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## On-the-Job Training and Skill Competence: An Industry-Based Evaluation of Vocational Trainees

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### ABSTRACT

#### BACKGROUND & CONTEXT

The integration of cognitive, psychomotor, and affective skills development is essential for vocational college students during their on-the-job training (OJT). Current literature emphasizes the alignment of technical and vocational education and training (TVET) with industrial demands, aiming to foster students' readiness for the dynamic workforce. Despite this, challenges in assessing students' domain-specific skills remain a concern for industry stakeholders.

#### PURPOSE OR GOAL

This study investigates the perception of industry supervisors regarding the cognitive, psychomotor, and affective skill levels of vocational mechanical trainees during OJT. Specifically, it evaluates the training's effectiveness in equipping students to meet job market expectations while exploring potential disparities in skill acquisition based on gender.

#### APPROACH OR METHODOLOGY

Data were collected through structured surveys targeting industries hosting vocational trainees. Quantitative analysis focused on assessing the competence levels across three domains and identifying patterns in supervisory feedback to enhance curriculum design.

#### OUTCOMES

Preliminary findings suggest notable strengths in psychomotor skill execution, while areas for improvement remain in affective skills such as communication and teamwork. Gender-based perceptions shows significant difference between male and female.

#### CONCLUSIONS

The study concludes by recommending tailored curriculum improvements that address identified gaps, ensuring vocational graduates are holistically prepared to navigate professional environments, contributing to their employability and industry satisfaction.

#### KEYWORDS

On-the-job training; vocational college; skill; industry.

## Introduction

On-the-Job Training (OJT) is an important stage in a student's academic journey that helps them prepare for real working environments. It gives students the opportunity to apply what they have learned in class to actual job settings. Through OJT, students gain hands-on experience that improves their thinking, technical, and soft skills, as key qualities needed in today's fast-changing industries. In this regard, vocational colleges play a crucial role in producing skilled workers who meet the needs of the industry (EPU, 2021).

According to Jamil et al. (2016), TVET programs must be aligned with industry needs so that graduates have the right skills. Training in vocational institutions allows students to develop important professional traits such as following workplace rules, performing tasks under supervision, and working effectively in teams (Jamil et al., 2016; Chang, 2017). Producing highly skilled and innovative graduates is essential for driving economic and technological development.

However, when employers lack a clear understanding of competency-based education, they may misjudge a graduate's abilities. Without proper tools to assess skills, hiring decisions are often based on assumptions. Developmental theorist Arnold Gesell (1880–1961) stated that people who are not ready to adapt to change will struggle to succeed. Many graduates are not fully exposed to industry expectations, and employers may underestimate their skills, making it harder for them to advance in their careers. On the other hand, those who show relevant skills and confidence are more likely to secure good job opportunities. When new graduates enter the workforce, they bring fresh perspectives and diverse skills that help organizations grow and perform better.

## The Role of On-the-Job Training in Enhancing Engineering Competencies and Industry Perception of Vocational College Graduates

Engineering is a multidisciplinary profession covering fields such as mechanical, electrical, electronic, mechatronics, chemical, and civil engineering (National Academy of Engineering, 2005). In today's fast-evolving world, engineers must be equipped to design innovative systems and solutions to meet societal challenges (Crawley, 2014). However, many industries remain hesitant to hire students post-training, perceiving them as lacking in practical skills and job readiness (Othman et al., 2017).

To close this gap, students must gain hands-on experience through structured On-the-Job Training (OJT), where theoretical knowledge is applied in real work settings (Lim & Mustafa, 2013). OJT serves as a critical platform for refining technical, cognitive, and interpersonal skills that cannot be acquired through classroom learning alone.

Graduates' competencies are often judged based on their ability to demonstrate technical knowledge, but this alone is insufficient. According to Bandura (1986), self-efficacy, or confidence in one's abilities, is equally significant and influenced by practical experiences. Yet, recruitment practices that favor narrow technical expertise may undervalue broader competencies, such as teamwork, adaptability, and communication, thereby affecting graduates' confidence and performance (Mukhid, 2009).

