

Parametric Evaluation and Modeling of the Alignment Between TVET Matriculation Choices and University Program Enrollment

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Abstract

Technical and Vocational Education and Training (TVET) plays a crucial role in equipping students with the skills necessary for industry-specific careers, yet there remains a gap in the alignment between TVET matriculation choices and subsequent university program enrollment. This misalignment may lead to challenges in students' academic progression and career outcomes. The aim of this study is to critically assess the factors influencing the alignment between TVET students' matriculation choices and their enrollment in university programs, with a focus on understanding students' perceptions and experiences. The research adopts a quantitative approach, utilizing a survey method to collect data from a stratified random considering the population of 3500 population a sample of 347 polytechnic students from Malaysian Technical University Network (MTUN) institutions specifically UTHM, was dawn using krejcie and morgan table. The sample was divided into two batches to ensure representation across various stages of their academic programs. The primary data collection instrument was a structured questionnaire, which included Likert scale items to assess students' views on assessment, curriculum implementation, and their alignment with industry requirements. Data was analyzed using descriptive and inferential statistical techniques, including t-tests and ANOVA. The findings reveal significant differences in student perceptions based on demographic and institutional factors, highlighting gaps in curriculum design and assessment practices. These findings suggest that misalignment between TVET programs and university curricula affects students' academic and career outcomes. The study concludes that addressing these gaps through improved curriculum design, better assessment practices, and stronger industry linkages is essential for enhancing the effectiveness of TVET education and supporting sustainable student success in the workforce.

1. Introduction

The alignment between students' matriculation choices in Technical and Vocational Education and Training (TVET) and their eventual enrollment in university programs has garnered significant attention in the context of workforce development and higher education (Azizan et al., 2024; Dahri et al., 2024; Hashim, 2024). This alignment is crucial as it reflects the efficiency of career guidance systems and the adaptability of academic institutions in addressing industry demands (De Wee, 2024). TVET pathways aim to equip students with practical skills and knowledge, bridging the gap between education and employment (Dahri et al., 2024; Abd Majid, et al., 2024). However, discrepancies often emerge between students' initial choices during matriculation and their final university program enrollment, influenced by various psychological, societal, and institutional factors (Azizan et al., 2024; Tshong & Yasin, 2024; Nawi et al., 2024).

Studies have shown that psychological well-being significantly impacts students' academic decisions and performance (Omar et al., 2020). For instance, Azizan et al. (2024) highlighted the importance of mental health support for TVET stakeholders in achieving sustainable workforce development. Additionally, societal factors such as family expectations, peer influence, and perceptions of TVET programs play a critical role in shaping students' educational trajectories (Nawi et al., 2024; Abdul Hamid et al., 2024; Sadam, & Al Mamun, 2024). The decision-making process is further complicated by the availability of resources, institutional support, and the quality of academic advising (Asojan & Omar, 2024; Sadam & Al Mamun, 2024).

TVET institutions worldwide face challenges in retaining students and ensuring their academic choices align with labor market needs (Omar, et al., 2020). Research by Rodzi et al. (2024) emphasized that high dropout rates in TVET programs often stem from a lack of alignment between students' expectations and institutional offerings. Furthermore, the integration of digital tools and innovative learning strategies has been identified as a potential solution to enhance student engagement and satisfaction. For example, the use of augmented reality in skill training has shown promise in improving learning outcomes and motivation among TVET students (Abdul Hamid et al., 2024; Shafieek et al., 2024; Dahri et al., 2024).

In Malaysia, initiatives to promote green TVET and entrepreneurial education are gaining momentum to prepare students for a rapidly evolving job market (Nordin & Omar, 2024). Efforts to align these programs with industrial demands have been extensively discussed in recent literature, highlighting the need for a holistic approach that incorporates students' interests, motivations, and self-efficacy (Nordin & Omar, 2024; Zawawi & Sern, 2024; Shaari et al., 2024c; Rodzi et al., 2024). Despite these efforts, gaps remain in understanding the factors influencing students' transitions from matriculation to university enrollment in TVET pathways.

Technical and Vocational Education and Training (TVET) plays a crucial role in equipping students with skills to meet labor market demands and contribute to economic development (Asres, & Abebe, 2024). Despite these advantages, a recurring issue is the misalignment between the TVET matriculation choices made by students and the university programs in which they eventually enroll. Numerous students matriculating in TVET fields in Malaysian Technical University Network (MTUN) institutions opt for programs unrelated to their initial technical preferences, leading to skill mismatches, dissatisfaction, and wasted resources (Azizan et al., 2024; Rodzi et al., 2024; Nawi et al.). This trend raises concerns about the efficiency of the education pipeline in preparing students for careers aligned with their initial interests and societal demands.

Existing studies have highlighted several factors contributing to this problem, including societal perceptions of TVET, inadequate career counseling, and a lack of awareness among students regarding the progression pathways in technical fields (Tshong & Yasin, 2024; Sadam & Al Mamun, 2024). Furthermore, systemic challenges such as insufficient support for bridging TVET and university programs, inconsistent quality of career guidance, and limited student engagement exacerbate this issue (Azizan et al., 2024; Abdul Hamid et al., 2024). As a result, many students experience difficulties transitioning from TVET to university, often leading them to choose alternative programs (Rajamanickam et al., 2024; Bakar et al., 2024).

Despite the growing body of literature, significant gaps remain in understanding the reasons behind the misalignment between TVET matriculation choices and university enrollment. Many studies focus on general TVET challenges, such as dropout rates and employability, without addressing specific enrollment discrepancies (Rodzi et al., 2024; Dahri et al., 2024). Furthermore, existing research often neglects the perceptions of students as critical stakeholders in identifying these misalignments (Shafieek et al., 2024; Shaari et al., 2024a).

Additionally, while previous studies have examined the impact of societal factors and the integration of technology in TVET (Nawi et al., 2024; Sadam & Al Mamun, 2024), few have explored the role of psychological and motivational factors, such as self-efficacy and career aspirations, in influencing student decisions (Asojan & Omar, 2024; Nordin & Omar, 2024). Consequently, the lack of empirical evidence on how these factors interact within MTUN institutions represents a significant knowledge gap that hinders effective policymaking and intervention strategies (Azizan et al., 2024; Rajamanickam et al., 2024).

This study aims to address these gaps by evaluating the factors contributing to the misalignment between TVET matriculation choices and university program enrollment in MTUN universities in Malaysia. Unlike previous studies, it integrates a comprehensive approach that examines student perceptions, societal influences, and

institutional policies simultaneously. By incorporating insights from multiple stakeholders, including students, educators, and policymakers, this research will provide a holistic understanding of the underlying causes of the issue (Abdul Hamid et al., 2024; Zawawi & Sern, 2024).

Furthermore, this study employs innovative methodologies, such as mixed-method approaches and longitudinal data analysis, to capture nuanced perspectives often overlooked in prior research (Jalil et al., 2024; Hashim, 2024). By bridging the gap between TVET and university enrollment, the findings aim to inform strategies for enhancing alignment, fostering student satisfaction, and improving workforce readiness.

Finally, this research offers actionable recommendations for stakeholders, emphasizing the importance of career counseling, institutional support, and policy coherence to ensure that TVET students can seamlessly transition to university programs aligned with their aspirations and the demands of the labor market (Nordin et al., 2024; Bakar et al., 2024;).

This study aims to critically evaluate and model the alignment between TVET matriculation choices and university program enrollment, offering insights into students' perceptions and experiences. By addressing the psychological, societal, and institutional dimensions of this alignment, the research seeks to contribute to the development of effective policies and strategies for improving TVET systems and promoting sustainable educational outcomes.

1.1 Concept of Career Choice

Career choice refers to the deliberate decision-making process individuals undertake to select a profession or occupational path, a decision shaped by various internal and external factors (Omar et al., 2020). This concept has been extensively explored in career development theories, such as Ginzberg's developmental theory, which posits that career choice is a dynamic process evolving over time, moving from fantasy and exploratory phases in early life to realistic decision-making in later stages (Abd Majid et al., 2024; Yau, & Sharil, 2024). Similarly, Super's life-span theory highlights how career decisions are influenced by the interplay of personal growth, life roles, and environmental contexts, emphasizing that career choice is a reflection of one's self-concept, which matures with age and experience (Shaari et al., 2024b; Amdan et al., 2024; Chear, & Arifin, 2024).

Other scholars, such as Holland, argue that individuals seek careers aligned with their personality types, which, when matched with compatible work environments, result in greater job satisfaction and productivity (Shaari et al., 2024c). For instance, an investigative personality may gravitate toward careers in research or analysis, while artistic personalities may thrive in creative professions (Yau, & Sharil, 2024). Social Cognitive Career Theory (SCCT) further expands this understanding by integrating the role of self-efficacy, outcome expectations, and personal goals in career decision-making. According to Nordin, & Omar, (2024) individuals are more likely to pursue careers they believe they can excel in and that promise desirable outcomes, underscoring the importance of early exposure and opportunities to build confidence in one's abilities.

Social and cultural factors also play a pivotal role in career choices. Parental expectations, peer influence, and societal norms can either support or limit an individual's options (Yusop et al., 2023). For example, in many cultures, traditional careers in medicine, law, or engineering are often seen as prestigious, while creative or vocational paths may be undervalued (Azeem et al., 2022). These societal biases can shape aspirations and limit exploration, highlighting the need for inclusive career guidance to foster diverse and informed (Zawawi, & Sern, 2024).

1.2 Career Choice in Education

In the field of education, career choice manifests both in students' decisions about their academic and professional paths and in the selection of education as a career by professionals (Ramaligela, 2022). Students face crucial decisions about the subjects they pursue and their alignment with future careers (Shaari, et al., 2024a; Rusli, 2024). These decisions are often influenced by socioeconomic status, parental guidance, and access to resources like career counseling. Azeem et al. (2022) emphasize the importance of career guidance programs in helping students explore a broad range of career options and equipping them with information to make decisions that align with their interests and market demands. The integration of career counseling in educational systems is particularly crucial in addressing disparities, as students from disadvantaged backgrounds may lack exposure to diverse career opportunities (Ahmad, et al., 2024).

Technical and Vocational Education and Training (TVET) programs have become instrumental in bridging the gap between education and industry demands (Azizan et al., 2024). These programs provide students with practical skills tailored to meet the requirements of rapidly evolving industries, enhancing employability and reducing unemployment rates (Shaari et al., 2024b; Tshong, & Yasin 2024). For instance, competency-based education prepares students not only with technical expertise but also with critical thinking and problem-solving skills needed in dynamic job markets (Rusli, 2024). Research has shown that aligning educational curricula with industry needs fosters innovation and equips students with a competitive edge in global markets (Tekle et al., 2024).

Choosing education as a career, on the other hand, is influenced by a range of intrinsic and extrinsic factors. Passion for teaching, a desire to contribute to societal development, and the perceived stability of the profession are among the primary motivators for individuals entering the field (Masek et al., 2021). However, challenges such as low remuneration, limited opportunities for career advancement, and societal undervaluation of the teaching profession can deter potential educators (Ngware, et al 2024). Addressing these challenges requires targeted policy interventions, such as improving teacher salaries, enhancing professional development opportunities, and fostering a culture that values educators as critical contributors to societal progress.

Additionally, teachers play a significant role in shaping students' career choices, as they are often the first to recognize and nurture students' talents and aspirations (Tun et al., 2021). Equipping educators with skills in career counseling can further enhance their impact, enabling them to guide students effectively in making informed decisions about their futures (Mesuwini, 2024). Moreover, integrating technology into education, such as digital career platforms and virtual counseling, can expand access to career resources and provide students with tailored guidance based on their unique profiles and aspirations (Tlapana, & Myeki, 2020).

