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Challenges, strengths, and relevance of integrating classroom-based assessment in technical and vocational education training

Siti Raudhah M. Yusop, Mohamad Sattar Rasul, Ruhizan Mohamad Yasin
Centre of STEM Enculturation, Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia

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ABSTRACT

Technical and vocational education training (TVET) assessment is critical to determine the intended learning outcomes for students. However, the TVET assessment presents several essential obstacles, such as assessing occupational skills disconnected from lesson-learning results. Assessment methods are another contentious topic among academics and other professionals because teachers' different methods of evaluating students' work are incompatible with assessment objectives and are a significant issue in TVET assessment. Consequently, this research investigates the challenges and strengths of classroom assessment practices and the relevance of implementing vocational skills. This research uses a quantitative survey methodology to assess the degree of participants agree using descriptive analysis. The study's findings indicate several challenges associated with administering classroom-based assessment (CA) within the context of TVET. CA is an excellent venue for assessing the students' acquired knowledge and abilities in education. The TVET assessment must include, in addition to technical skills, generic skills related to Industry 4.0 and career adaptability skills as a student's learning outcomes. These skills serve as the basis for the development of skills and competencies. Cognitive, psychomotor, and interpersonal qualities are vital in the TVET assessment as a student learning outcome.

Corresponding Author:

Mohamad Sattar Rasul
Centre of STEM Enculturation, Faculty of Education, Universiti Kebangsaan Malaysia
Lingkungan Ilmu, Bangi, Selangor, 43600, Malaysia
Email: drsattar@ukm.edu.my

1. INTRODUCTION

The correlation between the assessment of students' abilities and the unemployment rate is not straightforward, but it has the potential to be considerable. In Malaysia, the unemployment rate during the month remained at 3.6% as of 2023 [1]. To bring the unemployment rate in Malaysia down and boost job creation there, the government of Malaysia and several other organizations have been carrying out several different programs and projects [2]. The technical and vocational education training (TVET) assessment system that is both well-designed and successful may be of great assistance in identifying students' areas of skill, strength, and weakness [3], as well as in providing them with the service and training they need to increase their chances of obtaining and keeping work. On the other side, high unemployment rates may be an indication that there is a lack of jobs available or that there is a mismatch between the abilities of the workforce that is available and the skills that are required by businesses [4]. In such situations, assessing students' skills can help determine which skills are in high demand and design education and training programs to satisfy those demands [5]. TVET assessment ought to be based not only on cognitive characteristics but also on the skills and competencies that must be applied to assist students in mastering the

information and abilities that are important to their learning in keeping with the progression of the world towards Industry 4.0 [6]. Students enrolled in TVET programs must be prepared to meet the challenges of Industry 4.0, which requires employees to have the knowledge, technical skills, and generic skills relevant to the fourth industrial sector [7]. In addition, students with career adaptability skills such as control, confidence, concern, and a curious, inquisitive disposition are required since the difficulties posed by the quickly changing globe necessitate such individuals [8], [9]. A study by Kirchknopf [10] revealed that career adaptability must be included in the teaching and assessment curriculum for TVET students. Students with these abilities can better select jobs that fit them well and resist obstacles in the future labor market.

Recent research shows an apparent dearth of studies on the competency and skill assessment of TVET students enrolled in secondary schools. Duong [11] advised researching competence assessment using scope and measurement criteria emphasizing postsecondary and secondary education levels. According to Kenayathulla [12], this demonstrates why it is essential for students in Malaysian secondary schools to participate in research and investigations, particularly in the TVET. The success of Malaysia's assessment system is frequently linked to the factor of teachers as implementers. Teachers are less focused on holistic learning outcomes, emphasizing the competency elements in line with industry demand and only emphasizing the requirements in the examination [13].

