VTE VOCATION, TECHNOLOGY & EDUCATION

ORIGINAL ARTICLE

Bridging the skills gap: Technical and vocational education and training student competencies and labor market alignment in Oman

Ali Sulaiman Talib Al Shuaili*

Department of Educational Studies, Faculty of Human Development, Universiti Pendidikan Sultan Idris (UPSI), Tanjung Malim 35900, Perak Darul Ridzuan, Malaysia

ABSTRACT

This study investigates the vocational and technical skills of final-year students enrolled in Omani government vocational colleges and the extent to which these skills align with labor market needs. The research aligns with the goals of Oman Vision 2040, which emphasizes workforce readiness and economic diversification. Despite reforms in technical and vocational education and training (TVET), employers continue to report skill mismatches. A quantitative cross-sectional design was used in this study. Four hundred students from eight public vocational colleges were surveyed. A validated questionnaire measured three dimensions: vocational skills, technical skills, and alignment with labor market demands. The data were analyzed using descriptive statistics, *t*-tests, analysis of variance (ANOVA), and Pearson's correlation coefficient. Students reported moderate-to-high levels of vocational (Mean [M] = 3.62) and technical (M = 3.55) skills, but perceived alignment with labor market demands (M = 3.40) was slightly lower compared to their reported vocational and technical skills. Although no significant gender differences were found, technical skills differed significantly across specializations, with engineering students scoring the highest. A moderate positive correlation ($r = 0.57$, $P < 0.001$) was found between skill levels and perceived labor market alignment. While students perceived themselves to be moderately skilled, gaps remained between the types and levels of skills they possessed, and the specific competencies employers required. Enhancing practical training, integrating soft skills, and expanding work-based learning to improve graduate employability are recommended. This study's insights can inform policymakers and educators aiming to improve TVET outcomes in Oman.

Key words: Oman, technical and vocational education and training, vocational skills, technical skills, labor market alignment, employability

INTRODUCTION

In the twenty-first century, technical and vocational education and training (TVET) has been globally recognized as a strategic priority for fostering human capital and addressing skills gaps in dynamic labor markets (OECD, 2019; UNESCO, 2021). According to the International Labour Organization (2020), more than 73 million young people worldwide remain unemployed, and employers report that a considerable proportion of applicants lack essential technical and employability skills. Consequently, many countries have intensified their efforts to upgrade their TVET systems to address rapidly evolving industry demands. Despite these global reforms, the OECD (2019) warns of a "global reskilling emergency", predicting that by 2030, more than one billion workers will require new skills to meet evolving job requirements.

***Corresponding Author:**
Ali Sulaiman Talib Al Shuaili, Department of Educational Studies, Faculty of Human Development, Universiti Pendidikan Sultan Idris (UPSI), Kampus Sultan Azlan Shah (KSAS), Jalan UPSI, Proton City, 35900 Tanjong Malim, Perak Darul Ridzuan, Malaysia. Email: ali.s.alshuaili@gmail.com; https://orcid.org/0009-0009-9946-1184
Received: 17 May 2025; Revised: 11 August 2025; Accepted: 16 September 2025
https://doi.org/10.54844/vte.2025.0991

In Oman, TVET plays a pivotal role in the national development strategy, Oman Vision 2040, which seeks to reduce reliance on oil and foster a competitive, knowledge-based economy (Mathew, 2023; Oman Vision 2040 Implementation Follow-up Unit, 2025). Approximately 65% of Oman's population is under the age of 30 (Oman's National Centre for Statistics and Information, 2025), creating substantial pressure to establish sustainable employment pathways for young people. While the Ministry of Higher Education, Research and Innovation has prioritized the expansion and quality enhancement of vocational colleges, a persistent gap remains between the skills provided by these institutions and employers' requirements (Dola & Goli, 2023; Mathew, 2023). This gap prevents educators and policymakers from implementing targeted interventions and ensuring graduates' readiness for the labor market.

The objectives of this study are to examine student skill levels, evaluate the technical skills acquired within their specializations, determine the alignment of student competencies with industry demands, and explore demographic variations based on gender, field of study, and academic level. The research is guided by three questions: (1) What is the level of vocational skills possessed by students relative to labor market expectations? (2) What is the level of technical skills attained by students in relation to industry demands? (3) To what extent do vocational college programs in Oman meet local labor market requirements?

These questions are informed by prior research on skill mismatches in TVET contexts and Oman's Vision 2040 priorities for workforce readiness. Accordingly, the study's hypotheses test for demographic and specialization-related differences, as well as the relationship between acquired skills and alignment with labor market needs.

LITERATURE REVIEW

Global perspectives on TVET reform

Countries such as China, Malaysia, the United States, and Thailand have implemented extensive reform initiatives in TVET. In China, reforms since the 1950s have driven industrial and technological advancement, although skill mismatches persist (T. Jing *et al.*, 2022; Li, 2019). Malaysia has integrated employability and entrepreneurship training into vocational curricula, yet soft skills gaps and limited industry engagement remain (Omar *et al.*, 2021; Prayitno *et al.*, 2024). In the United States, academic and vocational integration has been promoted through programs such as Tech-Prep and Advanced Technological Education (Grubb *et al.*, 1991; U. S. Department of Education, 2018). Despite these reforms, international organizations highlight the urgent need for inclusive, competency-based frameworks to close persistent skills gaps (OECD, 2019; UNESCO, 2021).