To meet industrial demands, graduates must acquire both technical and generic abilities, which include communication, self-management, and problem-solving (Hadi, 2020; Kamaruzaman et al., 2025). These skills are essential for workplace adaptability and long-term career success.

Studies by Abd Rahman et al. (2015) and Haron et al. (2019) emphasize that industrial training enhances employability by allowing students to contextualize theoretical learning in real-world environments. Effective OJT also strengthens knowledge-based and cross-disciplinary competencies, as a key factors in developing work-ready graduates.

Notably, communication skills remain one of the most sought-after attributes by employers, as they are vital for understanding instructions, providing feedback, and collaborating across functions (Dziatul Nadiah, 2020). Research by Ferns and Lilly (2015), Messum et al. (2017), and others reinforces that integrating technical skills with knowledge-based and interpersonal competencies improves graduates' readiness and adaptability.

This study explores how industry stakeholders perceive the competency mastery of vocational college trainees during their five-month OJT, particularly in the field of mechanical engineering. It aims to assess trainee performance across cognitive, psychomotor, and affective domains, and analyze perceptions based on gender differences. These insights will help vocational institutions identify gaps, improve curriculum, and better prepare students for the realities of the workforce.

## Methodology

This study employs a mixed-methods research design, integrating quantitative and descriptive approaches to evaluate the level of cognitive, psychomotor, and affective mastery among Vocational College trainees during their On-the-Job Training (OJT). The primary data was collected through structured questionnaires administered to industrial employers who provided training placements for interns specializing in the mechanical engineering field. This approach was designed to capture industry perceptions regarding trainees' competencies. Data analysis was conducted using descriptive and inferential statistics, facilitated by the Statistical Package for the Social Sciences (SPSS) version 25.0 to ensure rigorous evaluation and interpretation of the findings.

The study population consisted of mechanical field trainees from Vocational Colleges who underwent OJT during the 2021 and 2022 academic years. In consideration of practical constraints, including time, financial resources, governance, and geographical factors, the researchers employed a cluster sampling technique to obtain a representative sample from the state of Johor. No significant differences were observed in employer perceptions across different states. As highlighted by Mertens (2015), cluster sampling is an effective methodological approach that enables researchers to optimize time and financial resources while facilitating efficient data management. A total of 54 employers from 32 companies offering OJT placements were initially identified as potential respondents; however, only 38 employers (70.4%) provided complete responses. The study encompassed key sectors within the mechanical industry, including automotive, welding, industrial machining, refrigeration, and air conditioning. Sample selection was guided by the Krejcie and Morgan (1970) sampling framework to ensure statistical adequacy and representativeness.

The research instrument consisted of a structured questionnaire comprising 46 items, categorized into three primary domains: cognitive, psychomotor, and affective competencies. Each domain was assessed using a five-point Likert scale, with response categories ranging from strongly agree to strongly disagree. Prior to implementation, the questionnaire underwent face validity, content validity, and construct validity assessments to ensure its reliability and applicability. A pilot study was conducted with 10 respondents to measure internal consistency using Cronbach's alpha with an acceptable reliability range of 0.70 to 0.95. Though formal reliability estimation typically requires around 24 to 30 respondents (Bujang et al., 2024), smaller samples (5–20) are acceptable when the pilot's purpose is to test instrument clarity and feasibility rather than obtain definitive estimates.

Data collection was conducted through both online and physical questionnaire distribution to industrial employers. The collected data was analyzed using descriptive statistical techniques, including mean, frequency distribution, percentage analysis, and standard deviation calculations. Additionally, inferential statistical analysis was performed using the t-test to examine variations in employer perceptions based on trainees' gender. Table 1 presents the distribution of study samples across various mechanical engineering disciplines involved in the research. The study locations included several districts in Johor such as Johor Bahru, Pasir

Gudang, Masai, Kulai, Senai, Skudai, and Kota Tinggi, based on certain criteria to ensure that the data collected were relevant and met the requirements of the study.