Additionally, the success of the assessment system in Malaysia through classroom-based assessment (CA) for TVET subjects in secondary schools is still unsatisfactory. Based on the analysis of the Malaysian Certificate of Education (SPM) results for TVET subjects in secondary schools for 2019 and 2020, there was a decrease in the average grade for TVET subjects such as computer science, which was 0.15 in 2019. The SPM achievement for three TVET subjects, basic sustainability, decreased by 0.29, household science by 0.33, and communication and technology graphics decreased by 0.06 [14]. The SPM is a primary assessment method combining classroom and central assessments. It is implemented at the end of the fifth grade in high school. TVET subjects in secondary schools are evaluated using a combination of center-based assessment in SPM and CA, which allocates 70% of marks from the final examination and 30% from coursework marks that require teachers and students to give priority and focus to all forms of assessment provided by Ministry of Education (MOE) [15]. This situation is related to the main problem: the teachers do not know how to teach their students the skills they are supposed to teach. Therefore, there is a pressing need to investigate the components of skills, the challenges associated with adopting CA in the TVET domains, and the advantages of using CA to evaluate TVET students in secondary schools. As a result, this study aims to investigate the challenges and strengths of adopting CA and the importance of integrating vocational skills in CA practices in TVET.

2. LITERATURE REVIEW

Classroom-based assessment is a continuous process in the learning session to gather information about students' development, progress, abilities, and mastery toward the desired curriculum goals [16]. CA allows the student's learning process to be strengthened, and teachers can identify the effectiveness of the learning process in the classroom, whether it has been achieved or not [17]. CA provides a clear picture of student's mastery of the curriculum that encompasses knowledge, skills, and values embodied in the Learning Standards of each subject [18]. The information obtained from CA not only improves the effectiveness of the learning process but also helps parents and the school to plan subsequent actions to enhance students' mastery and achievement in learning, not just exam grades [19]. Sustained efforts are still needed to ensure that CA can be implemented as well as possible.

Nevertheless, issues and challenges in the implementation of CA still exist. As a multi-ethnic country, Malaysia has a diverse school environment with various issues and challenges. For instance, issues related to teacher competence in conducting assessments are often discussed. Teachers were found to have insufficient knowledge in controlling exams according to the assessment stage [20]. In planning teaching and assessments, teachers must fully understand and apply the standard curriculum and assessment documents and CA concepts in their teaching subject.

Studies have also found bias in assigning mastery levels to students and a lack of responsibility in conducting assessments, leading to inaccurate reporting [21]. It deserves attention, as inaccurate CA reporting will cause distrust and doubt among parents. Weak knowledge of assessments results in teachers failing to monitor student learning progress, inadequate teaching planning, and an inability to produce fair results [22]. Thus, the actual potential of the students cannot be tapped. Furthermore, the challenges in CA implementation are teachers' lack of confidence in producing reports based on the CA format and feeling that preparing CA reports is a burden. According to the authors, poor coordination of CA in schools, lack of knowledge and experience in carrying out CA, difficulties in obtaining relevant materials and sources, and time constraints further complicate the implementation process. Therefore, CA implementation must be

viewed comprehensively, and immediate improvement steps must be taken. Assessment practices are essential in any assessment to explain teachers' assessment approach. The curriculum development division designed the assessment practice approach in the context of CA [16]. In this study, CA practices are described through i) the concept of CA; ii) the CA aspects; iii) the implementation of assessment; and iv) the level of student mastery. The statement in the CA practice construct shows how essential this item is for CA in the TVET subject. Applying skill elements in classroom assessment practices helps students master the knowledge and skills in a topic but also helps students prepare for other vocational skills before entering the future workforce [23].

