	38
	Enables energy saving	37
	Promoting quality of life	32
	Green technology adoption	32
	Promoting green economy	5

Table 7 highlights about the benefits of green technology responded by the educators. There are eight themes derived, namely managing and maintaining sustainable environment, relate with renewable energy, promoting recycling activities, saving operational costs, improving wellbeing, enhancing energy saving, providing more green jobs opportunities and encouraging use of green materials. Each educator had to provide three benefits, hence, the frequency of managing and maintaining environment had been prioritized.

TABLE 7 OPEN-ENDED ITEM ABOUT BENEFITS OF GREEN TECHNOLOGY (EDUCATORS)

Item	Theme	Frequency (f)
List 3 benefits of green technology	Manage and maintain sustainable environment	21
	Related to renewable energy	9
	Promotes recycling activities	8
	Saves operational cost	7
	Promotes well being	7
	Promotes energy savings	5
	Green job opportunities	5
	Encourages use of green material	2

Based on Table 8, seven themes were derived related to benefits of green skills competency among students. The themes are green related research and development, promoting wellbeing, sustainable green technology, green elements integration in students' educational activities, new product development through recycling activities, renewable energy adoption to save energy and future green job skills set. Students had highlighted the green related research and development are the most essential benefit of green skills competency.

TABLE 8 OPEN-ENDED ITEM ABOUT BENEFITS OF GREEN SKILLS COMPETENCY AMONG STUDENTS (STUDENTS)

Item	Theme	Frequency (f)
List 3 benefits of green skills competency among students	Green related research and development	59
	Promoting wellbeing	41
	Sustainable green technology	36
	Green elements integration in students' educational activities	25
	New product development through recycling activities	24
	Renewable energy adoption to save energy	22
	Future green job skills set	12

As for Table 9, educators responded for open-ended item about listing three benefits of green skills competency among TVET students and six themes were derived from the responses. The themes are enhancing green knowledge as the most popular benefit among educators. Followed by preparing students for green jobs opportunities, fostering awareness and practices in green skills, promoting recycling activities, adopting value added technology and encouraging cost saving operations toward sustainable environment as the least important benefit.

TABLE 9 OPEN-ENDED ITEM ABOUT BENEFITS OF GREEN SKILLS COMPETENCY AMONG
STUDENTS (EDUCATORS)

Item	Theme	Frequency (f)
List 3 benefits of green skills competency among TVET students	Enhance green knowledge	17
	Preparing students for green jobs	13
	Foster awareness and practice in green skills	9
	Promotes recycling	5
	Adopt value added technology	3
	Encourages cost saving operations towards sustainable environment	2

Table 10 presents barriers faced by students while learning green skills in the faculty. Five themes were classified namely, lack of educators to deliver green skills related curriculum, inadequate infrastructure to support green skills related activities, training needs to uplift green skills competency, financial issues in carrying out green skills related activities and lack of motivation engaging in green skills related activities. Majority students indicated that lack of educators to deliver green skills related curriculum as the most critical barrier faced while learning green skills in the faculty.

TABLE 10 OPEN-ENDED ITEM ABOUT BARRIERS FACED WHILE LEARNING GREEN SKILLS
IN THE FACULTY (STUDENTS)

Item	Theme	Frequency (f)
List 3 barriers faced while learning green skills in the faculty	Lack of educators to deliver green skills related curriculum	51
	Inadequate infrastructure to support green skills related activities	48
	Training needs to uplift green skills competency	48
	Financial issues in carrying out green skills related activities	12
	Lack of motivation engaging in green skills related activities	9

Educators listed three barriers faced while teaching green skills in their institution, shown in Table 11. Four themes were derived with the most challenging barrier is inadequate facilities to support green skills related activities. Next, educators also highlighted lack of knowledge about green skills as the second challenging factor. Educators further listed need to emphasize on practical knowledge and lack of motivation as the other barriers faced while teaching green skills.

TABLE 11 OPEN-ENDED ITEM ABOUT BARRIERS FACED WHILE LEARNING GREEN
SKILLS IN THE FACULTY (EDUCATORS)

Item	Theme	Frequency (f)
List 3 barriers faced while teaching green skills in your institution	Inadequate facilities to support green skills related activities	22
	Lack of knowledge in green skills	21
	Need to emphasize on practical knowledge	6
	Lack of motivation	4

According to Table 12, several suggestions were provided by students for the institution to enhance green skills competency. Six themes were categorized include should provide more green skills related training, promote green related activities and curriculum, engage students in green related real-life job-related practical learning, provide adequate infrastructure for green skills learning, involve relevant stakeholders in uplifting green skills competency and promote green technology utilization. Among the themes, students had highlighted the need for green skills related training to enhance green skills competency.