**Table 1: Study Population and Sample by Programme**

| Program      | Program Name                                          | Number of Employers | Number of Samples |
|--------------|-------------------------------------------------------|---------------------|-------------------|
| MTA          | Automotive Programs                                   | 11                  | 7                 |
| MTK          | Welding Technology Program                            | 10                  | 7                 |
| MPI          | Industrial Machining Program                          | 14                  | 10                |
| SRC          | Air Conditioning and Refrigeration Technology Program | 18                  | 14                |
| <b>Total</b> | <b>Overall</b>                                        | <b>54</b>           | <b>38</b>         |

## Results and Discussion

Based on the analysis that has been carried out, Table 2 shows a total of 38 respondents from the industry who are willing to offer on-the-job training for mechanical students. Representatives from the industries involved in this study have different backgrounds in terms of gender, position, age, work experience, highest academic qualification and the field of specialization of the students recruited as interns. In terms of gender, there were more male respondents than female respondents with a difference of only 68.4 percent or a total of 26 people. The analysis of the respondents showed four categories of positions, the first is those who work as technicians as many as 18 people, the second category is the respondents who work as engineers as many as 5 people, the third category is the respondents who work as managers as 4 people, while the rest are other positions namely supervisors, directors, field service executives, company managers and service advisors. All of these respondents fall into four categories of years of service experience, the first is those who have served between 3 to 10 years, the second category is respondents who have served between 11 to 20 years, while the rest are those who have served for 21 to 30 years. The analysis also found that the respondents in the first category were the highest group of 26 people or 68.4% compared to the second and third years of experience category.

**Table 2: Distribution of Frequency and Percentage of Respondents by Position**

| Position     | Frequency ( f ) | Percent (%)  |
|--------------|-----------------|--------------|
| Technician   | 18              | 47.4         |
| Engineer     | 5               | 13.2         |
| Manager      | 4               | 10.5         |
| Others       | 11              | 28.9         |
| <b>Total</b> | <b>38</b>       | <b>100.0</b> |

The analysis of the respondents showed four categories of positions, the first is those who work as technicians as many as 18 people, the second category is the respondents who work as engineers as many as 5 people, the third category is the respondents who work as managers as 4 people, while the rest are other positions namely supervisors, company managers, field service executives and service advisors. In terms of specialisation in mechanical technology programmes, the analysis shows that each of the 38 programmes consists of four different programmes, namely the Automotive Technology Programme, the Industrial Machining Technology Programme, the Welding Technology Programme and the

Refrigeration and Air Conditioning Technology Programme. Statistically, the largest number of respondents are those in the Refrigeration and Air Conditioning Technology Program.

**Table 3: Degree of Competency Mastery**

| <b>Min Score</b> | <b>Tendency level</b> |
|------------------|-----------------------|
| 1.00-1.33        | Low                   |
| 1.34-2.67        | Moderate              |
| 2.68-4.00        | High                  |

As shown in Table 3, the mean values were categorized into three levels, namely as Low, Moderate, and High to indicate the degree of competency mastery. Building upon this classification, Table 4 provides a structured summary of vocational trainees' performance across cognitive, psychomotor, and affective domains, as evaluated by industry stakeholders. The competencies are further categorized into High and Moderate levels based on their respective mean scores. This presentation format highlights priority areas for curriculum enhancement to better support industrial readiness.

**Table 4: Categories of trainees' competency mastery based on industry evaluations**

| <b>Domain</b> | <b>Competency Statement</b>                                              | <b>Mean Score</b> | <b>Mastery Level</b> |
|---------------|--------------------------------------------------------------------------|-------------------|----------------------|
| Psychomotor   | Able to write daily log book reports according to the work done          | 3.42              | High                 |
|               | Able to implement the work operation process (SOP) correctly             | 3.37              | High                 |
|               | Able to make complex tasks carefully to achieve the desired goals        | 2.16              | Moderate             |
|               | Able to carry out assigned tasks accurately based on previous experience | 2.11              | Moderate             |
| Affective     | Practice good occupational safety procedures                             | 3.42              | High                 |
|               | Able to work well with employers                                         | 3.39              | High                 |
|               | Able to show interest in assignments in the field                        | 3.39              | High                 |
|               | Applying leadership attitudes in the organization                        | 2.18              | Moderate             |
|               | Able to think critically in solving problems                             | 2.16              | Moderate             |
| Cognitive     | Able to apply fields of knowledge related to the field of duty           | 3.37              | High                 |
|               | Able to complete assignments within the stipulated time frame            | 3.37              | High                 |
|               | Able to remember existing facts in the field related to the task         | 2.16              | Moderate             |
|               | Able to provide suggestions related to the field of work                 | 2.13              | Moderate             |
|               | Able to make decisions based on knowledge in the field appropriately     | 2.08              | Moderate             |