1.3 Students' Perception and Attitudes Toward TVET in Malaysia

Technical and Vocational Education and Training (TVET) plays a pivotal role in Malaysia's national development, aiming to equip students with practical skills and technical expertise needed to meet the demands of modern industries (Abd Karim, & Mustapha, 2022; Tlapana & Myeki, 2020). However, students' perceptions and attitudes toward TVET significantly influence its effectiveness and enrollment rates, these perceptions are shaped by a combination of societal attitudes, career aspirations, and the availability of resources and support systems within the education framework (Tlapana & Myeki, 2020; Hong et al., 2023).

One of the key challenges in promoting TVET in Malaysia is the lingering societal stigma that views it as a less prestigious option compared to academic pathways. Research highlights that many students and parents perceive TVET as a "last resort" for those who do not excel in traditional academic fields (Shaari et al., 2024b). This stigma often leads to negative attitudes among students, who may feel that pursuing TVET limits their career prospects and social status (Tun et al., 2021). Such perceptions can deter capable students from considering TVET as a viable pathway, despite its alignment with high-demand industries and strong employability prospects (Tlapana & Myeki, 2020; Masek et al., 2021).

A study by Azeem et al. (2022) revealed that students in Malaysia often associate TVET with blue-collar jobs, which are sometimes undervalued in society. This perception persists even though the government has made significant efforts to modernize TVET curricula and facilities. Many students remain unaware of the high-level technical skills and innovation-driven careers that TVET can lead to, particularly in fields such as robotics, renewable energy, and advanced manufacturing (Abd Majid et al., 2024). This lack of awareness underscores the need for targeted campaigns to educate students and their families about the benefits of TVET and its role in the Fourth Industrial Revolution (4IR) (Omar et al., 2020).

On the other hand, students enrolled in TVET programs tend to have more positive attitudes once they experience the practical, hands-on training offered (Hong, 2021). These students often appreciate the relevance of their education to real-world applications, which contrasts with the more theoretical approach of traditional academic programs (Tekle et al., 2024). They also report higher confidence in securing employment due to the demand for skilled workers in sectors such as construction, automotive, and information technology (Hong et al., 2022). This positive feedback from current TVET students suggests that firsthand exposure and success stories can play a vital role in reshaping broader perceptions (Asres, & Abebe, 2024).

Despite these benefits, the lack of clear progression pathways within the TVET system remains a concern for many students (Hong et al., 2023). While academic programs often have well-defined routes to higher education, TVET pathways are sometimes perceived as terminal, limiting students' aspirations for further education or career advancement (Jalil et al., 2022; Omar et al., 2020; Makochehanwa, & Mahuyu, 2021). Addressing this issue requires creating seamless links between TVET and higher education institutions, enabling students to transition to advanced studies or specialized certifications if desired.

The government of Malaysia has taken significant steps to improve students' attitudes toward TVET through initiatives such as the Malaysian TVET Master Plan and collaborations with industries to provide internships and apprenticeships (Ahmad et al., 2024). These programs aim to demonstrate the value of TVET by showcasing its alignment with high-demand, high-paying jobs. Additionally, campaigns such as Skills. Malaysia have been launched to rebrand TVET as a forward-looking, innovative choice rather than a fallback option (Rodzi et al., 2024).

However, effective implementation of these initiatives depends on overcoming challenges such as resource disparities and inconsistent quality across TVET institutions (Tekle et al., 2024). Studies have pointed out that students in rural areas often face limited access to modern equipment, qualified instructors, and industry exposure, which can reinforce negative perceptions about TVET's effectiveness (Azeem et al., 2022). Bridging these gaps is crucial to ensure that all students, regardless of location, have equal opportunities to benefit from

TVET programs, while students' perceptions and attitudes toward TVET in Malaysia are gradually improving, significant challenges remain in overcoming societal stigma, enhancing awareness, and ensuring equitable access to high-quality training (Rusli, 2024). A holistic approach involving government policies, industry partnerships, and community engagement is essential to reshape these perceptions and position TVET as an attractive, prestigious pathway that meets the aspirations of Malaysia's youth while supporting the nation's economic development (Tekle et al., 2024).

1.4 Challenges in Assessment and Curriculum Implementation in TVET

Assessment and curriculum implementation in Technical and Vocational Education and Training (TVET) institutions face numerous challenges, primarily in aligning the curriculum with industry needs and ensuring consistent evaluation standards (Zhi, & Atan, 2021). These challenges are evident in various contexts, including Malaysia and other nations with significant TVET sectors (Amdan et al., 2024).

A recurring issue is the misalignment between the skills emphasized in TVET curricula and the assessment methods employed (Hashim, 2024). Pirzada et al. (2022) observed in Pakistan that assessments often fail to reflect the practical skills outlined in the curriculum. This disconnect not only hampers students' ability to demonstrate their competencies but also undermines the relevance of their training to industry needs. Similarly, in South Africa, Ramaligela (2022) found that students frequently question the fairness and validity of assessments, leading to a lack of trust in the TVET system and its ability to provide industry-aligned education.

In Malaysia, these challenges are mirrored by gaps in classroom assessment practices. Yusop et al. (2023) highlighted that vocational skills assessments often lack validated indicators, making it difficult to measure student competencies effectively. This creates disparities between what is taught and what is assessed, leaving students underprepared for real-world job demands (Ahmad et al., 2024). Furthermore, the lack of standardized assessment criteria across institutions exacerbates these inconsistencies, limiting the credibility of TVET qualifications (Alhassan et al., 2024).

Hashim et al. (2021) further analyzed the implementation of assessments in Malaysia's TVET system, noting frequent inconsistencies in how classroom evaluations are conducted. While the curriculum emphasizes dynamic, industry-relevant skills, classroom practices often lag in adopting innovative, competency-based evaluation methods. This gap not only affects students' learning outcomes but also diminishes employers' confidence in TVET graduates.

Another significant challenge lies in ensuring that the curriculum evolves to meet the changing demands of industries driven by technological advancements (Nkwanyane et al 2022). In many cases, outdated curricula and assessment frameworks fail to address the emerging skills required in fields such as automation, renewable energy, and digital technology (Asojan, & Omar, 2024). This issue is compounded by limited collaboration between TVET institutions and industry stakeholders, which hinders the development of responsive, future-ready programs.

Efforts to address these challenges include the integration of competency-based education and training (CBET) models, which focus on practical skills and direct industry applicability. However, implementing CBET requires substantial investment in instructor training, modern equipment, and partnerships with industry players, which are not uniformly available across institutions. Additionally, regular reviews of curriculum and assessment practices are needed to align them with labor market demands, ensuring that TVET graduates remain competitive.

Table 1 Challenges in assessment and curriculum implementation

Challenge	Description	Example/Source
Misalignment between curriculum and assessments	Assessments fail to reflect the practical skills outlined in the curriculum.	Pirzada et al. (2022), Pakistan
Questionable assessment validity	Students distrust the legitimacy of assessments, affecting their engagement and motivation.	Ramaligela (2022), South Africa
Gaps in validated indicators	Lack of standardized criteria to measure vocational competencies accurately.	Yusop et al. (2023), Malaysia
Inconsistent classroom assessment practices	Inconsistent evaluation methods hinder the credibility of TVET qualifications.	Hashim et al. (2021), Malaysia
Outdated curricula	Curricula fail to address emerging skills needed in modern industries.	Observed in multiple TVET systems, including Malaysia and Pakistan (Zawawi, & Sern, 2024).
Limited industry collaboration	Insufficient partnerships with industry stakeholders reduce curriculum relevance.	General observation across TVET institutions globally (Ayanwale, et al., 2023)

2. Methodology

The research methodology adopted for this study aims to investigate the challenges and dynamics of assessment and curriculum implementation in Technical and Vocational Education and Training (TVET) institutions. Specifically, the study targeted polytechnic students from Malaysian Technical University Network (MTUN) institutions, employing a structured approach to data collection and analysis.

2.1 Research Design

The study utilized a quantitative research design to obtain empirical evidence from a large sample of TVET students. A survey method was selected to gather data on students' perceptions and experiences with assessment and curriculum practices. This approach allowed for the collection of standardized information, facilitating robust statistical analysis and comparison across different respondent groups.

2.2 Population And Sampling

A total of 150 students were enrolled in the study; however, the actual population size refers to the entire number of students enrolled in Technical and Vocational Education and Training (TVET) programs across the involved Malaysian Technical University Network (MTUN) universities. This broader population includes all current TVET matriculants at these institutions, serving as the reference group from which the sample of 150 was drawn for analysis. The population for this study comprised polytechnic students enrolled in MTUN universities in Malaysia. A stratified random sampling technique was employed to ensure a representative sample that accounted for variations among the student population. The final sample size consisted of 347 respondents, divided into two batches to facilitate efficient data collection and processing.

- Batch 1: Comprised 149 students.
- Batch 2: Comprised 198 students.

The stratification of the sample allowed the researchers to capture diverse perspectives from students at different stages of their programs while maintaining proportional representation across the population. The sample for this study involved only one MTUN university Universiti Tun Hussein Onn Malaysia (UTHM) rather than all MTUN universities in Peninsular Malaysia. This focused selection was made to allow for in-depth analysis within a specific institutional context, although it is acknowledged that this may limit the generalizability of the findings across the broader MTUN network.

The study focuses solely on Universiti Tun Hussein Onn Malaysia (UTHM), the population was defined as all polytechnic students enrolled in various faculties within UTHM under the MTUN framework. Stratified random sampling was applied by first identifying the total number of eligible students across relevant faculties, treating each faculty as a distinct stratum. The number of students selected from each faculty was then proportionally

determined based on its share of the total population, ensuring balanced representation. This approach led to a final sample size of 347 students, divided into two batches for practical data collection and analysis.

Since the study aims to evaluate the alignment between TVET matriculation choices and university program enrollment across different faculties within UTHM, it is essential to ensure that each faculty is adequately represented. Stratified sampling allows the researcher to divide the population into homogeneous subgroups (faculties) and then randomly sample within each stratum, which enhances the representativeness and reliability of the findings.

In contrast, purposive sampling is more suitable when the goal is to select participants with specific characteristics or expertise, often for qualitative or exploratory studies. However, since this study involves a larger student population and aims for quantitative generalization within UTHM, stratified sampling provides a more objective and statistically sound method.

2.3 Instrumentation

The primary data collection instrument was a structured questionnaire designed to capture students' perceptions of assessment and curriculum implementation in TVET. The questionnaire comprised closed-ended items using a Likert scale to measure levels of agreement or disagreement on various aspects of the curriculum, assessment practices, and alignment with industry requirements. The instrument was pilot-tested for reliability and validity before deployment, ensuring that it effectively captured the targeted constructs. In addition the research instrument used in this study was a structured questionnaire specifically developed and validated by experts from a leading TVET institution to align with the objectives of the study. The questionnaire was purposively designed for this research to assess the alignment between TVET matriculation choices and university program enrollment. It was not adopted or adapted from previous studies but rather created afresh, incorporating expert input to ensure content validity and relevance to the Malaysian TVET context

2.4 Data Collection Procedure

Data collection was conducted in two phases, corresponding to the two respondent batches. During each phase, questionnaires were distributed to the selected students, with clear instructions provided to ensure consistency in responses. Participation was voluntary, and measures were taken to protect respondents' anonymity and confidentiality. The collection process was closely monitored to minimize errors and enhance data quality.

2.5 Data Analysis

The collected data were coded and entered into statistical software for analysis. Descriptive statistics were used to summarize the demographic characteristics of respondents and identify general trends in their perceptions. Inferential statistics, including t-tests and ANOVA, were conducted to compare responses between the two batches and to determine any significant differences based on demographic or institutional factors. The stratified sampling framework facilitated subgroup analysis, providing nuanced insights into the challenges of TVET assessment and curriculum implementation.