In addition to vocational and technical competencies, employability or "soft" skills have been increasingly recognized as critical to graduate success in the labor market. These include communication, collaboration, problem-solving, critical thinking, adaptability, and emotional intelligence (Moore, 2022; Morjai *et al.*, 2018; Prayitno *et al.*, 2024). These competencies enhance a graduate's ability to thrive in dynamic, team-oriented, and customer-focused work environments (Marzuki *et al.*, 2022). Nonetheless, research has consistently identified a gap between employer expectations and graduate preparedness in soft skills, which is evident across both developed and developing TVET systems (Le, 2014; Machumu *et al.*, 2016).

TVET challenges in the Gulf and Oman

In the Gulf region, challenges mirror global trends but are compounded by demographic pressures and reliance on expatriate labor (Gulf Cooperation Council, 2004). In Oman, studies report that graduates often lack adequate technical proficiency, practical experience, and employability skills such as problem-solving, communication, and teamwork (Mathew, 2023; Mendoza *et al.*, 2025; OECD, 2019). For example, Dola and Goli (2023) found that while English language training at Ibri Vocational College improved communication skills, workplace readiness remained low. Mendoza *et al.* (2025) identified gaps in safety knowledge and technical competencies among marine engineering students, highlighting the need for experiential learning. Similarly, Prayitno *et al.* (2024) identified core automotive technology competencies using confirmatory factor analysis, reinforcing the need for structured assessment frameworks.

Identified research gap

International findings underscore that even advanced TVET systems struggle to achieve full labor market alignment, and Oman is no exception (T. Jing *et al.*, 2022; Li, 2019). While the expansion of vocational colleges has been prioritized, no comprehensive national study has systematically assessed student skills relative to labor market requirements across all specializations. This gap limits the ability to design responsive curricula and industry partnerships. Addressing this evidence gap is essential for aligning education with economic diversification goals and ensuring sustainable workforce development.

CONCEPTUAL FRAMEWORK

The conceptual framework of this study is grounded in

the relationship between vocational and technical skills acquisition and labor market alignment. TVET programs are designed to equip students with job-relevant competencies that enhance their employability prospects (Ministry of Manpower-Sultanate of Oman, 2018; UNESCO, 2021). In Oman, TVET institutions play a vital role in preparing the national workforce to meet the demands of an increasingly competitive and dynamic labor market. The Ministry of Higher Education, Research and Innovation supervises eight government vocational colleges tasked with implementing competency-based curricula designed to reduce the skills gap between educational outcomes and industry requirements (Ministry of Manpower-Sultanate of Oman, 2018; Omar & Kamaruzaman, 2024; Omar *et al.*, 2021).

Human capital theory provides a theoretical lens through which to conceptualize the value of TVET. It posits that investment in education enhances worker productivity and national economic growth (Al-Hiti, 2008; Becker, 1993). Complementing this, skills mismatch theory addresses structural unemployment resulting from misalignments between educational outcomes and labor market needs (Abu Ras, 2023; International Labour Organization, 2020). These frameworks underscore the importance of aligning educational systems with evolving job requirements to avoid underemployment and reliance on foreign labor (Bailey, 2003; Dola & Goli, 2023; Mathew, 2023).

Additionally, the study draws on the competency-based education (CBE) framework, which emphasizes students' mastery of measurable skills rather than time spent in instruction (Li, 2019; UNESCO, 2020). CBE fosters industry-linked, outcome-driven learning in which students progress through demonstrated competencies. In countries such as Malaysia and Thailand, CBE has improved the readiness of vocational graduates (Abdullah *et al.*, 2020; Abu Asab, 2005).

In Oman, however, CBE implementation remains limited. This is reflected in research findings such as those of Mendoza *et al.* (2025), which identified critical gaps in workplace safety competencies among marine engineering students gaps that a well-implemented CBE approach could potentially address.

Signaling theory (Spence, 1973) further supports the framework by positing that educational credentials act as indicators of graduate potential. When formal qualifications fail to convey actual workplace readiness, as noted by Dola and Goli (2023), employers often express dissatisfaction. Social cognitive career theory (Li, 2019) also plays a role, asserting that career choices and employability are influenced by self-efficacy and outcome expectations, which in the TVET context relate to students' confidence in their vocational and technical abilities.

The conceptual foundation of this study rests on the interrelationship between vocational skills, technical skills, employability competencies, and labor market alignment, which are influenced by demographic and academic factors. These constructs define the variables and relationships that guide the investigation of skills preparedness and gaps among vocational college students in Oman. Vocational skills refer to practical competencies and manual proficiencies essential for specific trades or occupations, such as machinery operation, electrical work, and technical procedures (Selane & Odeku, 2024). Vocational education aims to develop these capabilities to enable immediate application in workplace settings (Saadati & Celis, 2023). By contrast, technical skills involve specialized expertise in technologies, software, diagnostic tools, and engineering systems. In fields such as automotive and marine engineering, these skills include mastery of equipment maintenance, safety protocols, and complex operational tasks (Nasir *et al.*, 2011; Spence, 1973).

Although vocational and technical skills are closely linked, they represent distinct focuses on manual versus technological proficiencies. Equally critical are employability skills often referred to as soft skills, including communication, collaboration, problem-solving, critical thinking, adaptability, and emotional intelligence (Moore, 2022; Morjai *et al.*, 2018; Prayitno *et al.*, 2024).

Labor market alignment refers to the extent to which educational outputs meet current and anticipated industry needs (Abiodun-Oyebanji & Ojetunde, 2016; Ihsan *et al.*, 2025). An aligned TVET system minimizes skills mismatches between graduate capabilities and employer expectations, which can contribute to unemployment, underemployment, or overreliance on expatriate labor (Halabi, 2017; Huma *et al.*, 2022). In Oman, the continuing reliance on foreign labor in technical sectors underscores the urgency of addressing this challenge.