However, there is limited research on student learning outcomes regarding competence and skills in secondary schools, particularly about TVET subjects. According to Taib [24], TVET students who enroll in design and engineering drawing courses in secondary schools demonstrate deficiencies in technical skills. This factor can be attributed to their lack of engagement in practical activities. Furthermore, according to Sohimi [25], collaboration between industry and educational institutions is perceived as inadequate for enhancing and advancing academic curriculum standards, particularly in Industry 4.0. This situation highlights insufficient Industry 4.0 skills among TVET students in Malaysia. This scenario highlights the limited awareness among higher education students regarding Industry 4.0 skills. Previous research on the implementation of skill elements in the TVET curriculum indicates that it has not yet achieved the desired level. Applying technical, IR 4.0 generic, and career adaptability skills in CA practices for TVET subjects in secondary schools should be prioritized. TVET aims to effectively implement its objective of producing students with extensive knowledge, advanced technical skills, adaptability to Industry 4.0, and technological proficiency, enabling them to compete globally.

This study examines teachers' perceptions as implementers of CA on applying vocational skills (technical skills, Industry 4.0 generic skills, and career adaptability skills) in CA practices. Technical skills in the context of this study refer to technical skills elements based on the construct of methods, processes, and techniques [26] that need to be mastered by TVET students to master the subject, continue their studies at a higher level, and meet the needs of industry and the job market. IR 4.0, also known as Industry 4.0, refers to the fourth industrial revolution characterized by the integration of advanced technologies such as artificial intelligence, the Internet of Things (IoT), big data, and robotics into manufacturing and other industries [27], in the context of Industry 4.0, generic skills refer to transferable skills essential for success in the modern workforce. According to Yusop *et al.* [28], career adaptability skills are psychosocial characteristics requiring accountability and understanding of their duties when they experience unanticipated transition and trauma during learning and employment tasks. Integrations of vocational skills (technical skills, industry 4.0 generic skills, and career adaptability skills) as learning outcomes in classroom assessment in TVET allow a comprehensive evaluation of student learning and help to ensure that students are not only knowledgeable in their field of study but also possess a range of transferable skills and the ability to adapt to changing career demands [28]. As a result, this study was carried out to address the following research questions: i) What challenges and strengths are associated with integrating CA practices in TVET? and ii) What is the relevance of incorporating vocational skills in TVET CA practices?

3. RESEARCH METHOD

This study used a quantitative research approach that utilized a survey questionnaire as an instrument to obtain the findings, which were analyzed using descriptive analysis to get frequency, percentage, mean, and standard deviation scores. The aspect measured was the study respondents' demographics, gender, ethnicity, length of service, and academic qualifications. In addition, researchers also performed descriptive analysis to obtain the minimum and standard deviation values regarding the challenges and issues in the implementation of CA, the strength of CA in assessing TVET secondary school students, and the respondent's perception of the application of vocational skills (technical skills, Industry 4.0 generic skills, and career adaptability skills) in CA practices. The researcher collected data directly from the subject group using study questions (survey questions) through oral or pen-and-paper.

The researcher has determined the target population to be the study's sample: TVET Education Officers in Malaysia. According to Fraenkel *et al.* [29], the minimum sample size for descriptive research is about 100. Therefore, the researcher has precisely sampled the analysis to consist of 114 TVET Education Officers involved in the curriculum and assessment in TVET through cluster sampling from three central ministries, namely the Ministry of Education Malaysia, the MOE, and the Ministry of Youth and Sports and industrial representative. In addition, to control and minimize the confounding variable that might exist in this study, researchers did the criteria selection among the sample: respondents had been working at the TVET area for more than five years and at least have the degree for their qualification. The survey that has

been built contains several sections that begin with the background section of the respondents. Subsequently, the survey is continued with items that lead to the study's objective: the challenges of implementing CA and the strength of CA in assessing TVET secondary school students' and respondents' perceptions of applying vocational skills in CA.

The researcher distributes the questionnaire via Google Form and posts it to the respondents far from the researcher's location. The data were analyzed using the statistical package for the social science (SPSS) Version 27 software. The researcher used a five-point Likert scale in the questionnaire instrument and determined three levels, low, moderate, and high, to interpret the mean score. The interpretation of the mean score is based on Wiersma and Jurs [30], which interpreted 1.00-2.33 as low, 2.34-3.67 as moderate, and 3.68-5.00 as high.