2.6 Justification for Methodology

The choice of stratified random sampling ensured that the study captured a broad spectrum of student experiences while maintaining proportional representation. This approach enhanced the generalizability of the findings to the broader TVET population in Malaysia. The use of a structured questionnaire enabled the collection of standardized data, facilitating reliable statistical analysis and interpretation. Dividing the sample into two batches allowed for phased data collection, minimizing logistical challenges and ensuring comprehensive coverage of the target population.

3. Result

The study results are discussed below, with each category clearly labeled in the accompanying table. The abbreviations used are as follows: PS for pure science, AS for accounting science, TRD for trade, LIT for literature, and OT for others.

Table 2 cross tabulation analysis

CROSS TABULATION	First Batch					Second Batch					Total	
	PS	AS	TRD	LIT	OT	PS	AS	TRD	LIT	OT		
Field of study during SPM and choice of bachelor of civil engineering technology (environmental) with honors. At university crosstabulation												
Not selected	82	4	1	24	11 1	42	6	8	19	54	129	
First choice	4	0	0	0	4	1	1	1	1	3	7	
Field of study during SPM and choice Bachelor of Civil Engineering Technology (Building Services) with Honors												
Not selected	83	5	1	16	10 5	42	3	9	14	51	119	
First choice	3	0	0	1	4	2	1	1	0	8	12	
Field of study during SPM and choice of Bachelor of Civil Engineering Technology (Construction) with Honors.												
Not Selected	69	3	1	17	90	36	4	7	8	38	93	
First Choice	10	0	0	6	16	6	2	3	3	14	28	
Field of study during SPM and choice of Bachelor of Chemical Engineering Technology (Biotechnology) with Honors												
Not Selected	75	5	1	27	10 8	31	5	12	17	68	133	
First Choice	10	0	0	0	10	7	0	0	0	5	12	
Field of study during SPM and choice of Bachelor of Electronics Engineering Technology (Industrial Automation) with Honors												
Not Selected	72	2	0	23	97	31	4	7	8	53	103	
First Choice	8	1	0	1	10	2	2	0	2	3	9	
Field of study during SPM and choice of Bachelor of Electrical Engineering Technology (Electric Power) with Honors												
Not Selected	59	1	0	19	79	24	5	7	6	42	84	
First Choice	16	1	1	2	20	12	1	5	11	20	49	
Field of study during SPM and choice of Bachelor of Electronics Engineering Technology (Communications and Computers) with Honors												
Not Selected	74	2	0	18	94	22	6	8	10	47	93	
First Choice	7	1	0	3	11	8	0	2	2	6	18	
Field of study during SPM and choice of Bachelor of Technology Mechanical Engineering (Automotive) with Honors												
Not Selected	49	3	1	16	69	17	3	4	10	33	67	
First Choice	20	2	0	5	27	17	0	2	2	20	41	
Field of study during SPM and choice of Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors												
Not Selected	51	3	1	13	68	25	1	6	10	33	75	

CROSS TABULATION	First Batch					Second Batch					Total
	PS	AS	TRD	LIT	OT	PS	AS	TRD	LIT	OT	
Field of study during SPM and choice of Bachelor of Technology Mechanical Engineering (Plant) with Honors	10	1	0	3	14	9	4	0	2	11	26
Not Selected	61	3	0	17	81	41	8	9	20	67	145
Field of study during SPM and choice of Bachelor of Engineering Technology in Rail Transport with Honors	5	0	0	2	7	1	0	0	1	3	5
Not Selected	36	1	0	8	45	44	8	12	20	66	150
Field of study during SPM and choice of Bachelor of Occupational Safety and Health Technology with Honors	21	1	0	6	28	1	1	0	0	0	2
Not Selected	73	3	1	16	93	47	7	9	20	67	150
Field of study during SPM and choice of Bachelor of Civil Engineering Technology (Environmental) with Honors	2	0	0	2	4	4	0	0	0	1	5
Not Selected	73	3	1	16	93	47	7	9	20	67	150

The cross-tabulation of students' field of study during SPM and their choice of Bachelor of Civil Engineering Technology (Environmental) with Honors revealed that most students (111) did not select the program, with the highest number from pure science (82 students). Only 4 students from pure science selected the program as their first choice, while no students from Accounting Science, Literature, or "others" chose it as their first option. This suggests that while students from pure science are more inclined toward the program, interest remains low overall, indicating a need for further investigation into the factors influencing their choices.

The cross-tabulation of students' field of study during SPM and their choice of Bachelor of Civil Engineering Technology (Building Services) with Honors showed that the majority (105 students) did not select the program, with 83 from pure science. A small number (4) chose it as their first option, with 3 students from pure science. This indicates limited interest in the program, particularly among students from accounting science, literature, and others. For the Bachelor of Civil Engineering Technology (Construction) with Honors, 90 students did not select the program, with 69 from pure science. A higher proportion (16 students) selected it as their first choice, with 10 from pure science. This suggests a relatively stronger preference among pure science students for this program compared to the Building Services track.

For the Bachelor of Chemical Engineering Technology (Biotechnology) with Honors, the data is still pending, but the trends observed in the other programs suggest that students from pure science may be more likely to select engineering-related programs. This warrants further investigation to understand the factors influencing students' program choices. The cross-tabulation of students' field of study during SPM and their choice of Bachelor of Electrical Engineering Technology (Electric Power) with Honors reveals that 79 students did not select this program, with 59 from pure science. However, 20 students chose it as their first choice, with 16 coming from pure science. This shows a stronger preference for this program, particularly among pure science students.

For the Bachelor of Electronics Engineering Technology (Communications and Computers) with Honors, 94 students did not select the program, with 74 from pure science. Only 11 students selected it as their first choice, with 7 from pure science. This indicates a relatively low interest in this program compared to other engineering technology fields.

In the case of the Bachelor of Technology Mechanical Engineering (Automotive) with Honors, 69 students did not select the program, with 49 from pure science. However, 27 students selected it as their first choice, with 20 from pure science. This shows that a significant number of students, especially those from pure science, are interested in pursuing this program. The data suggests that while students from pure science generally show more interest in engineering-related programs, the level of preference varies depending on the specific field of study. The cross-tabulation of students' field of study during SPM and their choice of Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors shows that 68 students did not select the program, with 51 from pure science. In contrast, 14 students selected it as their first choice, with 10 from pure science, indicating a moderate level of interest among pure science students. For the Bachelor of Technology Mechanical Engineering (Plant) with Honors, 81 students did not select the program, with 61 from pure science. Only 7 students selected it as their first choice, with 5 from pure science. This low preference suggests limited interest in this particular field.

In the case of the Bachelor of Engineering Technology in Rail Transport with Honors, 45 students did not select this program, with 36 from pure science. However, 28 students chose it as their first choice, with 21 from

pure science. This shows a higher level of interest, particularly from students in pure science. Lastly, for the Bachelor of Occupational Safety and Health Technology with Honors, 93 students did not select the program, with 73 from pure science. Only 4 students selected it as their first choice, with 2 from pure science, indicating minimal interest in this field. The data reflects varying levels of interest in different engineering technology programs, with pure science students showing stronger preferences for programs related to engineering and rail transport, while other fields like occupational safety and health have much lower first-choice selection. The cross-tabulation between the field of study during SPM (Sijil Pelajaran Malaysia) and choices during university enrollment across various bachelor's degree programs reveals insightful patterns regarding the preferences of students with diverse academic backgrounds.

Second Batch

Bachelor of Civil Engineering Technology (Environmental) with Honors out of 129 students who did not select this program, the majority (42) came from a pure science background. Those from accounting science (6), trade (8), and literature (19) backgrounds also avoided this program, along with 54 from "others." Only 7 students selected this as their first choice, distributed evenly across all fields (pure science, accounting, trade, literature, and others with 1–3 students each).

Bachelor of Civil Engineering Technology (Building Services) with Honors for this program, 119 students did not choose it, with the largest group (42) being pure science students. Smaller numbers came from accounting science (3), trade (9), literature (14), and others (51). Twelve students selected it as their first choice, with pure science contributing the most (2), while others also showed notable interest (8).

Bachelor of Civil Engineering Technology (Construction) with Honors This program had 93 students who did not select it, mainly from pure science (36) and others (38). Trade (7), literature (8), and accounting science (4) formed the remainder. Among the 28 students who selected it as their first choice, pure science dominated (6), while others (14) contributed significantly.

Bachelor of Chemical Engineering Technology (Biotechnology) with Honors a significant number (133) did not choose this program, with pure science (31) and others (68) forming the majority. Literature (17), trade (12), and accounting science (5) made up the rest. Only 12 students selected it as their first choice, dominated by pure science (7) and others (5).

Bachelor of Electronics Engineering Technology (Industrial Automation) with Honors among 103 students who did not select this program, the majority were from pure science (31) and others (53). Literature (8), trade (7), and accounting science (4) had smaller numbers. Nine students chose it as their first choice, with representation from pure science (2), accounting (2), and others (3).

Bachelor of Electrical Engineering Technology (Electric Power) with Honors. Eighty-four students did not choose this program, led by pure science (24) and others (42). Trade (7), literature (6), and accounting science (5) were less represented. Interestingly, 49 students made this their first choice, with substantial interest from pure science (12) and others (20).

Bachelor of Electronics Engineering Technology (Communications and Computers) with Honors Ninety-three students did not opt for this program, mainly from pure science (22) and others (47). Trade (8), literature (10), and accounting (6) followed. Eighteen students selected it as their first choice, with pure science (8) leading.

Bachelor of Technology Mechanical Engineering (Automotive) with Honors. This program had 67 students who did not select it, dominated by others (33) and pure science (17). Forty-one students made it their first choice, with a significant preference from pure science (17) and others (20).

Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors seventy-five students did not choose this program, mostly from pure science (25) and others (33). Twenty-six students selected it as their first choice, led by pure science (9) and others (11).

Bachelor of Technology Mechanical Engineering (Plant) with Honors. This program was not selected by 145 students, predominantly from others (67) and pure science (41). Only 5 students chose it as their first choice, mainly from pure science (1) and others (3).

Bachelor of Engineering Technology in Rail Transport with Honors. A total of 150 students did not choose this program, with others (66) and pure science (44) forming the largest groups. Only 2 students selected it as their first choice.

Bachelor of Occupational Safety and Health Technology with Honors. Similarly, 150 students did not choose this program, with significant numbers from others (67) and pure science (47). Only 5 students selected it as their first choice, mainly from pure science (4).

The data reveals that students from pure science and "others" fields during SPM dominate both the non-selection and selection of engineering technology programs. However, preferences for specific programs vary, with some fields like "others" showing more inclination toward specific programs, such as electrical power and automotive engineering.

Table 3 Cross tabulation between field of study during SPM and career according to the priority

	First Batch						Second Batch					
	PS	AS	TRD	LIT	OT	Total	PS	AS	LIT	OT	Total	
Technician												
Not a choice	3	0	0	0	2	5	0	1	0	0	1	
First choice	3	3	2	2	12	22	8	0	0	0	8	
Construction Jobs												
Not a choice	3	0	0	1	3	7	3	1	0	3	7	
First choice	5	1	1	1	10	18	5	1	0	5	11	
Engineering and Technology												
Not a choice	3	0	0	0	2	5	2	1	0	0	3	
First choice	42	5	6	18	60	131	79	4	1	17	101	
Automotive Services												
Not a choice	1	0	0	1	3	5	1	1	0	0	2	
First choice	5	0	1	1	11	18	9	0	0	3	12	
Information and communication technology												
Not a choice	3	1	0	1	4	9	2	1	0	2	5	
First choice	8	0	2	1	4	15	4	0	0	3	7	
Entrepreneurship and Commerce												
Not a choice	2	0	0	1	5	8	4	1	0	0	5	
First choice	2	0	2	1	3	8	8	0	0	2	10	

First Batch

The cross-tabulation data provides insights into the relationship between students' field of study during their SPM and their career choices, showing how these preferences align based on their priority. In the technician category, most students did not prioritize this as their first choice, with only 5 students in total indicating it as a choice. Among the students who selected it as their first choice, 3 were from the pure science stream, and 12 were from the others category, showing a preference for non-traditional science fields.