The conceptual model of this study (Figure 1) illustrates the hypothesized relationships between the independent variables (vocational and technical skills) and the dependent variable (perceived alignment of these skills with labor market demands).

This model is underpinned by human capital theory, skills mismatch theory, signaling theory, and CBE frameworks. It posits causal relationships that explain student preparedness for labor market demands. Demographic variables, such as gender, field of study, and academic level, are expected to influence students' self-reported levels of vocational and technical skills,

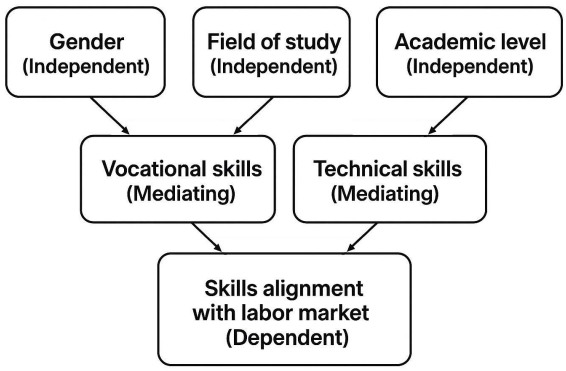

Figure 1. Proposed conceptual model illustrating relationships between demographic factors, student skill acquisition, and labor market alignment.

reflecting their own perceptions of readiness for the labor market. These skills, in turn, mediate the relationship between demographics and perceived skills alignment with labor market needs by influencing how factors such as gender, field of study, and academic level shape students' ability to acquire, apply, and demonstrate competencies valued by employers (Barabasch & Rauner, 2012; Becker, 1993; Boochever *et al.*, 2023).

The inclusion of demographic variables such as gender, field of study, and academic level in the conceptual model is informed by both theoretical and contextual considerations. Prior research has indicated that these factors can influence students' exposure to training opportunities, access to resources, and perceptions of preparedness for employment (Boochever *et al.*, 2023; Omar *et al.*, 2021). In the Omani context, variations across specializations (*e.g.*, engineering, business, and marine sciences) and academic levels (*e.g.*, second *vs.* final year) may affect the extent and depth of practical and technical skill acquisition. Gender was also included to explore potential disparities in TVET outcomes considering the government's focus on equitable educational access under Vision 2040. Thus, these variables are essential for understanding the nuanced ways in which student characteristics shape skill development and labor market alignment.

This structural model serves as a theoretical foundation for the study and as a guide for interpreting the relationships between variables. The framework facilitates the descriptive-analytical methodology and supports the hypothesis testing conducted in this research. By integrating insights from international TVET literature and adapting them to Oman's context, the conceptual framework offers a comprehensive lens for data interpretation. It also informs curriculum design, teaching strategies, and institutional reforms aimed at reducing skills mismatches and improving graduate employability across Oman.

METHODOLOGY

Research design

In this study, a quantitative cross-sectional descriptive survey design was adopted to obtain comprehensive and standardized data from a large and diverse student population in Oman, enabling a clear snapshot of TVET student competencies and their perceived alignment with labor market needs (Creswell, 2014; Krejcie & Morgan, 1970).

The rationale for employing this design was to systematically document student perceptions and self-assessments across a wide geographical and institutional distribution, which would have been impractical using purely qualitative methods such as interviews. A structured questionnaire was selected as the primary data collection tool due to its efficiency in obtaining standardized responses from a large number of participants within a limited timeframe and under budget constraints (Y. Jing *et al.*, 2022). While interviews were considered, they were ultimately rejected due to logistical challenges such as the wide geographical dispersion of institutions, scheduling difficulties with participants, and the significant time and travel costs involved and the potential for interviewer bias, whereby the interviewer's tone, wording, or non-verbal cues may inadvertently influence responses (Creswell & Poth, 2018; Opdenakker, 2006).

The questionnaire comprised three main sections: vocational skills, technical skills, and perceived alignment with labor market requirements. This structure ensured comprehensive coverage of the study's conceptual variables while minimizing respondent fatigue and maximizing response rates. Additional domains, such as personality traits or attitudes, were intentionally excluded to maintain the study's focus and avoid increasing participants' cognitive load.

Unlike studies relying on convenience sampling, this study deliberately adopted a stratified sampling approach to enhance external validity by ensuring equitable participation and capturing diverse perspectives from students across Oman's vocational education system.

Participants and procedure

The study's target population comprised final-year students enrolled during the 2024-2025 academic year at eight government vocational colleges affiliated with the Ministry of Higher Education, Research and Innovation and overseen by the General Directorate of Vocational Training. The colleges included Seeb Vocational College, Al-Khaboura Vocational College for Marine Sciences,

Salalah Vocational College, Sohar Vocational College, Sur Vocational College, Ibri Vocational College, Shinas Vocational College, and Buraimi Vocational College. These institutions represent the core of Oman's technical workforce development.

A stratified random sampling technique was applied to ensure balanced representation by gender, field of study, and institution (Mendoza *et al.*, 2025; Omar *et al.*, 2021). A sample size of 400 students was determined using the formula proposed by Krejcie and Morgan (1970), providing sufficient statistical power to generalize the findings to the total population of approximately 5000 students across the eight colleges. This corresponds to a confidence level of 95% with a margin of error of ± 5%, which is consistent with widely accepted standards for representativeness in survey-based research (Bartlett *et al.*, 2001; Israel, 1992). Random selection within strata minimized researcher bias and maximized representativeness.