First, the highest mean score was for vocational trainees' psychomotor competency mastery during on-the-job training (OJT), as assessed by industry stakeholders. The highest-rated item (3.42) was the ability to write daily logbook reports based on tasks performed, reflecting trainees' capacity to document physical work systematically. This was followed by high scores for the ability to perform tasks correctly after observation and accurately execute Standard Operating Procedures (SOPs). These findings indicate that trainees acquire psychomotor proficiency through experiential engagement, particularly via processes such as imitation, trial-and-error, and task repetition (Hu et al., 2020).

Psychomotor learning in OJT enables trainees to operate tools and handle materials confidently, improving performance outcomes. As noted by Morrison et al. (2019), such training fosters the ability to execute hands-on tasks effectively and record them accurately. However, lower mean scores were observed for the ability to perform tasks based on previous experience and the execution of complex tasks with care, suggesting difficulties in task generalization and fine-motor precision.

These gaps may stem from trainees' limited prior industrial exposure, which impedes their ability to apply past learning effectively in complex work scenarios. In practice, high-quality outputs are required without tolerance for errors, especially in lower-tier roles where efficiency and precision are paramount. As such, close monitoring and resource efficiency are crucial in evaluating trainee contributions.

Drawing on Bloom's Taxonomy of the psychomotor domain, Simpson (1972) emphasized the importance of structured practical exposure in developing advanced motor skills. Training programs that emphasize correct tool usage, SOP adherence, and quality standards are vital for preparing trainees to meet organizational expectations consistently. Competency in completing complex tasks with care is also essential for effective quality control systems.

Overall, these findings highlight the pivotal role of psychomotor training in TVET curricula. Through scheduled workshops, supervised field exercises, and constant feedback systems, vocational institutions can improve trainees' capacity to transfer from fundamental procedural abilities to exact execution of complicated processes, hence boosting their industry readiness.

The analysis of industry feedback regarding the affective domain competencies of vocational college trainees during On-the-Job Training (OJT) in the mechanical field reveals several significant insights. The highest-rated competency was the ability to practice occupational safety procedures, highlighting the trainees' strong commitment to workplace safety. This was closely followed by the ability to demonstrate cooperation within the organization, adhere to personal safety measures, and work effectively with employers. These findings reflect the trainees' positive workplace attitudes, including teamwork, compliance with safety norms, and the establishment of constructive professional relationships.

However, notable gaps were identified in the lower-performing competencies. The lowest mean score was recorded for the item assessing the ability to think critically in solving problems, while the second-lowest pertained to applying leadership attitudes within the organization. These findings suggest that while foundational affective traits are well developed, more complex attributes such as critical thinking and leadership remain underdeveloped during the OJT period.

As emphasized by Helsdingen et al. (2010), the capacity to adapt, communicate effectively, solve problems, and think critically is essential for cohesive and productive workplace teams. These competencies form the basis of workplace resilience and efficiency, particularly in high-demand industrial settings. Wolcott and Sargent (2021) further underscore the importance of embedding such soft skills, especially problem-solving, leadership, and teamwork into technical education, to ensure well-rounded professional preparation.

Leadership, in particular, plays a pivotal role in shaping critical thinking frameworks among trainees. It drives not only individual motivation but also the behavioral dynamics of teams, promoting collective action toward organizational goals. As noted by Mohamad Fadli and

Norlia (2019), developing these leadership attributes equips trainees to serve as change agents who inspire positive transformation and foster collaborative success.