For construction jobs, 7 students did not consider it as a choice, with 3 from pure science and 3 from the others category. However, when prioritizing, the pure science stream had 5 students who chose it as their first career choice, followed by 10 students from the others category. In the Engineering and Technology field, a significant preference was seen for pure science, with 42 students choosing it as their first career choice. Additionally, 60 students from the others category also expressed a high preference for this field. This reflects the strong inclination towards engineering and technology within both the pure science and others fields.

In automotive services, most students did not prioritize this field, with only 5 students indicating it as a choice. Among the first-choice selections, 5 were from pure science, while 11 came from others, showing a relatively even but lower interest in this career path. The information and communication technology (ICT) field also saw a mixed response. 9 students did not choose ICT as a career, and among the first-choice selections, 8 were from pure science, indicating a solid interest in ICT within this stream, while the others category had a more moderate 4 students selecting it as a top choice.

Finally, for entrepreneurship and commerce, 8 students did not prioritize it, with the highest number of selections in the others category. A total of 8 students selected it as their first choice, with 2 from pure science, indicating a moderate preference across all categories but especially within the others category. In summary, students from pure science tend to gravitate toward engineering and technology, while students from the others category show broader interests, particularly in fields like engineering and technology and automotive services, with varied preferences across all career categories.

Second Batch

The cross-tabulation data further highlights students' field of study during their SPM and their career preferences, providing additional insights into career prioritization. For technician, the majority (8 students) chose it as their first choice, with no students from accounting science or literature selecting it. Only 1 student from the others category and 1 from accounting science did not consider it as a career. This reflects a strong interest in the technician field within the pure science stream.

In the construction jobs category, 7 students did not prioritize it as a career, with 3 from pure science and 3 from others. For first choices, pure science again had the most selections, with 5 students. The others category showed a moderate preference, with 5 students prioritizing construction jobs. Accounting Science had only 1 student considering it as a first choice.

For engineering and technology, pure science students showed a dominant interest, with 79 selecting it as their first choice. The others category also displayed a solid preference, with 17 students selecting it. Very few students from accounting science (4) and literature (1) chose this field, indicating that engineering and technology is a primary choice for students from pure science.

In the automotive services category, 2 students did not consider this as a choice, with most selecting it as their first choice 9 from pure science and 3 from the others category. This shows a relatively higher interest in automotive services from the pure science stream. For information and communication technology (ICT), 5 students did not choose it, with 2 from pure science and 2 from others. Among the first-choice selections, pure science showed 4 students selecting ICT, while the others category had 3 students, demonstrating a steady preference for ICT within pure science.

In entrepreneurship and commerce, 5 students did not choose this field, and 4 were from pure science. However, when considering first choice, 8 students from pure science selected it, indicating that despite the lower total number of selections, it remains a preferred career option within the pure science stream. The others category showed moderate interest, with 2 students prioritizing it. Overall, pure science students tend to favor engineering and technology most, followed by technician and automotive services, with moderate interest in entrepreneurship and commerce. The others category showed varied interests, particularly in engineering and technology, with some moderate preferences across other fields.

Table 4 Cross tabulation between field of study during SPM and TVET foundation program

	First Batch					Second Batch						
Field Of Study During SPM and the TVET foundation program Focuses on Practical and Hands-On Learning That Is More Relevant to TVET												
Crosstabulation	PS	AS	LIT	OT	Total	PS	AS	TRD	LIT	OT	Total	
Strongly disagree	6	1	0	1	8	2	0	0	1	3	5	
Disagree	5	0	0	2	7	0	0	0	0	1	1	
Not sure	11	1	0	3	15	9	0	0	3	15	27	
Agree	51	1	0	11	63	19	4	5	3	28	59	
Strongly agree	39	3	1	13	56	31	5	9	16	44	105	
Total	112	6	1	30	149	62	9	14	23	91	198	
Field of study during SPM and do the facilities and infrastructure provided allow you to access the latest equipment and software?												
Crosstabulation	PS	AS	LIT	OT	Total	PS	AS	TRD	LIT	OT	Total	
Strongly disagree	4	1	0	0	5	0	0	0	1	1	2	
Disagree	6	1	0	4	11	2	0	0	0	2	4	
Not sure	17	1	0	2	20	7	0	1	3	7	18	
Agree	57	2	0	13	72	24	4	4	10	48	90	
Strongly agree	28	1	1	11	41	28	5	9	9	33	84	
Total	112	6	1	30	149	61	9	14	23	91	198	

	First Batch					Second Batch					
	PS	AS	LIT	OT	Total	PS	AS	TRD	LIT	OT	Total
Field of study during SPM and Does Your Family Fully Support Your Choice to Follow the TVET foundation program?											
Strongly disagree	1	0	0	1	2	0	0	0	1	1	2
Disagree	1	0	0	1	2	1	0	0	0	2	3
Not sure	8	1	0	1	10	3	0	2	3	5	13
Agree	28	2	0	11	41	10	5	2	3	28	48
Strongly agree	74	3	1	16	94	47	4	10	16	55	132
Total	112	6	1	30	149	61	9	14	23	91	198
Field Of Study during SPM and Does the selection of the TVET foundation program suit your interests and inclinations?											
Strongly disagree	4	0	0	1	5	0	0	1	2	3	6
Disagree	3	2	0	1	6	0	0	1	0	1	2
Not sure	18	0	0	6	24	7	0	2	8	13	30
Agree	50	3	0	8	61	20	4	3	5	29	61
Strongly agree	37	1	1	14	53	34	5	7	8	45	99
Total	112	6	1	30	149	61	9	14	23	91	198

First Batch

The cross-tabulation data explores the relationship between students' fields of study during SPM and their perceptions of the TVET foundation program in four key aspects: its focus on practical learning, adequacy of facilities and infrastructure, family support for their choice, and alignment with their interests and inclinations.

Perceptions on TVET's practical and hands-on focus. The majority of pure science (PS) students positively perceived the practical and hands-on focus of the TVET foundation program. Out of 112 respondents, 51 agreed, and 39 strongly agreed with the statement. However, there were some uncertainties and disagreements, with 11 students not sure and 5 disagreeing or strongly disagreeing. Among accounting science (AS) students, most also supported this focus, with 3 strongly agreeing and 1 agreeing, although 1 student was unsure, and another strongly disagreed. Literature (LIT) students strongly agreed (1) with the program's focus, showing marginal alignment. Meanwhile, other (OT) students had a strong agreement rate, with 13 strongly agreeing and 11 agreeing. However, 3 were not sure, and 3 either disagreed or strongly disagreed.

Adequacy of facilities and Infrastructure

Students were asked whether the facilities and infrastructure provided by the program enabled access to the latest equipment and software. Among PS students, the responses were predominantly positive, with 57 agreeing and 28 strongly agreeing. However, 17 were unsure, and 10 disagreed or strongly disagreed. Similarly, AS students generally responded positively, with 2 agreeing and 1 strongly agreeing, but some were unsure or disagreed. LIT students were split, with 1 strongly agreeing and the rest expressing no strong opinion. OT students displayed varied responses, with 13 agreeing and 11 strongly agreeing, but a small portion was unsure or in disagreement.

Family Support for the TVET foundation program

The majority of students across all fields of study felt they had strong family support for their decision to enroll in the TVET foundation program. Among pure science (PS) students, 74 strongly agreed, and 28 agreed, with only 8 expressing uncertainty and 2 disagreeing. Accounting Science (AS) students also reported high levels of family support, with 3 strongly agreeing and 2 agreeing, although 1 was unsure. Literature (LIT) students unanimously reported family support, with 1 strongly agreeing. Among Other (OT) students, 16 strongly agreed, and 11 agreed, while 1 each disagreed, strongly disagreed, or was unsure.

Alignment with Interests and Inclinations

In assessing whether the TVET foundation program suited their interests and inclinations, most pure science (PS) students responded positively, with 50 agreeing and 37 strongly agreeing. However, 18 were unsure, and 7 expressed disagreements. Accounting science (AS) students were mixed, with 3 agreeing and 1 strongly agreeing,

but 2 disagreed. Literature (LIT) students showed strong agreement from 1 respondent, indicating marginal alignment. Among other (OT) students, responses were largely positive, with 14 strongly agreeing and 8 agreeing. However, 6 were unsure, and 2 expressed disagreement.

Across all aspects, pure science (PS) students showed the highest levels of agreement and satisfaction, followed by other (OT) students. Accounting science (AS) students generally responded positively but had more variability in their responses, with notable levels of uncertainty. Literature (LIT) students showed the least alignment, with minimal representation in the data. While the TVET foundation program is broadly perceived positively, areas for improvement include addressing uncertainties and strengthening infrastructure to ensure that the program meets the expectations of all student groups.

Second Batch

The cross-tabulation data between the field of study during SPM and students' perceptions regarding the TVET Foundation program presents the students' views on whether the program suits their interests and inclinations, with the categories of strongly disagree, disagree, not sure, agree, and strongly agree.

Perceptions on program suitability In the first table, where students were asked if the program suits their interests, pure science (PS) students showed a high level of agreement, with 31 strongly agreeing and 19 agreeing. However, 9 students were unsure, and 2 strongly disagreed with the suitability of the program. This suggests that while a majority of PS students feel aligned with the program, a small group remains uncertain or unsatisfied.

For accounting science (AS) students, there was less agreement, with only 5 strongly agreeing and 4 agreeing. AS students had a relatively high number of students who were unsure (7 students). In contrast, no AS students strongly disagreed, indicating a moderate level of alignment but also some uncertainty among this group.

Trade (TRD) students generally showed positive perceptions of the program's relevance. A total of 9 students strongly agreed, and 5 students agreed that the program suited their interests. However, 2 students were unsure about its suitability, suggesting that while most TRD students felt the program was suitable, a few were uncertain.

Literature (LIT) students, in comparison, showed more mixed perceptions. A total of 16 students strongly agreed, and 3 agreed, but 8 students were unsure, reflecting a lack of clarity about the program's relevance to their academic path. Additionally, 2 students strongly disagreed with the suitability of the program, which indicates that for some LIT students, the program does not align with their academic interests.

Other (OT) students had a similar pattern of responses. Most of them were favorable, with 44 students strongly agreeing and 28 agreeing. However, 15 students were unsure about the program's relevance to their interests. This suggests that while the OT group had generally positive views, there was a significant proportion who were unsure.

Additional Responses

In the second table, where students were asked if the facilities and infrastructure provided allow them to access the latest equipment and software, PS students generally agreed that they could access the necessary tools, with 47 students strongly agreeing and 10 agreeing. However, 3 students were unsure, and none strongly disagreed.

For AS students, 5 strongly agreed, and 4 agreed, indicating a more moderate perception of the program's facilities and infrastructure. Notably, AS students had 7 students who were unsure, highlighting a need for better clarity or improvement in the available resources.

In the TRD group, 10 students strongly agreed that the infrastructure was adequate, while 2 students were unsure. Similarly, 16 LIT students strongly agreed, and 3 students agreed, although 8 were unsure and 1 strongly disagreed, suggesting varying opinions about the available resources.

OT students showed a similarly high level of agreement, with 45 strongly agreeing and 29 agreeing. However, 13 students were unsure about the adequacy of the infrastructure, highlighting that despite strong support for the facilities, a small group was uncertain.