Data collection occurred between March and May 2025 using a drop-off and pick-up approach to maximize accessibility and return rates. Of the 450 questionnaires distributed, 410 were returned, and 400 were deemed valid for analysis. Participants demonstrated high cooperation and engagement, with many expressing an interest in contributing to the improvement of vocational education in Oman. The final sample consisted of 55% female and 45% male students, covering a wide range of academic specializations and levels (Ministry of Higher Education, Research and Innovation-Sultanate of Oman, 2025; Oman's National Centre for Statistics and Information, 2025).

Instrument

The data were collected using a structured, self-administered questionnaire specifically developed for this research. The instrument consisted of five sections: demographic information, vocational skills, technical skills, employability skills, and perceived alignment with labor market requirements. The questionnaire items were adapted from validated instruments in prior studies (Y. Jing *et al.*, 2022; Prayitno *et al.*, 2024) and were reviewed by local TVET experts for cultural and contextual appropriateness. This was followed by a pilot test involving 30 final-year students to ensure clarity and internal consistency. Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 1 presents the internal consistency (reliability) and construct validity results of the research instrument. Cronbach's alpha values for the three scales ranged from 0.78 to 0.84, exceeding the widely accepted minimum threshold of 0.70 (Creswell, 2014), thereby confirming the instrument's good internal reliability. Content validity was established through an expert review and consultation prior to data collection.

Table 1: Reliability and validity of the instrument

Dimension	Number of items	Cronbach's alpha
Vocational skills	10	0.81
Technical skills	12	0.78
Skills alignment	8	0.84
Overall instrument	30	0.82

The reliability analysis indicated that the instrument demonstrated high internal consistency across all dimensions. The dimension with the highest reliability was skills alignment ($\alpha = 0.84$), which is particularly important, as this construction directly addresses the critical focus of labor market readiness. The overall Cronbach's alpha for the complete instrument was 0.82, confirming its suitability and reliability for academic research.

Data analysis

The quantitative data collected were analyzed using IBM's SPSS Statistics version 28. Descriptive statistical methods, including frequencies, means (M), and standard deviations (SD), were utilized to summarize the participants' demographic profiles and to assess the overall distribution of vocational, technical, and employability skills among the respondents.

To address the research hypotheses, appropriate inferential statistical techniques were applied. Specifically, independent samples *t*-tests were conducted to examine potential differences in skill levels based on gender, and one-way analysis of variance (ANOVA) was employed to explore differences across students' academic specializations. Furthermore, Pearson product-moment correlation analysis was performed to investigate the strength and direction of the relationship between students' perceived skill levels and the extent to which those skills align with labor market demands (T. Jing *et al.*, 2022; Y. Jing *et al.*, 2022; Mendoza *et al.*, 2025).

RESEARCH FINDINGS

The findings are presented in alignment with the three core research questions and their associated hypotheses, with each section addressing the research question and reporting the corresponding statistical analyses.

Prior to answering the main research questions, a descriptive analysis was conducted to outline the demographic characteristics of the sample and to provide a general overview of the students' self-assessed competencies. As shown in Table 2, the sample of 400

Table 2: Demographic characteristics of the sample (*n* = 400)

Variable	Category	Frequency	Percentage (%)
Gender	Male	180	45
	Female	220	55
Specialization	Business	100	25
	Engineering	160	40
	Marine sciences	140	35
Academic level	Year 2	160	40
	Year 3 (final year)	240	60

students was fairly balanced in terms of gender (55% female, 45% male), specialization (25% business, 40% engineering, and 35% marine sciences), and academic year (40% Year 2 and 60% Year 3). This distribution supports the representativeness of the sample and offers a relevant context for interpreting the statistical findings.

Descriptive statistics for the three core dimensions of vocational skills, technical skills, and skills alignment with labor market demands were computed to establish a foundational understanding of perceived competency levels among students. As illustrated in Table 3, students reported slightly higher levels of vocational skills (M = 3.62, SD = 0.52) compared to technical skills (M = 3.55, SD = 0.48). The lowest mean was observed in labor market alignment (M = 3.40, SD = 0.60), suggesting a perceived gap between acquired skills and real-world employability demands. These initial results underscore the importance of further exploring the structural dynamics between training and labor market relevance.

Table 3: Descriptive statistics for the main study dimensions (*n* = 400)

Dimension	Mean	SD
Vocational skills	3.62	0.52
Technical skills	3.55	0.48
Skills alignment with labor market	3.40	0.60

SD, standard deviation.

Vocational skills

Descriptive statistics were calculated to determine the average self-reported level of vocational skills among the students. As shown in Table 3, the mean score for vocational skills was relatively high (M = 3.62, SD = 0.52), suggesting that the students generally felt confident in the practical training they had received. This finding reflects a positive perception of vocational skill acquisition within the institutions surveyed.

To test H1, an independent samples *t*-test was conducted to examine whether significant differences existed between male and female students in terms of vocational skill levels. As reported in Table 4, female students had a slightly higher mean score (M = 3.65, SD = 0.50) than their male counterparts (M = 3.58, SD = 0.54). However, the difference was not statistically significant (t [398] = -1.43, P = 0.153), thus supporting the null hypothesis.

Table 4: Independent samples *t*-test for vocational skills by gender (*n* = 400)

Gender	*n*	Mean	SD	*t*	df	*P*
Male	180	3.58	0.54	−1.43	398	0.153
Female	220	3.65	0.50			

SD, standard deviation.

Technical skills

Descriptive statistics were first examined to determine the students' self-reported technical skill levels. As illustrated in Table 3, the average score for technical skills was (M = 3.55, SD = 0.48), indicating a moderate-to-high level of perceived technical competency among vocational students.