TABLE 12 OPEN-ENDED ITEM ABOUT SUGGESTIONS TO INSTITUTION TO ENHANCE
GREEN SKILLS COMPETENCY (STUDENTS)

Item	Theme	Frequency (f)
Provide 3 suggestions to your institution to enhance green skills competency	Should provide more green skills related training	59
	Should promote green related activities and curriculum	43
	Should engage students in green related real-life job-related practical learning	33
	Should provide adequate infrastructure for green skills learning	30
	Should involve relevant stakeholders in uplifting green skills competency	21
	Should promote green technology utilization	8

Table 13 highlights suggestions made by educators to the institution to enhance green skills competency among TVET educators and students. Five themes were classified. The educators had emphasized on the need to conduct seminar and training related to green skills as the top suggestion. Followed by need to restructure green curriculum, ensuring adequate resources are available, cultivating green attitude and ensuring policy is implemented in institutional and national level.

TABLE 13 OPEN-ENDED ITEM ABOUT SUGGESTIONS TO INSTITUTION TO ENHANCE
GREEN SKILLS COMPETENCY (EDUCATORS)

Item	Theme	Frequency (f)
Provide 3 suggestions to your institution to enhance green skills competency among TVET educators and students	Emphasizing on seminar and training	24
	Need to restructure green curriculum	15
	Ensure adequate resources are available	7
	Cultivate green attitude	6
	Ensure policy is implemented in institutional and national level	6

Table 14 shows the final open-ended item which had made the students to provide any other related comments about this survey. Two themes only were classified, namely need to have a specific platform for students to lift up their green skills and green technology competency with the highest frequency. Followed by the need to create a new curriculum to expose and train students with green skills and green technology related TVET practical knowledge, related to this survey.

TABLE 14 OPEN-ENDED ITEM ABOUT ANY COMMENTS ABOUT THIS SURVEY (STUDENTS)

Item	Theme	Frequency (f)
State any comments related to this survey (if any)	Need to have a specific platform for students to lift up their green skills and green technology competency	5
	Need to create a new curriculum to expose and train students with green skills and green technology related TVET practical knowledge	4

Table 15 shows additional comments provided by the educators pertaining to this survey. Two themes were categorized with the most frequently highlighted comment is about the need for emphasizing on green knowledge and practices, followed by comment about greening TVET and awareness creating pertaining to green skills competency.

TABLE 15 OPEN-ENDED ITEM ABOUT ANY COMMENTS ABOUT THIS SURVEY (EDUCATORS)

Item	Theme	Frequency (f)
State any comments related to this survey (if any)	Emphasizing on green knowledge and practices	8
	Comment about greening TVET and awareness creation	5

Open-ended questions were analyzed through thematic analysis and the findings has been reported through the tables for students and educators accordingly. Based on the thematic analysis, students had highlighted that promoting sustainable economy with environmentally friendly intervention as the most important aspect of green skills competency. Besides that, they also indicated the importance of engaging in recycling activities, enabling energy saving and improvisation of wellbeing. Educators had emphasized on enhancing green knowledge, manage and maintain sustainable environment and preparing students for green jobs demand as the most important aspects of green skills competency.

4.   Conclusion

The findings of the study show several significant patterns and main trends. When asked about the respondents' understanding of the green concept, the findings revealed six main categories − sustainability, knowledge of green technology, recycling activities, knowledge of green jobs, non-renewable and non-renewable resources and green curriculum.

Most of the participants agreed that they possessed green knowledge and skills. They also stated the benefits of green technology which included creating sustainable environment, providing renewable energy, promoting recycling activities, saving operational costs, improving wellbeing, enhancing energy saving, providing more green jobs opportunities and encouraging the use of green materials.

However, the most challenging barrier is inadequate facilities to support green skills related activities. Next, educators also highlighted the lack of proper green curriculum and the lecturers lack of motivation as the other barriers faced while teaching green skills.

Finally, the respondents made suggestions to their institution on how to enhance green skills competency among TVET educators and students. Five themes emerged. The educators had emphasized on the need to conduct seminar and training related to green skills as the top suggestion. Followed by need to restructure green curriculum, ensuring

adequate resources are available, cultivating green attitude and ensuring policy is implemented at the institutional and national levels.

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