3.1. Validity and reliability of the instrument

The researcher has carried out content and criterion validity of the constructed instrument involving two experts with more than ten years of experience in assessment and TVET, namely senior lecturers at the University Tun Hussien Onn, Malaysia. Expert experience is as suggested by [31], i.e. more than three years, and the number of experts is at least two if subjective [32]. In terms of instrument reliability, the researcher has conducted a pilot study on 30 Senior TVET teachers in Putrajaya district schools as recommended by Ghazali and Sufean [33], where a pilot study is conducted not intended to be generalized because the reliability of the questionnaire is required to see that the suitability and understanding of the respondents towards the items in the instrument. The conditions for visiting the questionnaire as appropriate are based on Cronbach's alpha value. According to Johnson and Christensen [34], the minimum Cronbach's alpha value accepted is 0.7. The findings of a pilot study on the Cronbach alpha value obtained by the variables i) the challenges in the classroom assessment practices of TVET subjects in secondary schools was (0.78); ii) the strength of CA in assessing TVET secondary school students was (0.87); and iii) respondents' perceptions of applying vocational skills in CA was (0.90). Overall, this research instrument is suitable for further research.

4. RESULTS

The respondent profiles pertain to the background of the study sample, which consists of 114 teachers, education officers, or TVET teaching officers affiliated with the Malaysian Ministry of Education, the Ministry of Higher Education, the Ministry of Youth and Sports, and industry representatives. The findings of the descriptive study on the demographics of the study respondents were to find the frequency and percentage values from the aspects of gender, race, period of services, position, and academic qualifications. Findings showed that the study respondents comprised 13.2% males and 99% females. Regarding races, 91.2% are Malay, and 1.8% are respondents of Chinese and Indian ethnicity. Furthermore, 61.4% of respondents have served between 6-10 years, 15.8% have served between 11-15 years, 8.8% have served between 16-20 years, and 14% have served more than 20 years. The respondents consisted of Senior TVET teachers (10.5%), TVET teachers (38.5%), MOE officers (7.8%), public skills training institute lecturers (7.0%), teacher training institute lecturers (8.8%), and public higher education institution lecturer (8.8%). The academic qualifications of the study respondents showed a Bachelor's Degree (85%), Master's Degree (10.5%), and Doctor of Philosophy (PhD) (5.5%).

4.1. What are the challenges of classroom-based assessment practices in TVET?

The challenges that exist in the CA practice of Malaysian secondary school TVET subjects are divided into five main factors, namely i) the TVET students' involvement; ii) the syllabus of TVET subjects; iii) the teachers as CA practitioners; iv) the learning environment; and v) the involvement of experts and industry representatives in TVET assessment practices. Respondents agree with all the issues and challenges in CA. The TVET students' involvement factor was overall (mean=4.13 and SD=1.14). The number of students in the class and the problem of students not attending school are the main issues and challenges in implementing CA for TVET subjects. The factor of TVET subjects recorded a high overall mean and SD (mean=4.0 and SD=1.12). The respondents agreed with the TVET subject scale factor that does not explain the importance of applying technical skills, Industry 4.0 generic skills, and career adaptability skills as a challenge in CA. As the practitioners of CA, the teacher factor recorded a score of (mean=3.7 and SD=1.2), showing a high level of agreement among the study respondents. The learning environment factor was recorded (mean=3.9 and SD=1.0). While the factor of experts and industry involvement in the assessment of TVET with (mean=4.1 and SD=1.0). These findings also showed the lack of participation of experts and the industry in assessing the level of knowledge and skills of TVET students. Table 1 shows the result of challenges in the CA practices of TVET subjects in secondary school.