To test H2, a one-way ANOVA was performed to assess whether technical skill levels varied significantly across academic specializations (business, engineering, and marine sciences). As shown in Table 5, students majoring in engineering reported the highest average technical skill score (M = 3.68, SD = 0.45), followed by those in marine sciences (M = 3.52, SD = 0.47) and business (M = 3.42, SD = 0.50).

Table 5: Descriptive statistics of technical skills by academic specialization (*n* = 400)

Specialization	*n*	Mean	SD
Business	100	3.42	0.50
Engineering	160	3.68	0.45
Marine sciences	140	3.52	0.47

SD, standard deviation.

The ANOVA results revealed a statistically significant difference among the three groups, F (2397) = 9.67, P < 0.001, leading to the rejection of the null hypothesis. Further post hoc comparisons using Tukey's Honestly Significant Difference (HSD) test showed that engineering students scored significantly higher in technical skills than both business and marine sciences students (P < 0.05). However, the difference between business and marine sciences students was not statistically significant.

Academic level comparisons

Additional analyses were conducted to examine differences in skill levels between academic levels (Year 2 *vs.* Year 3). As indicated in Table 6, final-year students

scored higher across all three skill dimensions vocational skills, technical skills, and labor market alignment compared to Year 2 students. Statistical tests indicated significant differences in all three domains, with final-year students demonstrating stronger performance overall. These results highlight the potential impact of additional years of study and training on students' perceived competencies.

Table 6: Mean skill scores by academic level (n = 400)

Dimension	Year 2 (n = 160)	Year 3 (n = 240)	t	P
Vocational skills	3.55 (SD = 0.54)	3.67 (SD = 0.49)	−2.21	0.028
Technical skills	3.48 (SD = 0.50)	3.60 (SD = 0.46)	−2.84	0.005
Skills alignment with labor market	3.30 (SD = 0.62)	3.47 (SD = 0.58)	−3.01	0.003

SD, standard deviation.

Skills alignment with labor market demands

Students' perceptions of the alignment between the skills they acquired, and labor market requirements were first explored descriptively. As indicated in Table 3, the mean score for skills alignment was 3.40 (SD = 0.60), indicating a moderate level of perceived alignment.

To test H3, a Pearson correlation analysis was conducted to examine the relationship between the total acquired skill scores (a composite of vocational and technical skills) and students' perceived alignment with labor market needs. The analysis revealed a moderate positive correlation, r = 0.57, P < 0.001, between the two variables. This statistically significant result indicates that students with higher self-assessed vocational and technical competencies were also more likely to perceive their skills as relevant and aligned with current labor market expectations. Accordingly, the null hypothesis was rejected, while the alternative hypothesis was supported.

The scatter plot in Figure 2 visually reinforces this relationship, showing a clear upward trend, which suggests that stronger self-reported skill levels are associated with a greater sense of labor market readiness.

These findings indicate that the participants' technical and vocational skills were generally well developed, reflecting strong potential for labor market integration.

Overall gender-based comparisons

In addition to vocational skills, gender-based comparisons were conducted for technical skills and labor market alignment. Female students consistently reported marginally higher mean scores than male students across all three domains; however, these differences were not statistically significant (technical skills: t [398] = -1.27, P = 0.205; alignment: t [398] = -1.11, P = 0.267).

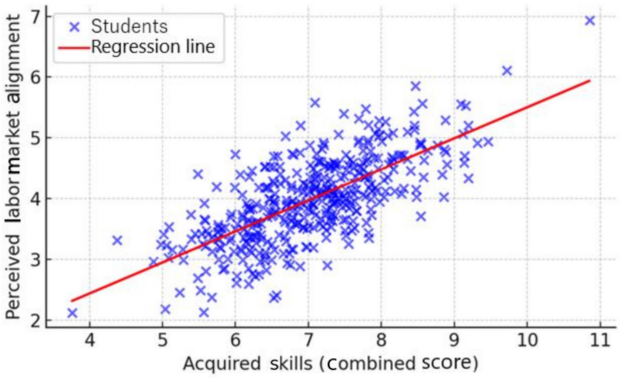

Figure 2. Scatter plot of acquired skills and perceived labor market alignment.

Overall, these findings reinforce the idea of equal training opportunities and consistent delivery across genders for all three skill domains.

DISCUSSION

The results reveal a moderate-to-high level of self-perceived vocational skills among the students (M = 3.62), which is consistent with similar findings in other TVET systems (Mendoza *et al.*, 2025). This suggests that vocational programs in Oman are generally effective in equipping students with practical competencies. A key reason for this outcome may lie in the structure of the vocational training curriculum, which emphasizes hands-on skill acquisition and competency-based modules. Moreover, the absence of statistically significant gender differences (P = 0.153) reinforces the notion that both male and female students receive equal exposure and access to training opportunities. This aligns with Oman's inclusive educational policy implemented by the Ministry of Higher Education, Research and Innovation and reflects the egalitarian principles underscored in human capital theory (Becker, 1993), which posits that investments in equitable education lead to national gains in productivity and human resource development regardless of gender. Additionally, standardization in curriculum delivery, uniform assessment practices, and consistent teacher qualifications may contribute to the observed gender parity in vocational skill levels (Omar *et al.*, 2021).

The results also show a clear disparity in technical skill levels across academic specializations, with engineering students scoring the highest (M = 3.68), followed by marine sciences (M = 3.52) and business (M = 3.42) students. The statistically significant ANOVA result (P < 0.001) indicates that program-specific factors likely influence technical skill development. This discrepancy

can be attributed to curriculum design and training environments. Engineering programs often integrate extensive laboratory work, industry simulations, and field-based projects, providing more robust technical training (T. Jing *et al.*, 2022; Omar *et al.*, 2021). By contrast, business curricula are typically more theory oriented and may lack immersive technical components. These differences reflect the principles of skills mismatch theory (International Labour Organization, 2020; Ministry of Manpower-Sultanate of Oman, 2018), which explains how educational structures that fail to align closely with labor market needs can lead to variances in student readiness. The findings therefore suggest that specialization-specific curriculum enrichment and improved alignment with sectoral requirements are crucial for reducing skills disparities across academic programs (Prayitno *et al.*, 2024).