Across all fields, there is a general trend toward agreement that the TVET foundation program suits students' interests and provides adequate facilities for their learning. PS and OT students were the most favorable toward the program, while LIT and TRD students exhibited more mixed responses, with a higher number of students unsure or in disagreement. The data reveals that while the program is well-regarded by the majority of students, there is a significant subset in each field who remain uncertain, suggesting areas for improvement in program alignment and infrastructure clarity.

Actual Program Enrolled into the University

The data presents the enrollment statistics for students from the TVET foundation program at Politeknik Pagoh (PTSN) and Politeknik Ungku Omar (PUO) for the year 2024. The enrollment is categorized by faculty and program across both institutions, reflecting the distribution of students in specific academic pathways.

Faculty of Applied Science and Technology (FAST), A total of 22 students enrolled in programs under FAST. The breakdown indicates 21 students from PTSN and only 1 student from PUO. Among these programs, the

majority enrolled in the BWD program (15 students), followed by BWK (5 students), and one student each in BWA and BWC.

Faculty of Civil and Environmental Engineering (FKAAB). All 34 students enrolled in programs under FKAAB originated from PTSN, with the BFF program dominating at 33 students. Only one student joined the BFR program, reflecting a significant preference for BFF within this faculty.

Faculty of Electrical Engineering (FKEE) The FKEE faculty saw 9 enrollments, split between PTSN (3 students) and PUO (6 students). The BEJ program had the highest enrollment with 7 students (2 from PTSN and 5 from PUO), while the BEV program had 2 students (1 from each institution).

Faculty of Mechanical and Manufacturing Engineering (FKMP) Under FKMP, 26 students enrolled, with 10 from PTSN and 16 from PUO. The BDD program recorded the highest enrollment with 14 students (2 from PTSN and 12 from PUO). Other programs include BDG (4 students), BDC (1 student), BDM (2 students), and BDX (1 student).

Faculty of Technical and Vocational Education (FPTV). FPTV had 6 students enrolled, predominantly from PUO (5 students), with only 1 student from PTSN. These students were distributed across programs such as BBA, BBB, BBE, and BBJ, with each program attracting between 1 and 2 students.

Faculty of Computer Science and Information Technology (FSKTM) FSKTM enrolled 14 students, all from PTSN. The most popular programs were BIS (5 students) and BIW (3 students), followed by BIM, BIP, and BIT, each with 1 or 2 students.

Faculty of Technology and Engineering (FTK). FTK had the largest overall enrollment, with 39 students split between PTSN (17 students) and PUO (22 students). The most subscribed program was BNN, with 11 students (all from PTSN). Other notable programs included BNG (7 students) and BNS (6 students). Smaller enrollments were seen in BNA, BNC, BND, BNE, and BNF, each with 2 or 3 students.

Grand total in total, 150 students were enrolled across PTSN (52 students) and PUO (98 students). This distribution highlights PUO as hosting a larger share of TVET students for the 2024 intake. Each faculty's enrollment reflects the varying appeal and capacity of the programs offered, with FTK and FKAAB drawing the highest numbers.

Table 5 Alignment between field of study during SPM, course of choice at university and actual program enrolled

Faculty	Program	PTSN	PUO	Total
FAST (Faculty of Applied Science and Technology)	BWA	1	0	1
	BWC	1	0	1
	BWD	15	0	15
	BWK	5	0	5
Subtotal (FAST)		21	1	22
FKAAB (Faculty of Civil and Environmental Engineering)	BFF	33	0	33
	BFR	1	0	1
Subtotal (FKAAB)		34	0	34
FKEE (Faculty of Electrical Engineering)	BEJ	2	5	7
	BEV	1	1	2
Subtotal (FKEE)		3	6	9
FKMP (Faculty of Mechanical and Manufacturing Engineering)	BDC	1	0	1
	BDD	2	12	14
	BDG	3	1	4
	BDJ	4	0	4
	BDM	1	1	2
	BDX	1	0	1
Subtotal (FKMP)		10	16	26

Faculty	Program	PTSN	PUO	Total
FPTV (Faculty of Technical and Vocational Education)	BBA	1	1	2
	BBB	1	1	2
	BBE	1	2	3
	BBJ	0	1	1
Subtotal (FPTV)		1	5	6
FSKTM (Faculty of Computer Science and Information Technology)	BIM	1	0	1
	BIP	1	0	1
	BIS	5	0	5
	BIT	4	0	4
	BIW	3	0	3
Subtotal (FSKTM)		14	0	14
FTK (Faculty of Technology and Engineering)	BNA	1	2	3
	BNC	2	0	2
	BND	1	0	1
	BNE	2	2	4
	BNF	0	3	3
	BNG	0	7	7
	BNN	11	0	11
	BNS	3	3	6
Subtotal (FTK)		17	22	39
Grand Total		52	98	150

3.1 Alignment Between Field of Study and Actual Program Enrolled

The alignment between students' fields of study during the SPM (Sijil Pelajaran Malaysia) and their subsequent choices of university programs reveals significant trends, particularly in engineering and technology fields. The data shows a notable disparity between students' pre-university academic background and their university program preferences, with pure science students dominating enrollment in engineering-related programs but showing varying levels of interest across different specializations. This misalignment highlights the importance of understanding students' decision-making processes and the factors influencing their program choices.

For the Bachelor of Civil Engineering Technology (Environmental) with Honors, a majority (111 students) did not select the program, with 82 coming from pure science. Only four pure science students chose it as their first choice, while none from accounting science, literature, or "others" selected it. This indicates that while pure science students are more inclined toward the program, their overall interest remains low. Similarly, for the Bachelor of Civil Engineering Technology (Building Services) with Honors, 105 students did not choose the program, with 83 from pure science. Only four students selected it as their first choice, further demonstrating a limited interest, particularly among students from non-science streams.

Conversely, the Bachelor of Civil Engineering Technology (Construction) with Honors received relatively higher interest, with 16 students choosing it as their first choice, 10 of whom were from pure science. This suggests a stronger preference for construction-related civil engineering among pure science students compared to environmental or building services tracks. In the Bachelor of Electrical Engineering Technology (Electric Power) with Honors, 20 students selected the program as their first choice, with 16 from pure science, showing a more significant preference for this field. Similarly, the Bachelor of Technology Mechanical Engineering (Automotive) with Honors attracted 27 students, with 20 from pure science, reflecting its popularity among science-oriented students.

However, the Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors saw a more moderate interest, with 14 students selecting it as their first choice, 10 of whom were from pure science. The Bachelor of Technology Mechanical Engineering (Plant) with Honors, however, received only seven first-choice selections, with five from pure science, indicating limited enthusiasm for this specialization.

The Bachelor of Engineering Technology in Rail Transport with Honors was another notable program, with 28 students selecting it as their first choice, 21 of whom were from pure science. This strong preference suggests that engineering programs with a clear and unique career pathway, such as rail transport, may be more appealing

to science students. In contrast, the Bachelor of Occupational Safety and Health Technology with Honors saw minimal interest, with only four students choosing it as their first choice, two of whom were from pure science.

Overall, pure science students show a stronger inclination toward engineering and technology programs, with preferences varying based on the specificity and perceived career prospects of the field. Programs like civil engineering technology (construction), electrical engineering technology (electric power), mechanical engineering (automotive), and rail transport stand out as popular choices, while fields like occupational safety and health and plant mechanical engineering attract significantly less interest. These trends emphasize the need for universities to investigate the underlying factors influencing student decisions, such as program awareness, career guidance, and perceived employability, to better align educational offerings with student aspirations and labor market demands.

The alignment between students' field of study during the SPM (Sijil Pelajaran Malaysia) and their university program choices in the second batch further highlights intriguing trends. The data indicates that students from pure science and the "others" category dominate both the non-selection and selection of Bachelor of Engineering and Technology programs, but preferences vary significantly across specific disciplines. This variation reflects a complex interplay of interest, program awareness, and possibly career aspirations.

Trends in Program Selection

For the Bachelor of Civil Engineering Technology (Environmental) with Honors, a significant number (129 students) did not select this program, with the largest group being from the "others" category (54) and pure science (42). Despite this, 7 students chose it as their first choice, distributed evenly across pure science, Accounting Science, Trade, Literature, and others. This even distribution suggests a broad but low-level interest across fields, likely influenced by limited awareness or perceived career prospects in environmental engineering. The Bachelor of Civil Engineering Technology (Building Services) with Honors exhibited a similar pattern, with 119 students not selecting the program, led by pure science (42) and others (51). However, this program saw 12 students selecting it as their first choice, including a notable interest from the "others" category (8). This suggests that the program may appeal to a more diverse demographic, particularly students outside traditional science fields.

The Bachelor of Civil Engineering Technology (Construction) with Honors showed relatively higher interest compared to other civil engineering programs. While 93 students did not choose it, 28 students selected it as their first choice, led by pure science (6) and others (14). This suggests a stronger appeal for construction-related engineering, especially among students categorized as "others."

For the Bachelor of Chemical Engineering Technology (Biotechnology) with Honors, the lack of interest was significant, with 133 students not selecting the program, predominantly from others (68) and pure science (31). Only 12 students selected it as their first choice, with pure science (7) leading. This indicates that biotechnology, despite its potential relevance for science students, may not be seen as a primary career pathway by many.

Programs like the Bachelor of Electronics Engineering Technology (Industrial Automation) and the Bachelor of Electronics Engineering Technology (Communications and Computers) also showed moderate levels of interest. While the majority of students did not select these programs, a smaller but notable group, especially from pure science, did choose them. For instance, the Communications and Computers program attracted 18 first-choice selections, with pure science (8) leading. This reflects the growing recognition of electronics and communications as promising career fields.

Stronger Preferences in Certain Fields

The Bachelor of Electrical Engineering Technology (Electric Power) with Honors and the Bachelor of Technology Mechanical Engineering (Automotive) with Honors stood out for their relatively higher first-choice selections. Electrical Power attracted 49 first-choice selections, with significant contributions from pure science (12) and others (20). Similarly, Automotive Engineering was selected by 41 students, led by pure science (17) and others (20). These programs appear to benefit from their clear career pathways and practical applications, making them more appealing to students, especially those from science and non-traditional fields.

The Bachelor of Technology Mechanical Engineering (Manufacturing) also demonstrated a moderate level of interest, with 26 first-choice selections, led by pure science (9) and others (11). This indicates an attraction to manufacturing, albeit at a lower scale compared to automotive engineering.

Programs with Minimal Interest

On the other hand, programs like the Bachelor of Technology Mechanical Engineering (Plant), Bachelor of Engineering Technology in Rail Transport, and Bachelor of Occupational Safety and Health Technology saw very low levels of interest. For instance, the Plant program had only 5 first-choice selections, primarily from the "others" category (3) and pure science (1). Similarly, Rail Transport and Occupational Safety and Health each attracted only 2–5 first-choice selections, despite their potential relevance in specific industries. This highlights the need for targeted outreach and awareness campaigns to attract students to these niche fields.

Pure science students show a consistent preference for engineering and technology programs, particularly in fields like automotive engineering, electrical power, and construction. However, their interest varies across programs, with some specializations like biotechnology and plant mechanical engineering receiving limited attention. Meanwhile, students from the others category demonstrate significant influence in both selection and non-selection patterns, suggesting a broad range of interests and the potential to attract more diverse students with effective program marketing.

The data underscores the need for universities to: increase program awareness: highlight unique career pathways and job opportunities associated with lesser-known programs, enhance career guidance: provide targeted counseling to align student interests with industry demands, diversify recruitment efforts: engage students from varied academic backgrounds, particularly those in the "others" category, who show interest in specific programs.