Table 1. Challenges of CA practices in TVET

	Construct	Mean	SD	Interpretation
	The TVET Students' involvement			
1.	A large number of students in the class when CA is implemented	3.68	1.46	High
2.	Students absent from school	4.58	0.82	High
	Overall	4.13	1.14	High
	The syllabus of TVET subjects			
3.	TVET subjects are less clear about the application of technical skills.	4.05	1.15	High
4.	TVET subjects are less clear about the application of generic skills.	4.14	1.04	High
5.	TVET subjects are less clear about applying career adaptability skills.	3.98	1.1	High
	Overall	4.0	1.12	High
	The teachers as practitioners of CA			
6.	Documentation that burdens the teacher	4.56	0.86	High
7.	Teachers lack mastery of the technical and vocational subject syllabus	3.72	1.22	High
8.	Teachers are not given complete autonomy in determining the actual level of student mastery	3.53	1.38	Moderate
	Overall	3.7	1.2	High
	The learning environment			
9.	Lack of school system support	3.35	1.4	Moderate
10.	The time given to implement CA is not enough due to the compact size of the subjects	3.98	1.18	High
	Overall	3.9	1.07	High
	The involvement of experts and the industry in the assessment of TVET			
11.	There is no involvement of experts in the field of education in assessing the level of student mastery in terms of knowledge	4.14	1	High
12.	There is no involvement of the industry in assessing the level of mastery of students in terms of skills	4.05	1.14	High
	Overall	4.1	1.0	High

4.2. What is the strength of classroom-based assessment practices in TVET?

The findings in Table 2 showed the strength of CA in assessing TVET students from student factors, leading to a high level of agreement among the study respondents. The finding obtained is (mean=3.9 and SD=1.04). However, an item for CA that can help students evaluate the mastery of their peers received moderate agreement among respondents (mean=3.63 and SD=1.2). This finding shows that the respondents agree that CA is a holistic, integrated assessment system that can assess the knowledge and skills of TVET students and build their technical skills, Industry 4.0 generic skills, and career adaptability skills. The factors of teachers and stakeholders also recorded a high level of agreement, with a mean score of 3.95 and SD 1.07. The study shows that CA helps teachers evaluate their teaching and learning methods. CA also allows stakeholders such as schools and the Ministry of Education to provide a comprehensive, effective assessment mechanism that can provide effective feedback on the success of the TVET education system at the secondary school level.

Table 2. The strength of CA in TVET

	The strength of CA in assessing TVET students	Mean	SD	Interpretation
Students				
1.	CA emphasizes the form of assessment that measures mastery of skills rather than mastery of subject content only	3.96	1.11	High
2.	CA can measure the level of student's knowledge, attitudes, and skills holistically (overall)	3.89	1.12	High
3.	CA can help students evaluate the mastery of their peers	3.63	1.24	Moderate
4.	CA helps students improve their level of mastery in learning	3.84	1.08	High
5.	CA can develop students' "soft skills"	4.09	0.95	High
	Overall	3.9	1.04	High
Teachers and stakeholders				
1.	CA helps teachers master various teaching and learning methods	3.88	1.07	High
2.	CA increases the public's satisfaction, trust, and confidence in implementing bodies such as schools, PPD, JPN, and KPM	3.74	1.14	High
3.	Curriculum and assessment standard document (DSKP) help teachers make assessments	4.25	0.95	High
4.	CA is implemented following the guidelines set by the Ministry of Education	3.93	1.03	High
	Overall	3.95	1.07	High

4.3. What is the relevance of integrating vocational skills in CA practices?

The findings in Table 3 showed the relevance of integrating technical skills in TVET classroom assessment practices. The overall mean score and SD obtained were 4.69 and 0.53. This finding indicated that the respondents had agreed that integrating technical skills in classroom assessment is relevant. This finding also showed that integrating technical skills into classroom assessments allows teachers to track students' skill growth and progress. Proper assessments reveal where students succeed and where they need to improve. This data assists teachers in identifying specific skill gaps and adapting their instructional techniques accordingly, ensuring students receive targeted support in building their technical skills.