Furthermore, the analysis confirmed a statistically significant moderate positive correlation ($r = 0.57$, $P < 0.001$) between students' perceived skill levels and their alignment with labor market demands. This indicates that students who believe they possess stronger vocational and technical competencies also perceive greater alignment with employment requirements. Theoretically, this finding affirms human capital theory (Becker, 1993; Selane & Odeku, 2024), which emphasizes that skill development enhances individual employability and economic value. It also resonates with international research (T. Jing *et al.*, 2022; Li, 2019) that associates higher technical competence with improved job market integration. However, the moderate strength of the relationship implies that skill alignment is influenced by other mediating factors, such as the availability of career counseling, internships, exposure to real-world industry settings, and employer engagement in curriculum development (UNESCO, 2020; UNESCO, 2021).

These results suggest that vocational education programs in Oman are partially succeeding in equipping students with competencies relevant to the labor market. While students generally recognized the value of their vocational and technical training, there remains some uncertainty about the extent to which these skills directly translate to real-world employment opportunities. This may reflect gaps in curriculum-industry alignment, limited exposure to practical work environments, or variations in students' awareness of labor market demands. The moderate positive correlation between acquired skills and perceived labor market alignment further supports the argument that strengthening the practical and industry-linked components of vocational programs could enhance students' confidence in their career readiness.

One notable strength of the study was the high level of student cooperation and engagement, with many participants expressing interest in contributing to the research and reflecting on their readiness for the labor market. This voluntary participation contributed to the reliability and robustness of the collected data. Such active engagement supports the view that vocational education programs in Oman adopt a progressive, competency-based approach, where student confidence and skill proficiency increase with academic advancement.

Overall, these findings align with the principles of human capital theory (Becker, 1993; Selane & Odeku, 2024), which postulates that investment in education and training enhances employability and productivity. They also echo previous empirical research (Y. Jing *et al.*, 2022; Mendoza *et al.*, 2025), affirming that well-developed technical and vocational skills serve as key drivers for successful labor market integration.

Despite its contributions, this study has several limitations that should be acknowledged when interpreting the findings. First, its reliance on student self-reported data introduces the risk of response bias, which may not accurately reflect actual skill levels; this distinction has been made more explicit throughout the revised manuscript. Future research should incorporate objective performance assessments or third-party evaluations to validate self-reported competencies. Second, the cross-sectional design captures only a snapshot of skill perceptions at a single point in time. Longitudinal research designs are therefore needed to examine skill development trajectories and long-term employment outcomes. Third, the sample was drawn exclusively from public vocational colleges under the Ministry of Higher Education, Research and Innovation, excluding private and international TVET providers. Expanding the sampling frame in future studies will improve generalizability and offer a more holistic view of vocational training in Oman. Fourth, the absence of employer feedback limited the possibility of triangulating the findings. Incorporating employer surveys or workplace performance data into future research would provide a more comprehensive evaluation of graduates' readiness for the labor market.

By addressing these limitations through mixed-method, multi-stakeholder approaches, future research can strengthen the evidence base for effective vocational education policies and contribute to narrowing the skills gap in Oman's evolving economic landscape.

The results highlight the partial effectiveness of current vocational training programs in preparing students for employment. While national initiatives have succeeded in ensuring equitable access to training, the findings suggest areas in which policy and practice can be

strengthened. Therefore, the following recommendations are proposed, each accompanied by practical measures for implementation.

Strengthen collaboration between vocational colleges and industry stakeholders

Establish joint curriculum review committees that include industry representatives to ensure that training content remains responsive to technological and market trends. Introduce sector-specific advisory boards that can provide annual feedback on the skill gaps observed in new graduates. Involve employees in co-developing teaching materials, guest lectures, and skill certification standards to enhance program relevance and industry trust.

Expand work-based learning opportunities and structured internships

Develop national frameworks for mandatory internships in all TVET programs, with clearly defined learning outcomes, supervision protocols, and assessment rubrics. Create partnerships with private sector employers to offer short-term placements during academic breaks. Establish a digital internship matching platform managed by the Ministry of Higher Education, that will enable students to apply for placements aligned with their specialization.

Systematically integrate soft skills into vocational education curricula

Embed soft skill modules such as communication, teamwork, and problem-solving into existing courses through project-based learning, role-playing scenarios, and team assessments. Train instructors in student-centered methods that foster emotional intelligence, adaptability, and critical thinking. Collaborate with industry to simulate workplace situations in classrooms (*e.g.*, customer service simulations and group-based technical tasks) that mirror real job settings.

These targeted recommendations aim to bridge the gap between training and employment and enhance the overall employability of vocational graduates. When implemented, they can contribute to reducing youth unemployment and aligning education outcomes with the strategic needs of Oman's growing economy.

CONCLUSION

This study investigated the vocational and technical skill levels of students enrolled in government vocational colleges in the Sultanate of Oman and evaluated the extent to which their acquired competencies align with labor market requirements. Drawing on data from 400 students across eight institutions, the findings indicate that overall skill levels are moderate to high, with notable disparities across specializations. Furthermore, the analysis identified a moderate positive correlation between students' self-reported competencies and their perceived alignment with employment demands, underscoring the critical role of targeted curriculum design and industry engagement in enhancing graduate employability.