In light of these observations, it is imperative for vocational institutions to design and integrate targeted training modules focused on enhancing critical thinking and leadership development during OJT. Addressing these gaps will better position trainees to handle the multifaceted challenges of modern workplaces, promoting not only individual employability but also broader institutional effectiveness.

The analysis of employer perceptions regarding the cognitive domain mastery of Vocational College trainees in the mechanical field during their On-the-Job Training (OJT) reveals both strengths and areas for improvement. Among the evaluated competencies, the highest mean values (3.37) were recorded for “able to apply fields of knowledge related to the field of duty” and “able to complete assignments within the stipulated time frame”. These results reflect strong cognitive proficiency, indicating that trainees can apply theoretical knowledge effectively in task execution and manage their responsibilities within required timelines. This is consistent with the findings of Ali et al. (2014), who emphasize the value of OJT in providing authentic workplace exposure that enables students to adapt academic knowledge into practical application. Through such programs, trainees develop a competitive skill set that supports their professional readiness.

According to Ferris and Aziz (2005), effective problem-solving and task management in real-world environments are key indicators of well-developed cognitive skills. The ability to analyze work tasks and plan actions accordingly is aligned with Bandura’s (1986) Social Cognitive Theory, which posits that confidence and self-efficacy stem from cognitive processing and self-regulation. Hadi (2020) further affirms that high-performing trainees often exhibit structured thinking, leading to better task output. Similarly, Ratna Wilis Dahar (2011) highlights the relevance of symbolic and diagrammatic interpretation skills, which are developed through real-life training experiences, emphasizing the value of experiential learning in cognitive mastery.

Despite these strengths, the lowest mean value (2.08) was observed for “able to make decisions based on knowledge in the field appropriately.” The second-lowest score was for “able to provide suggestions related to the field of work.” These results indicate specific gaps in higher-order cognitive abilities such as decision-making and idea formulation.

Jazdi (2014) and Peruzzini et al. (2017) explain that decision-making in industrial contexts requires a nuanced understanding of human-machine interaction and production systems. The constant evolution of industrial technology also necessitates quick, data-driven decision-making, which may be underdeveloped in trainees without adequate scaffolding. In terms of knowledge synthesis and suggestion-making, Piaget’s developmental theory asserts that learners advance cognitively by integrating prior knowledge with new experiences. Weaknesses in this integration may hinder a trainee’s progression to expert-level competence.

These findings suggest the need for structured cognitive development interventions during OJT, such as reflective journaling, scenario-based decision-making tasks, and guided feedback from industry mentors. As recommended by the Economic Planning Unit (EPU, 2025), consistent collaboration between TVET institutions and industry is essential to align training outcomes with dynamic workforce expectations.

In summary, while vocational trainees exhibit strong capabilities in basic cognitive functions like task completion and knowledge application, they face challenges in decision-making and innovative thinking. These insights call for deliberate efforts by educational providers and employers to jointly reinforce cognitive skills through real-time assessments, mentoring, and curriculum enrichment.

**Table 5: Findings of an independent t-test analysis showing differences in levels of cognitive mastery based on sex**

|                 | Gender | N  | Min    | Standard Deviation | t     | Sig. |
|-----------------|--------|----|--------|--------------------|-------|------|
| Cognitive level | Men    | 10 | 8      | 2.59272            | 2.802 | 0.01 |
|                 | Female | 14 | 4.7857 | 2.88707            |       |      |

As shown in Table 5, the analysis of employer perceptions regarding the cognitive mastery levels of Vocational College mechanical trainees during On-the-Job Training (OJT) revealed significant differences based on gender. The independent t-test analysis demonstrated a statistically significant difference in cognitive mastery levels between male and female trainees,  $t(10) = 2.802$ ,  $p < 0.05$ , where  $p = 0.01$ . Male trainees recorded a higher mean score (mean = 8.0) compared to their female counterparts (mean = 4.7857), indicating that male trainees exhibited superior cognitive mastery levels according to employer evaluations.