Table 3. The relevance of integrating vocational skills in CA

	The relevance of integrating technical skills in classroom assessment practice	Mean	SD	Interpretation
1.	Students must be competent in specific activities, especially involving the correct method.	4.65	0.61	High
2.	Students need to have an understanding of doing specific activities, with correct process.	4.75	0.43	High
3.	Students must be competent in specific activities, especially involving the correct process.	4.67	0.54	High
4.	Students need to have an understanding of doing specific activities, with correct technique.	4.68	0.47	High
5.	Students must practice correct and accurate procedures/work steps/work processes before/during/after using specific equipment and materials.	4.81	0.44	High
	Overall	4.69	0.53	High

The findings in Table 4 showed the relevance of integrating industry 4.0 generic skills in classroom assessment practice. The results showed a high level of agreement among the respondents. The overall mean and standard deviation scores were obtained (mean=4.62 and SD=0.58). This finding indicated that integrating IR 4.0 generic skills in TVET classroom assessment practices is relevant and essential. The result also showed that integrating Industry 4.0 generic skills into classroom assessment practices is critical for preparing students for the changing demands of the modern workforce and can equip students with the necessary competencies to thrive in the dynamic and technology-driven workplaces of Industry 4.0.

Table 4. The relevance of integrating industry 4.0 generic skills in CA

	The relevance of integrating industry 4.0 generic skills in classroom assessment practice	Mean	SD	Interpretation
1.	Generic skills need to be applied in teaching and learning technical and vocational subjects in line with the goals of Industrial Revolution 4.0	4.68	0.50	High
2.	Manage network systems and information systems that help students in learning activities.	4.60	0.65	High
3.	Communicating virtually (virtual community), such as Skype, Google Meet, and Zoom, is suitable for discussing something related to student learning.	4.18	1.13	High
4.	Students who are aware of the opportunities that exist in the field of entrepreneurship can build career opportunities	4.75	0.43	High
5.	Assessment of students' generic skills in classroom assessment helps students see their potential.	4.58	0.53	High
	Overall	4.62	0.58	High

The findings in Table 5 showed a high agreement among respondents on integrating career adaptability skill elements in CA with the mean value and overall SD (mean=4.58 and SD=0.67). Respondents agreed that through career adaptability skills, students could master their teaching and learning better. The respondents also agreed that through applying career adaptability skills, students could explore opportunities when exposed to accurate career selection information in the real world of work through the curriculum and TVET assessment. In addition, the respondents also agreed that students would have a good career choice and be able to face future challenges in the world of work.

Table 5. The relevance of integrating career adaptability skills in CA

	The relevance of integrating career adaptability skills in CA practice	Mean	SD	Interpretation
1.	Career adaptability skills should be assessed in classroom to help students develop career knowledge.	4.60	0.65	High
2.	Be aware of the education and career choices that need to be made	4.67	0.60	High
3.	Exploring the learning environment and finding its relevance to appropriate career development	4.67	0.60	High
4.	Carry out the tasks given by the teacher efficiently and according to the correct procedures	4.49	0.80	High
5.	Always optimistic (with high/good hopes in the future) about a career choice according to a specific field.	4.53	0.76	High
	Overall	4.58	0.67	High

5. DISCUSSION

5.1. The challenges in the TVET classroom assessment practices

Assessment practice is an assessment component that must be provided to explain the assessment strategy teachers employ. According to the Malaysian Education Blueprint 2013–2025 [35], in combination with the Malaysian philosophy of education, classroom assessment is the key to holistically developing a child's cognitive, affective, and psychomotor development skills [36]. The five primary challenges in CA in TVET at Malaysian secondary schools are i) the TVET students' involvement; ii) the syllabus of TVET subjects; iii) the teachers as CA practitioners; iv) the learning environment; and v) the involvement of experts and industry representatives in TVET assessment practices. Respondents agree with all CA issues and

challenges. Respondents agreed that many students not attending school was the most significant difficulty and challenge in implementing CA for TVET subjects. The absence of students during the school session also became the main issue in the study conducted by Lokman *et al*. [20].