DECLARATIONS

Acknowledgement

The author would like to express their sincere gratitude to the Ministry of Higher Education, Research and Innovation in the Sultanate of Oman for facilitating access to vocational colleges and supporting the data collection process. Appreciation is also extended to the participating students and faculty members for their valuable time and contributions, without which this research would not have been possible.

Author contributions

Al Shuaili AST: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing—Original draft, Writing—Review and Editing, Visualization, Supervision, Project administration. The author has read and approved the final version.

Source of funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

Not require.

Informed consent

Written informed consent was obtained from all participants prior to data collection. Participants were informed about the objectives of the research, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. They were also assured that all responses would be anonymized and used solely for research purposes. No identifiable images or personal information are included in this publication.

Conflict of interest

The author has no conflicts of interest to declare.

Use of large language models, AI and machine learning tools

None.

Data availability statement

All data generated or analyzed during this study are included in this published article.

REFERENCES

Abdullah, N. S., Sumarwati, S., & Abd Aziz, M. I. (2020). Life and career skills among technical and vocational education and training (TVET) students in vocational colleges. *Online Journal for TVET Practitioners*, *5*(2), 20-26. https://doi.org/10.30880/ojtp.2020.05.02.003

Abiodun-Oyebanji, O. J., & Ojetunde, S. (2016). Determinants of students' enrolment in technical and vocational education in Ondo State, Nigeria. *Kenya Journal of Educational Planning, Economics & Management*, 10(1), 1-20.

Abu Asab, H. F. Problems of Vocational Education in the Palestinian Secondary Vocational Schools from the Views of the Teachers and Students Involved in the Vocational Education. An-Najah National University (Thesis). 2005.

Abu Ras, M. A. M. The status of vocational and technical education in public schools in the Jerusalem Governorate and the role of school principals in promoting it. Al-Quds University (Thesis). 2023.

Al-Hiti, N. A. (2008, September 1). [Technical and vocational education and development requirements in the GCC countries]. Araa Journal. Retrieved September 1, 2025, from https://araa.sa/index.php?option=com_content&view=article&id=1685&catid=9&Itemid=172

Bailey, T. R., & Matsuzuka Y. (2003). *Integration of vocational and academic curricula through the NSF Advanced Technological Education Program (ATE)* (pp. 1-43). ERIC. https://doi.org/10.7916/D8P55KKH

Barabasch, A., & Rauner, F. (2012). *Work and education in America: The art of integration* (pp. 1-265). Springer. https://doi.org/10.1007/978-94-007-2272-9

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19, 43-50.

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press. https://doi.org/10.7208/chicago/9780226041223.001.0001

Boochever, A., Reed, S., & Kurlaender, M. (2023). Career technical education among California high school graduates. Policy Analysis for California Education. Retrieved September 1, 2025, from https://edpolicyinca.org/publications/career-technical-education-among-california-high-school-graduates

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Dola, S. R., & Goli, B. R. (2023). Exploring the effectiveness of post-foundation courses (Technical Writing, Technical Communications, and Public Speaking) in developing vocational English skills: A case study of Ibri Vocational College, the Sultanate of Oman. *International Journal of Research and Analytical Reviews*, *10*(3). Retrieved September 1, 2025, from https://www.academia.edu/105479185/Exploring_the_Effectiveness_of_Post_Foundation_Courses_Technical_Writing_Technical_Communications_and_Public_Speaking_in_Developing_Vocational_English_Skills_A_Case_Study_of_Ibri_Vocational_College_the_Sultanate_of_Oman

Grubb, W. N., Davis, G., Lum, J., Plihal, J., & Morgaine, C. (1991, July). *The cunning hand, the cultured mind: Models for integrating vocational and academic education*. National Center for Research in Vocational Education.

Gulf Cooperation Council. (2004). *Technical education strategy in the GCC countries: Prepared by the committee of deans and directors of technical colleges in the GCC countries*. General Secretariat of the Gulf Cooperation Council.

Halabi, A. S. (2017). The reality and challenges of vocational and technical education in the Arab world: A case study of the Syrian Arab Republic. *Al-Quds Open University Journal for Humanities and Social Studies*, *2*(28), 397-434. https://journals.qou.edu/index.php/jrresstudy/article/view/1036

Huma, A., Rizwan, S., & Rafique, R. (2022). Comparative analysis of policy perspectives for technical and vocational education. *Journal of Education and Educational Development*, *9*(1), 130-156. https://doi.org/10.22555/joeed.v9i1.568

Ihsan, F., Himawanto, D. A., & Suharno, S. (2025). Mapping the landscape of sustainability literacy research in the Indonesian technical and vocational education. *Journal of Education and Learning*, *19*(1), 350-361. https://doi.org/10.11591/edulearn.v19i1.21789

International Labour Organization. (2020). *Global employment trends for youth 2020: Technology and the future of jobs*. International Labour Organization. Retrieved September 1, 2025, from https://www.ilo.org/publications/major-publications/global-employment-trends-youth-2020-technology-and-future-jobs

Israel, G. D. (1992). Determining Sample Size. University of Florida Cooperative Extension Service.