The data highlights significant disparities between students' course choices and actual program enrollments at the university, with several key trends emerging. A notable observation is that many students from pure science and the "others" category dominate both non-selection and selection patterns, yet their preferences are unevenly distributed across different programs. For instance, in programs like Bachelor of Civil Engineering Technology (Environmental) with Honors, only 7 students selected it as their first choice, despite its relevance for pure science and interdisciplinary fields. This limited interest may stem from a lack of awareness about the program's career prospects or its perceived alignment with students' prior academic backgrounds.

Similarly, in the Bachelor of Civil Engineering Technology (Building Services) with Honors, the trend persists, with only 12 first-choice selections against a backdrop of 119 non-selections. Interestingly, the majority of those who selected this program as their first choice came from the "others" category (8), showing a potential mismatch between academic preparation and program inclination. A higher preference for Bachelor of Civil Engineering Technology (Construction) with Honors was observed, with 28 students selecting it as their first choice. This program appears to be more attractive to both pure science students (6) and those in the "others" category (14), likely due to the perceived practical applications and direct industry relevance of construction engineering.

Programs in chemical engineering, such as the Bachelor of Chemical Engineering Technology (Biotechnology) with Honors, exhibit substantial non-selection rates, with 133 students avoiding it and only 12 selecting it as their first choice. Notably, pure science students (7) formed the majority of those who opted for this program, reflecting its alignment with their academic background. However, this low level of interest suggests a need for more targeted marketing to raise awareness about its potential career pathways, especially in emerging industries like biotechnology.

In electronics and mechanical engineering fields, the disparity between program choice and enrollment is slightly less pronounced. For example, the Bachelor of Electronics Engineering Technology (Communications and Computers) with Honors garnered 18 first-choice selections, predominantly from pure science (8). Similarly, the Bachelor of Electronics Engineering Technology (Industrial Automation) with Honors had 9 first-choice selections, again led by pure science students. These programs seem to attract students who are more aware of the growing demand for expertise in electronics and automation. However, the relatively low number of first-choice selections compared to non-selections indicates that these fields could benefit from enhanced promotion and outreach efforts.

Mechanical engineering programs showed stronger alignment with student preferences. The Bachelor of Technology Mechanical Engineering (Automotive) with Honors stood out, attracting 41 first-choice selections, with significant contributions from pure science (17) and others (20). Similarly, the Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors had 26 first-choice selections, led by pure science (9) and others (11). These preferences indicate that mechanical engineering programs, particularly those with clear career trajectories, are more appealing to students, especially those with technical or non-traditional backgrounds.

On the other hand, programs like the Bachelor of Technology Mechanical Engineering (Plant), Bachelor of Engineering Technology in Rail Transport, and Bachelor of Occupational Safety and Health Technology faced minimal interest. For instance, the rail transport program and occupational safety and health each attracted only 2–5 first-choice selections, despite their potential relevance in niche industries. These low enrollment figures suggest a significant disparity between the availability of these programs and students' awareness or interest in them, possibly due to a lack of visible career opportunities or limited understanding of their significance.

The overall pattern indicates that students from pure science backgrounds generally prefer programs with clear technical applications, such as automotive engineering, electrical power, and construction. Meanwhile, students from the "others" category exhibit varied interests, often gravitating toward programs like electrical power and automotive engineering. However, a substantial proportion of students from both categories appear hesitant to select niche or less-promoted programs, resulting in under-enrollment in fields like biotechnology, plant mechanical engineering, and rail transport engineering.

This disparity suggests the need for universities to align their program offerings more closely with student interests and career expectations. Efforts to address this could include enhanced career counseling, targeted

marketing campaigns highlighting the relevance and opportunities associated with under-enrolled programs, and collaboration with industries to demonstrate the practical applications of niche fields. By addressing these gaps, universities can improve the alignment between students' academic aspirations and actual program enrollments, ultimately ensuring better utilization of educational resources and a more effective response to workforce demands.

3.2 Discussion

The results from the cross-tabulation analysis indicate varying levels of interest among students in selecting different engineering and technical programs. Most notably, students with a pure science background showed a slightly higher tendency to choose engineering-related programs, though their interest was generally low across many fields. For example, only a small number of pure science students selected the Bachelor of Civil Engineering Technology (Environmental) with Honors as their first choice, despite being the most represented group among those who avoided the program. This pattern aligns with previous findings that highlight the need for targeted interventions to better align students' interests with technical and vocational education opportunities (Hong, 2021; Huang & Mayisela, 2024; Adams et al., 2024).

Similarly, limited interest was observed for the Bachelor of Civil Engineering Technology (Building Services) with Honors and Bachelor of Civil Engineering Technology (Construction) with Honors, although the latter saw a relatively higher preference among pure science students. This highlights a need to investigate factors such as career perceptions, academic preparedness, and societal expectations influencing these choices (Hong et al., 2022; Shaari et al., 2024c; Ngware et al., 2024). On the other hand, the Bachelor of Electrical Engineering Technology (Electric Power) with Honors received more attention, with 20 students selecting it as their first choice, including 16 from pure science, indicating stronger preferences in this specific area. These variations suggest that program-specific interventions are necessary to address disparities in student interest (Dahri et al., 2024; Alhassan et al., 2024; Ngware et al., 2024).

For the Bachelor of Technology Mechanical Engineering (Automotive) with Honors, the data showed a significant preference, with 27 students, particularly from pure science, selecting it as their first choice. This result underscores the appeal of automotive engineering, which may reflect broader societal trends favoring this specialization. However, programs like Bachelor of Technology Mechanical Engineering (Plant) with Honors and Bachelor of Occupational Safety and Health Technology with Honors received minimal interest, even among pure science students. These findings emphasize the importance of promoting lesser-known programs and highlighting their relevance to modern industry needs (Mesuwini, 2024; Asres & Abebe, 2024; Tekle et al., 2024).

The data further reveals that fields like "others" also contributed significantly to non-selection and selection patterns across programs. For example, in the Bachelor of Technology Mechanical Engineering (Manufacturing) with Honors, students from "others" made up a large proportion of those who did not select the program but also contributed notably to those who did. This suggests that students outside the pure science track may be influenced by unique factors such as personal interest or exposure to related industries. These trends align with research emphasizing the role of socio-emotional skills and exposure in shaping technical education preferences (Dahri et al., 2024; Shaari et al., 2024a; Ngware et al., 2024).

The cross-tabulation results highlight varying preferences for engineering and technology programs, with pure science students demonstrating stronger inclinations toward specific fields like electrical power and automotive engineering. However, the generally low interest across most programs points to a broader challenge in attracting students to technical and vocational education and training (TVET). Addressing these issues requires a multifaceted approach, including awareness campaigns, curriculum alignment, and career counseling to better match students' aspirations with the opportunities in engineering and technical fields (Hong, 2021; Adams et al., 2024; Ngware et al., 2024).

The findings from the cross-tabulation data highlight significant insights into the relationship between students' field of study during their SPM and their career preferences. These results provide an understanding of the career choices prioritized by students from pure science and other streams, demonstrating varied inclinations across technical and non-technical fields.

In the technician category, the preference for this career was relatively low, with only a few students selecting it as their first choice. The dominance of pure science students in this category aligns with findings by Jalil et al. (2024) and Abdul Hamid et al. (2024), who highlighted the growing relevance of technical careers in TVET education but noted that such careers remain less attractive to students. Additionally, Rusli (2024) emphasizes that a lack of awareness about the potential career progression in technical fields contributes to the lower interest among students. On the other hand, the results suggest that pure science students exhibit a slight inclination towards technical careers compared to students from other streams, reflecting a potential alignment with the increasing demand for skilled technicians in modern industries.

For construction Jobs, the data reveal a moderate interest among students, with pure science students slightly leading in prioritization. This is consistent with findings by Hassan et al. (2024) and Ahmad et al. (2024), who

reported that while construction-related fields are essential within the TVET ecosystem, they often fail to attract high levels of interest from students due to perceived physical demands and limited career appeal. Shaari et al. (2024c) and Ahmad et al, (2021) further argue that targeted interventions and educational strategies could enhance the attractiveness of construction-related careers, particularly among pure science students.

The strong inclination of pure science students toward engineering and technology careers is particularly noteworthy. This result is supported by Azizan et al. (2024) and Rajamanickam et al. (2024), who identified engineering and technology as pivotal career pathways that align with Malaysia's industrial and economic goals. Tshong and Yasin (2024) also underscore the importance of equipping students with skills and knowledge in these fields, as they represent critical areas for technological innovation and workforce development. This strong preference reinforces the growing role of TVET institutions in fostering skills for emerging industries (De Wee, 2024).

Interest in automotive services was relatively lower overall, with a slightly higher inclination among pure science students. This finding mirrors conclusions by Sadam and Al Mamun (2024) and Dahri et al. (2024), who observed that while automotive services represent an integral part of the technical education framework, they often rank lower in students' career priorities due to limited exposure and perceived scope for advancement. However, the preference among pure science students suggests an opportunity for targeted engagement strategies to attract more students to this field.

Lastly, the entrepreneurship and commerce category demonstrated a balanced yet moderate level of interest, with the majority of selections coming from students in the others category. This finding is consistent with studies by Bakar et al. (2024) and Asojan and Omar (2024), which highlight the increasing emphasis on entrepreneurial skills within the TVET curriculum. However, challenges such as a lack of entrepreneurial confidence and unclear career pathways remain obstacles to broader student engagement in this domain, as noted by Pirzada et al. (2022) and Zhi and Atan (2021).

3.3 TVET-University Alignment Model

The results obtained underscore the diversity in career preferences across different student streams, emphasizing the need for tailored interventions to bridge gaps and enhance the attractiveness of underrepresented fields. These findings align with previous studies, reinforcing the importance of strategic reforms in TVET education to meet evolving student and industry needs. Figure 1 shows the TVET-University Alignment Model. This name reflects the focus on aligning technical and vocational education and training (TVET) matriculation choices with university program enrollment. It also highlights the evaluation and modeling aspects central to the research.

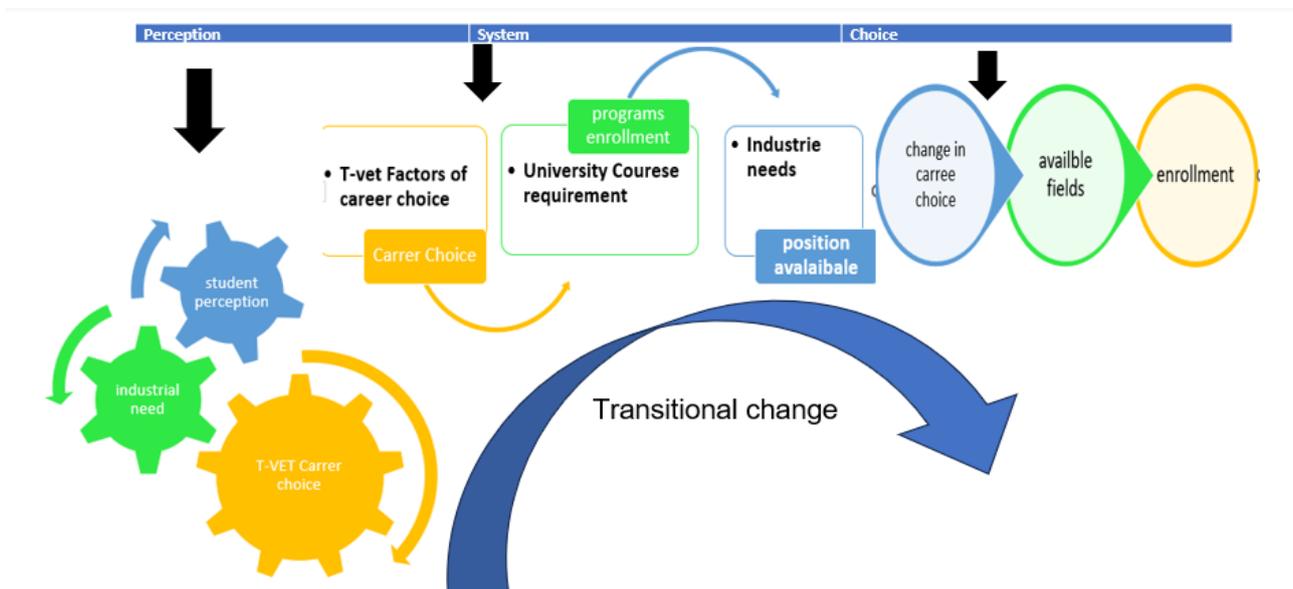


Fig. 1 TVET-University Alignment Model (TUAM)

Based on fig. 1, perception carries important spectrum towards choices of programs offered at the universities level. Figure 2 shows the mapping model for TVET matriculation program with technical degree program. The eight technical degree programs are the most popular chosen program from the respondents. Bachelor of Engineering Technology in Rail Trasport is the first ranking choice among the respondents.