From an economic perspective, the participation of women in TVET-related industries is essential for fostering gender balance and addressing disparities in labor market representation, which may reduce discriminatory practices (Doris et.al., 2024). Women's contributions to the workforce are integral to national development, as they complement the professional responsibilities within organizations and support economic progress. The government's 12th Malaysia Plan (12MP) underscores the importance of reducing poverty and improving living standards irrespective of gender, ethnicity, socio-economic background, or geographic location. Moreover, achieving gender equality in economic opportunities aligns with Sustainable Development Goal 4 (SDG-4), which emphasizes inclusive and equitable quality education while promoting lifelong learning opportunities (Department of Statistics Malaysia, 2019).

Providing equitable opportunities for women based on their abilities is crucial for enabling them to address workplace challenges effectively (Syahirah et.al., 2018). Trainees, regardless of gender, must develop metacognitive skills and conceptual understanding to refine their critical thinking abilities for effective problem-solving in spontaneous and dynamic contexts (Mazli Sham & Saemah, 2014; Raflee & Halim, 2021). According to Lestari et.al., (2024), learning strategies that prioritize self-regulation of cognitive processes can significantly enhance problem-solving and critical thinking skills. These skills, encompassing planning, monitoring, and evaluation, must be developed through structured and tailored learning methodologies (Lopez et.al., 2023).

Employers prioritize graduates who possess leadership qualities and demonstrate the ability to work collaboratively, as these attributes contribute significantly to organizational success. During the recruitment process, employers seek candidates with high intellectual capacity and teamwork skills, irrespective of gender. As such, fostering leadership and critical thinking skills in trainees is imperative to ensuring their employability and capacity to contribute meaningfully to organizational objectives.

## Conclusion

Overall, as summarized in Table 6, interviews with employers show that Vocational College trainees have a good theoretical and practical foundation, but need more additional training to improve the application of skills in real-life situations. In addition, weaknesses in communication and self-confidence are major issues that need attention. Employers are still ready to accept trainees in the future, but suggest some improvements in the curriculum and training in colleges to ensure that trainees are better prepared before entering the workforce. By increasing training in practical skills, problem-solving, and communication, trainees can improve their employability in the industry and meet the needs of a competitive workforce.

**Table 6: The summary of the findings of the study shows that it is based on the objectives that have been targeted**

| Domain       | Findings<br>(Quantitative Results)                                                                                                                                                                                  | Level of Mastery                                                                                                                                                                                                                                                                    |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cognitive    | Higher mastery observed in applying knowledge to tasks and completing assignments on time. Male trainees demonstrated significantly higher cognitive mastery levels than female trainees.                           | <p>Able to complete assignments within the stipulated time frame.</p> <p>Able to apply fields of knowledge related to the field of duty.</p> <p>Able to understand tasks in the form of diagrams.</p> <p>Able to make criticism from considerations in the field of assignment.</p> |
| Psycho motor | Trainees demonstrated proficiency in basic equipment handling but required additional training for advanced tools and precision tasks. Modern equipment use showed moderate performance requiring further exposure. | <p>Able to carry out the assigned tasks appropriately after seeing demonstrations from supervisors or readings.</p> <p>Able to carry out the work operation process (SOP) correctly.</p> <p>Able to write daily log book reports according to the work done.</p>                    |
| Affective    | Trainees showed positive discipline and determination but struggled with critical thinking, leadership, and communication skills. Confidence in expressing opinions and interacting with clients was notably weak.  | <p>Adopt a cooperative attitude in the organization.</p> <p>Carry out work instructions with full responsibility.</p> <p>Practice good occupational safety procedures.</p>                                                                                                          |

Studies conducted on employers' perceptions of interns' abilities by gender showed that there were significant differences between males and females. An analysis of employers' overall perception showed that the achievement of cognitive levels for men was higher than for women. The results of this study are expected to contribute to the continuous mastery of skills throughout their studies at vocational colleges in the mechanical field so that trainees always meet the needs and requirements of employers. Strengthening the skill mastery of trainees in continuous learning can help trainees master skill areas that are constantly evolving and dynamic according to the passage of time. The use of technological equipment requires technical skills and a combination of the expertise of trainees and employers to obtain maximum efficiency.

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