Jing, T., Chung, E., & Gregory, M. L. (2022). Vocational education in China: Its history, roles, challenges and the way forward. *Journal of Cognitive Sciences and Human Development*, *8*(1), 112-121. https://doi.org/10.33736/JCSHD.4497.2022

Jing, Y., Kamis, A., Mei, S. Y., & Rus, R. B. C. (2022). A review on the strategies to enhance graduate employability from higher vocational institutions. *International Journal of Academic Research in Business and Social Sciences*, *12*(1), 2621-2630. http://dx.doi.org/10.6007/IJARBSS/v12-i1/12257

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Le, C. (2014). *Technical and vocational education and training in the Socialist Republic of Viet Nam: An assessment*. Asian Development Bank. Retrieved September 1, 2025, from https://shorturl.at/QvYLo

Li, J. (2019). Study on the ways of creating the "upgraded version" of higher vocational education with Chinese characteristics. *Proceedings of the 5th International Conference on Education Technology, Management and Humanities Science (ETMHS 2019)* (pp. 1187-1192). https://doi.org/10.25236/etmhs.2019.255

Machumu, H. J., Zhu, C., & Sesabo, J. K. (2016). Blended learning in the vocational education and training system in Tanzania: Understanding vocational educators' perceptions. *International Journal of Multicultural and Multireligious Understanding*, *3*(2), 30-45. https://doi.org/10.18415/ijmmu.v3i2.46

Marzuki, M. A. B., Yusof, R., Yusof, R., & Musa, K. (2022). Evaluating the TVET financial allocation based on the polytechnics and community colleges students' enrolment: A preliminary analysis. *International Journal of Academic Research in Progressive Education and Development*, *11*(2), 1267-1284. https://doi.org/10.6007/IJARPED/v11-i2/13911

Mathew, A. (2023). *Vocational education in Oman: Evolution, challenges, and opportunities*. Dialogue Books.

Mendoza, R. A., Dumloan, E., Baloro, E. Jr., Capapas, J. E., Carbonilla, P., & Maluya, R. (2025). Exploring the understanding of knowledge, attitude, and practices in machine shop operations by analysing the technical skills and safety awareness of marine engineering students. *Psychology and Education: A Multidisciplinary Journal*, *35*(1), 1-6. https://doi.org/10.70838/pemj.350101

Ministry of Higher Education, Research and Innovation-Sultanate of Oman. (2025). [*Vocational training institutions*]. Sultanate of Oman.

Ministry of Manpower-Sultanate of Oman. (2018). *An overview of technical and vocational education and training in the Sultanate of Oman*. Ministry of Manpower-Sultanate of Oman.

Moore, G. D. (2022). Technical training and soft skills: A study of internships. *Journal of Instructional Pedagogies*, *28*, 1-7. https://www.aabri.com/manuscripts/223606.pdf

Morjai, W., Pupat, P., & Pimdee, P. (2018). Development of indicators on automotive technology skills of vocational diploma students: A confirmatory factor analysis model. *Mediterranean Journal of Social Sciences*, *9*(5), 203-210. https://doi.org/10.2478/mjss-2018-0152

Nasir, A. N. M., Ali, D. F., Noordin, M. K. B., & Nordin, M. S. B. (2011). Technical skills and non-technical skills: Predefinition concept (pp. 1-17). Proceedings of the IETEC'11 Conference.

Oman Vision 2040 Implementation Follow-up Unit. (2025). Oman Vision

2040 pillars. Retrieved September 1, 2025, from https://www.oman2040.om/?lang=en

Oman's National Centre for Statistics and Information. (2025). [National summary data page (NSDP)—Oman]. NCSI. Retrieved September 1, 2025, from https://portal.ecensus.gov.om/web/

Omar, M. K., Ismail, K., Abdullah, A., Abdul Kadir, S., & Jusoh, R. (2021). Embedding entrepreneurial knowledge in vocational college curriculum: A case study of the competency of TVET instructors. *Pertanika Journal of Social Sciences and Humanities*, *29*(S1), 101-117. https://doi.org/10.47836/pjssh.29.S1.06

Omar, M., & Kamaruzaman, F. M. (2024). Technical and vocational education training and industry collaboration: A bibliometric review. *Journal of Education and Learning*, *18*(4), 1582-1592. https://doi.org/10.11591/edulearn.v18i4.21120

Opdenakker, R. (2006) Advantages and disadvantages of four interview techniques in qualitative research. Forum: Qualitative Social Research, *7*, 10.

OECD. (2019). OECD employment outlook 2019: The future of work. OECD. Retrieved September 1, 2025, from https://doi.org/10.1787/9ee00155-en

Prayitno, M. A., Haryani, S., Wardani, S., & Wijayati, N. (2024). Chemoentrepreneurship-based learning: Influence on social and vocational skills. *LUMAT: International Journal on Math, Science and Technology Education*, *12*(2), 1-17. https://doi.org/10.31129/lumat.12.2.2076

Saadati, F., & Celis, S. (2023). Student motivation in learning mathematics in technical and vocational higher education: Development of an instrument. *International Journal of Education in Mathematics, Science, and Technology*, *11*(1), 156-178. https://doi.org/10.46328/ijemst.2194

Selane, C., & Odeku, K. O. (2024). An analysis of how TVET is playing a significant role in fostering students' skills and competencies in South Africa. *Journal of Educational and Social Research*, *14*(3), 293-305. https://doi.org/10.36941/jesr-2024-0074

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, *87*(3), 355-374. https://doi.org/10.2307/1882010

UNESCO. (2020). Global education monitoring report 2020: Inclusion and education: All means all. UNESCO. Retrieved September 1, 2025, from https://unesdoc.unesco.org/ark:/48223/pf0000373724

UNESCO. (2021). *Technical and vocational education and training for disadvantaged youth*. UNESCO.

U.S. Department of Education. (2018). Strengthening career and technical education for the 21st Century Act (Perkins V). Office of Career, Technical, and Adult Education. Retrieved September 1, 2025, from https://cte.ed.gov/legislation/perkins-v