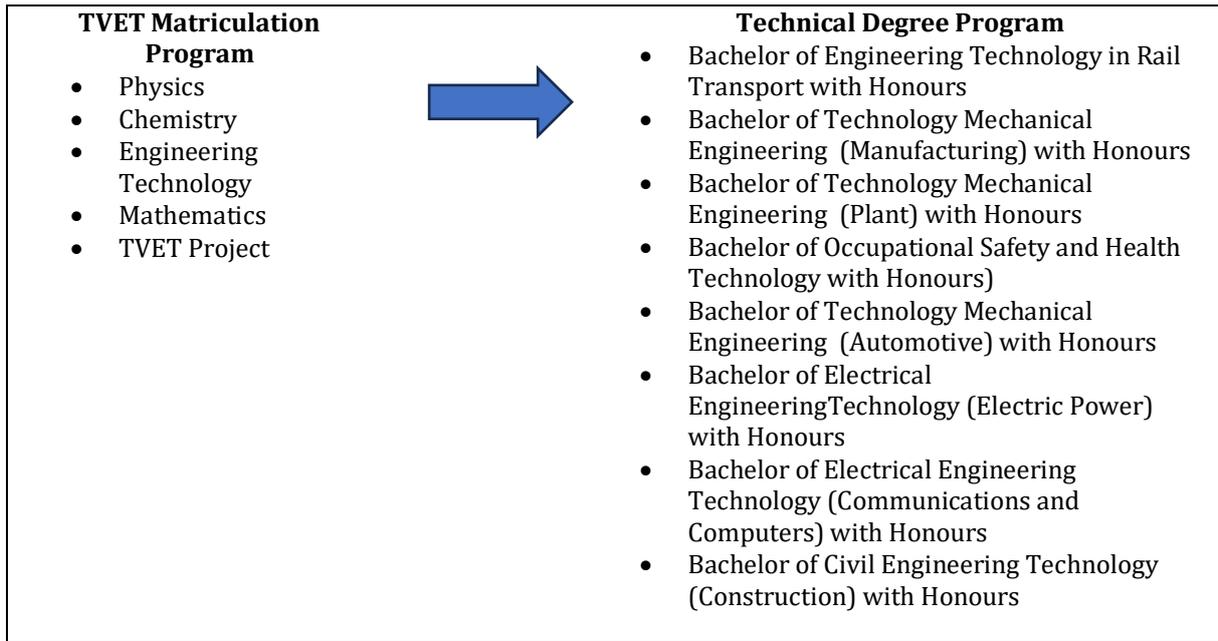


Fig. 2 The mapping model for TVET matriculation program with technical degree program

4. Conclusion and Recommendations

The findings of this study provide valuable insights into the career preferences of students based on their SPM field of study, with notable trends emerging across various categories. Students from the pure science stream demonstrated a strong inclination toward engineering and technology, reflecting the alignment of their academic foundation with technical and engineering-oriented careers. Similarly, there was moderate interest in technician, ICT, and automotive services within the pure science stream, while entrepreneurship and commerce garnered lower interest. Conversely, students from the others category exhibited a broader range of preferences, with a notable interest in engineering and technology, automotive services, and construction jobs. This diversity in preferences highlights the varying aspirations and career trajectories influenced by students' academic backgrounds and exposure to vocational training opportunities. These findings align with previous studies that emphasize the importance of aligning technical and vocational education with industry demands and student interests. For instance, Jalil et al. (2024) highlighted the role of augmented reality in TVET as a tool for enhancing career alignment and interest in technical fields. Similarly, Shaari et al. (2024a) discussed the behavioral dimensions influencing Malaysian youth's learning preferences, indicating that tailored approaches can better meet students' career aspirations. Rusli (2024) further emphasized the need for inclusive TVET programs that cater to diverse student backgrounds, which is evident in the preferences of the others category students in this study. Moreover, Ahmad et al. (2024) underscored the importance of academic enhancement programs in encouraging participation in vocational fields among low-income students, which can address gaps in career interest and skill development. These insights collectively reinforce the importance of targeted interventions and customized curriculum designs to align students' academic experiences with their career aspirations. In conclusion, this study underscores the significance of considering students' academic backgrounds and career priorities in the development of educational policies and vocational training programs. The distinct preferences observed between pure science and others categories suggest a need for diversified strategies to support students' career pathways. By fostering stronger links between academic curricula, vocational training, and industry needs, institutions can better prepare students for the workforce while addressing their unique aspirations and potential. This study serves as a foundation for future research to explore the underlying factors shaping students' career choices and the effectiveness of tailored interventions in meeting the demands of an evolving job market.

Based on the findings of this study, several recommendations can be proposed to better align students' academic preparation with their career aspirations and the demands of the labor market. Firstly, educational institutions should strengthen career counseling services, especially for students in the pure science and others categories, to provide them with clear guidance on aligning their academic strengths with industry needs. This includes exposing students to diverse career pathways, particularly in engineering and technology, ICT, automotive services, and construction jobs, through industry partnerships, internships, and mentorship programs. Secondly, curriculum designers should integrate more technical and vocational elements into academic programs, particularly for students in the others category, to broaden their career prospects and prepare them

for high-demand technical roles. Incorporating hands-on experiences and modern technologies, such as augmented reality in TVET, can also enhance students' interest and competency in technical fields.

Additionally, policymakers should prioritize the development of inclusive vocational training programs that cater to the diverse needs of students, particularly those from low-income backgrounds. These programs should focus on reducing barriers to participation, such as financial constraints, and ensure equitable access to resources and opportunities. Furthermore, collaborations between schools, technical institutions, and industries should be encouraged to create pathways that bridge the gap between education and employment, ensuring students are equipped with the skills needed in the job market. Lastly, continuous monitoring and research should be conducted to understand evolving student preferences and industry trends, enabling the education system to adapt to emerging demands. These recommendations aim to create a more dynamic and responsive education system that supports students in achieving their career aspirations while contributing to economic growth and workforce development. The study led to the recommendation for a comprehensive review and update of the TVET curricula to ensure alignment with university programs and current industry requirements, aiming to improve academic continuity and graduate employability. The study recommends the development of more effective assessment methods that accurately measure skills relevant to industry needs, ensuring that student competencies reflect real-world expectations. It also calls for stronger institutional cooperation between TVET institutions, universities, and industry stakeholders to promote alignment between educational outcomes and labor market demands. Additionally, the enhancement of career guidance systems is emphasized, enabling students to make informed matriculation choices that support both their academic progression and long-term career goals.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **data collection:** Rosziati Ibrahim, Khadijah Md Ariffin, Mazidah Mat Rejab, Sapiee Jamel, Abdul Rasid Abdul Razzaq; **data analysis:** Sani Inusa Milala, Khadijah Md Ariffin; **research finding and results:** Rosziati Ibrahim, Khadijah Md Ariffin, Mazidah Mat Rejab, Sapiee Jamel, Abdul Rasid Abdul Razzaq; **draft manuscript preparation:** Sani Inusa Milala, Rosziati Ibrahim, Khadijah Md Ariffin, Mazidah Mat Rejab, Sapiee Jamel, Abdul Rasid Abdul Razzaq. All authors reviewed the results and approved the final version of the manuscript.*

References

- Abd Karim, R., & Mustapha, R. (2022). TVET student's perception on digital mind map to stimulate learning of technical skills in Malaysia. *Journal of Technical Education and Training*, 14(1), 1-13: <https://doi.org/10.30880/jtet.2022.14.01.001>
- Abd Majid, F., Sharil, W. N. E. H., Yau, S. A., & Kamaruzaman, M. F. (2024). Strategies in Developing Graduate Employability Skills: An Investigation on a TVET Programme in a Malaysian Public University. *Asian Journal of University Education*, 20(3), 807-821.
- Abdul Hamid, R., Ismail, I. M., & Wan Yahaya, W. A. J. (2024). Augmented reality for skill training from TVET instructors' perspective. *Interactive Learning Environments*, 32(4), 1291-1299. <https://doi.org/10.1080/10494820.2022.2118788>
- Adams, A. Z., Intsiful, E., Zagoon-Sayeed, H., & Essuman, A. (2024). Examining public perception on Technical and Vocational Education and Training enrolment in Ghana. *International Journal of Training Research*, 22(2), 147-164. <https://doi.org/10.1080/14480220.2023.2222943>
- Ahmad, S. R., Samsudin, M., Adenan, M. N. F., Zulkifli, M. F., & Suhaimi, A. I. H. (2024). Evaluation of Academic Enhancement Program for Low-Income Students in Rural Malaysia. *Journal of Technical Education and Training*, 16(2), 241-251. <https://doi.org/10.30880/jtet.2024.16.02.021>
- Ahmad, W. N. W., & Idrus, A. A. (2021). TVET Students' Perception towards Online Distance Learning (ODL) during Pandemic COVID-19: Mental Health Perspective. *Evaluation Studies in Social Sciences*, 2, 64-70. <https://doi.org/10.37134/esss.vol2.sp.11.2021>

- Alhassan, H., Osei, M., Asinyo, B. K., & Ofori, E. A. (2024). Teacher colleges of education trainees' perception of the contribution of TVET to socio-economic development: the case of Tamale College of Education. *Cogent Education*, 11(1), 2393493. : <https://doi.org/10.1080/2331186X.2024.2393493>
- Amdan, M. A. B., Janius, N., & Kasdiah, M. A. H. B. (2024). Concept paper: Efficiency of Artificial Intelligence (AI) tools for STEM education in Malaysia. *International Journal of Science and Research Archive*, 12(2), 553-559. : <https://doi.org/10.30574/ijrsra.2024.12.2.1273>
- Asojan, L. M., & Omar, M. K. (2024) Relationship between Self-Efficacy and Learning Motivation towards the Acceptance of E-Learning among TVET Students *International Journal Of Academic Research In Business And Social Sciences* Vol. 1 4(6), 784-759. : <http://dx.doi.org/10.6007/IJARBS/v14-i6/20853>
- Asres, A. M., & Abebe, A. S. (2024). Teachers' Competence in The Educational Assessment of Students in A Competence Based Education in Amhara Region, Ethiopia: The Case of TVET Teachers and Assessors. <http://doi: 10.20944/preprints202402.1212.v1>
- Ayanwale, M. A., Molefi, R. R., & Matsie, N. (2023). Modelling secondary school students' attitudes toward TVET subjects using social cognitive and planned behavior theories. *Social Sciences & Humanities Open*, 8(1), 100478. <https://doi.org/10.1016/j.ssaho.2023.100478>
- Azeem, N., Omar, M. K., Rashid, A. M., & Abdullah, A. (2022). The secondary school students' interest toward the TVET programs: Demographic differences. *International Journal of Learning, Teaching and Educational Research*, 21(4), 80-96. <https://doi.org/10.26803/ijlter.21.4.5>
- Azizan, N., Omar, A. F., Yusof, M. A. M., Mehat, N. D., & Hamidi, S. R. (2024). Assessing Psychological Well-being in TVET Stakeholders: Implications for Sustainable Workforce Development. *Journal of Technical Education and Training*, 16(2), 1-12. : <https://doi.org/10.30880/jtet.2024.16.02.001>
- Bakar, K. A., Mohamad, M. A., Ahmad, N. N., Sahlan, M. K., & Harahap, A. Z. M. K. (2024). Entrepreneurial Intention Challenge in TVET Education. *Journal of Technical Education and Training*, 16(1), 148-160. : <https://doi.org/10.30880/jtet.2024.16.01.011>
- Chear, S. L. S., & Arifin, M. (2024). Technical and vocational education and training prospect for higher learning institution. *Quantum Journal of Social Sciences and Humanities*, 5(3), 144-160. <https://doi.org/10.55197/qjssh.v5i3.377>
- Dahri, S., Chinedu, C. C., Gull, M., & Ortiz, R. V. C. (2024). Examining the Social-emotional Skills of TVET Educators and Students: A Dual Perspective Analysis. *Journal of Technical Education and Training*, 16(1), 131-147. <https://doi.org/10.30880/jtet.2024.16.01.010>
- De Wee, M. F. (2024). Exploring the design and implementation of an entrance readiness assessment and its relationship with performance outcomes among first year TVET college students (Publication No. 10566/16245). (Doctoral dissertation, University of the Western Cape). *Philosophiae Doctor - PhD (Post-School Studies)*
- Hashim, S. (2024). Students' Soft Skills and Their Readiness Towards Industrial Revolution in Technical and Vocational Education and Training (TVET): A Malaysian Sight. *Online Journal for TVET Practitioners*, 9(1), 37-51. : <https://doi.org/10.30880/ojtp.2024.09.01.004>
- Hashim, S., Zakariah, S. H., Taufek, F. A., Zulkifli, N. N., Lah, N. H. C., & Murniati, D. E. (2021). An observation on implementation of classroom assessment in technical and vocational education and training (TVET) subject area. *Journal of Technical Education and Training*, 13(3), 190-200.: <https://doi.org/10.30880/jtet.2021.13.03.019>
- Hassan, S., Zakaria, M. H., Shamsudin, M. F., Omar, Y., & Fokeena, W. B. (2024). Development of a Student Loyalty Model for TVET Higher Learning Institution (HLI) with Integration of Service Quality, Corporate Image and Satisfaction Using the PLS-SEM Approach. In *Innovative Technologies for Enhancing Experiences and Engagement* (pp. 125-133). Cham: Springer Nature Switzerland. https://link.springer.com/chapter/10.1007/978-3-031-55558-9_15
- Hong, C. M. (2021). Students' tendencies in choosing technical and vocational education and training (TVET): Analysis of the influential factors using analytic hierarchy process. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(3), 2608-2615.
- Hong, C. M., Ch'ng, C. K., Roslan, N., & Raihana, T. (2023). Predicting Students' Inclination to TVET Enrolment Using Various Classifiers. *Pertanika Journal of Science & Technology*, 31(1). <https://doi.org/10.47836/pjst.31.1.28>

- Hong, C. M., Ch'ng, C. K., & Roslan, T. R. N. (2022). Application of the analytic hierarchy process (AHP) on factors that affect students' enrollment in TVET based on TVET instructors and students' perspectives. *Journal of Language and Linguistic Studies*, 18(1).
- Huang, C. W., & Mayisela, T. (2024). Exploring the possibilities and constraints of online assessment to advance open learning in a South African TVET college. *Open Learning as a Means of Advancing Social Justice*, 131. https://doi.org/10.47622/9781928502425_5
- Jalil, M. Z. A., Razali, N., Rahman, K. A. A., Rahim, M. B., & Abd Samad, N. (2024). Development and Evaluation of an Augmented Reality Chiller System Simulator for TVET Teaching. *Journal of Technical Education and Training*, 16(1), 40-55. <https://doi.org/10.30880/jtet.2024.16.01.004>
- Makochekeka, A., & Mahuyu, J. (2021). TVET Offering Institutions' Perceptions on TVET Education: The Case of Zimbabwe. *The African Review*, 48(1), 168-195. https://brill.com/view/journals/tare/48/1/article-p168_8.xml
- Masek, A., Ismail, A., Nurtanto, M., & Hasim, S. (2021). Enhancing Professional Knowledge and Self-Concept Through Self and Peer Assessment Using Rubric: A Case Study for Pre-Services TVET Teachers. *Journal of Engineering Education Transformations*, 35(1), <https://doi.org/10.16920/jeet/2024/v38i2/24186>
- Mesuwini, J. (2024). South African TVET Students' Perceptions of Their Online Learning Experiences and Challenges: A Pilot Study. *International Journal of Learning, Teaching and Educational Research*, 23(9), 592-616.
- Nawi, M. Z. M., Ahmad, N. A., Ghazali, A. M., & Anuar, M. H. M. A. (2024). Systematic Literature Review Examining the Impact of Societal Factors on Student's Intention to Enrol in Technical and Vocational Education and Training (tvET) programs at the tertiary level. *International Journal of Academic Research in Business and Social Sciences* vol. 14 (5) <https://doi.org/10.6007/IJARBS/v14-i5/21533>
- Ngware, M. W., Ochieng', V., Kiroro, F., Hungi, N., & Muchira, J. M. (2024). Assessing the acquisition of whole youth development skills among students in TVET institutions in Kenya. *Journal of Vocational Education & Training*, 76(1), 197-222. <https://doi.org/10.1080/13636820.2022.2029544>
- Nkwanyane, T. P., Makgato, M., & Ramaligela, S. M. (2022). Inquiry into Students' Perceptions of Civil and Building Construction Curricula in South African TVET Colleges. *Universal Journal of Educational Research*, 10(6), 369-377. <https://doi.org/10.13189/ujer.2022.100601>
- Nordin, D. N., & Omar, M. K. (2024). Factors Influencing TVET Readiness Among Students at Public Secondary School: Exploring Interest, Motivation, and Self-Efficacy. *Asian Journal of Vocational Education and Humanities*, 5(1), 10-19. <https://doi.org/10.53797/ajvah.v5i1.2.2024>
- Omar, M. K., Rauf, M. A., Ismail, N., Rashid, A. M., Puad, H. M., & Zakaria, A. (2020). Factors on deciding TVET for first choice educational journey among pre-secondary school student. *European Journal of Molecular & Clinical Medicine*, 7(3), 609-627. https://www.researchgate.net/profile/Muhammad-Omar/publication/346199349_Factors_On_Deciding_TVET_For_First_Choice_Educational_Journey_Among_Pre-Secondary_School_Student/links/5fbcc76e458515b797645854/Factors-On-Deciding-TVET-For-First-Choice-Educational-Journey-Among-Pre-Secondary-School-Student.pdf
- Pirzada, G., Muhammad, Y., & Mahmood, A. (2022). Assessment challenges faced by technical vocational education (TVET) stakeholders in Pakistan: Stakeholders' perspectives. *Research Journal of Social Sciences and Economics Review*, 3(4), 17-26. [https://doi.org/10.36902/rjsser-vol3-iss4-2022\(17-26\)](https://doi.org/10.36902/rjsser-vol3-iss4-2022(17-26))
- Rajamanickam, S., Che'Rus, R., Raji, M. N. A., Mina, H., & Vebrianto, R. (2024). Enhancing TVET Education for the Future: A Comprehensive Review of Strategies and Approaches. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 69-89. <https://doi.org/10.37934/araset.56.1.6989>
- Ramaligela, S. M. (2022). Student's Perceptions of assessment legitimacy in TVET Sector in South Africa. In *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 452-467). IGI Global. <https://doi.org/10.4018/978-1-6684-5696-5.ch026>
- Rodzi, R. M., Basri, N. E. A., & Mohd, Z. (2024). The Cause of Student Dropout from TVET at Malaysia Industrial Training Institute. <https://dx.doi.org/10.6007/IJARBS/v14-i9/22740>
- Rusli, N. A. (2024). A Comparative Analysis of Technical and Vocational Education and Training (TVET) for Special Needs Students in Malaysia and Hungary. *Online Journal for TVET Practitioners*, 9(1), 14-23. <https://doi.org/10.30880/ojtp.2024.09.01.002>
- Sadam, N. Y. S., & Al Mamun, M. A. (2024). Polytechnic students' perceived satisfaction of using technology in the learning process: The context of Bangladesh TVET. *Heliyon*, 10(16).

- Shaari, R., Haron, M. Z., Abdul Wahab, S. R., Abu Samah, I. H., & Yusof, J. (2024a). Malaysian youth's propensity towards ambidextrous learning: an in-depth analysis of behavioural insights dimensions. *Humanities and Social Sciences Communications*, 11(1), 1-7. <https://doi.org/10.1057/s41599-024-03475-7>
- Shaari, R., Haron, M., Samah, I. H. A., & Sarip, A. (2024b). Exploring factors influencing upper secondary school students' intention towards TVET: insights from Peninsular Malaysia. *International Journal of Technology and Design Education*, 1-23. <https://doi.org/10.6084/m9.figshare.22756817>.
- Shaari, R., Sarip, A., Royo, M. A., & Haron, M. Z. (2024c). Attitude towards technical and vocational education and training (TVET): examining the effect of behavioral insights approach. *International Journal of Training Research*, 1-16. <https://doi.org/10.1080/14480220.2024.2304830>
- Shafieek, M. S. M., Ismail, A., & Razali, S. S. (2024). Digital Learning Content in Automotive Technology Program Towards Student Cognition in TVET: A Partial Experiment. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 38(2), 142-152.
- Tekle, A., Areaya, S., & Habtamu, G. (2024). Stakeholders' perceptions of occupational competency assessment and certification systems in Ethiopia's TVET programs. *Higher Education, Skills and Work-Based Learning*. <https://doi.org/10.1108/HESWBL-02-2024-0030>
- Tlapan, T., & Myeki, Z. (2020). Students perception towards technical education and vocational training (TEVT) colleges in the Greater Buffalo City metropole. *Global Media Journal*, 18(35), 1-4.
- Tshong, P. K., & Yasin, R. M. (2024) TVET Educational Learning Strategies and their Impact on Students: A Systematic Literature.
- Tun, K. C., Aung, N. Z., & Oo, S. K. N. (2021). Awareness, perception and preparation of TVET students, teachers and managers for industry 4.0 in Myanmar. *TVET@ Asia*, 17, 1-21. https://www.sea-vet.net/images/seb/e-library/doc_file/1246/sea-vet-publications-awareness-perception-and-preparation-of-tvet-students-teachers-and-managers-for-industry-40-in-myanmar.pdf
- Yau, A., & Sharil, N. E. H. (2024) Challenges in TVET Education in Higher Learning Institutions. : <http://dx.doi.org/10.6007/IJARBSS/v14-i9/22304>
- Yusop, M. S. R., Rasul, M. S., Mohammad Yasin, R., & Hashim, H. U. (2023). Identifying and Validating Vocational Skills Domains and Indicators in Classroom Assessment Practices in TVET. *Sustainability*, 15(6), 5195. . <https://doi.org/10.3390/su15065195>
- Zawawi, M. A. H., & Sern, L. C. (2024). Students' Awareness, Acceptance, and Attitude Towards the Implementation of Green TVET. *Online Journal for TVET Practitioners*, 9(2), 16-24. <https://penerbit.uthm.edu.my/ojs/index.php/oj-tp/article/download/16844/6750>
- Zhi, W. W., & Atan, S. A. (2021). Factors influencing students' attitudes towards technical and vocational education and training (TVET). *Research in Management of Technology and Business*, 2(1), 335-348. : <https://doi.org/10.30880/rmtb.2021.02.01.024>