This study also reported that TVET subjects and elements that do not highlight the importance of applying vocational skills, such as technical, generic, and career adaptability abilities, also have a large-scale factor as a CA issue. Integrating vocational skills in assessing competency aspects is a frequently debated issue, such as the study conducted by Ana *et al*. [37]. The respondents agreed on the teacher aspect as CA practitioners. When a teacher does not fully understand the material, assessment technique, or workload, it causes an issue. Chookaew *et al*. [38] also defined short-term courses, combined with insufficient training, as being thought to raise the likelihood of poor skill acquisition and assessment rigor, notably for entry-level instructors and trainers. Based on the findings, CA implementation is complex due to the short timeframe for compact-scale implementation. This study also found no involvement of experts and industry in assessing TVET students' knowledge and skills in TVET for secondary school. According to Abelha *et al*. [39], if industry participation in TVET assessment is not aligned with the development of graduate competencies, this will contribute to skills disparity among graduates and impact employment demand. Therefore, industry involvement in TVET assessment is a priority in determining the desired learning outcomes.

5.2. The strength of TVET classroom assessment practices

The findings demonstrate the strength of TVET's CA assessment of students, teachers, and stakeholders. CA may assess a student's knowledge, attitude, and abilities comprehensively and build the student's soft skills. In addition, one of the critical strengths of assessment in TVET is its emphasis on practical, hands-on skills assessments. TVET programs are designed to provide learners with the knowledge and skills needed to perform specific tasks and duties in their chosen profession [40]. TVET assessments often evaluate their ability to perform specific tasks, use tools and equipment, and follow safety procedures to ensure they can apply what they have learned in practical skills. TVET assessments also prioritize continuous improvement and feedback. Students are usually provided with regular feedback on their performance, and assessments are used to identify areas where learners may need additional support or training [41]. This feedback loop allows learners to improve their skills and knowledge over time, essential in a rapidly changing job market where skills requirements constantly evolve.

Another strength of the TVET assessment is that it should be aligned with industry standards and requirements. According to Yamada *et al*. [42], TVET programs are often designed in collaboration with industry partners to ensure that learners are equipped with the skills and knowledge that are in demand in the job market. This collaboration also extends to the assessment process, with industry professionals often designing and evaluating assessments. Learners who have acquired knowledge and skills through previous education, training, or work experience can have those skills recognized and accredited to their TVET qualification. Overall, the emphasis on practical skills assessments, continuous improvement and feedback, alignment with industry standards, and recognition of prior learning are key assessment strengths in TVET.

This TVET assessment demonstrates the potential for developing a comprehensive approach to assessing students' knowledge, skills, and attitudes across multiple dimensions. This tool facilitates the development of lesson plans and the identification of appropriate assessment methods for teachers while supporting their implementation. The inclusion of practical tasks or “hands-on” experiences is essential within vocational education as it facilitates the transformation of cognitive conceptual knowledge into psychomotor abilities [43]. Practical work is critical for student preparation and mastering a precise and proper work method to fulfill real-world employment demands. A pedagogical strategy and methodology that effectively facilitates the acquisition of technical and vocational expertise must possess distinct attributes conducive to promoting ingenuity [44]. The facilitation of vocational skill development has significant implications for educators and other professionals in the field of vocational education, as it enables them to organize learning activities that align with predetermined objectives effectively.

5.3. The relevance of integrating vocational skills in classroom assessment practices of TVET subjects

Integrating vocational skills in the context of CA in TVET aligns with three essential benchmarks that TVET students must meet: technical skills, Industry 4.0 generic skills, and career adaptability skills. The result shows that all three skills attained a high degree of agreement. The finding showed the importance of integrating these vocational skills in TVET classroom assessment practice. Integrating vocational skills motivates students to deviate from conventional learning methods and become better equipped to comprehend essential concepts and skills. Given the significance of the situation, it can be utilized to address the issue at present. It illustrates the significance of vocational skills development in technical and vocational education.

The categorization of technical skills can be based on elements such as methods, processes, and techniques [26]; consistent with a study conducted by Mazin *et al.* [45], performing consecutive exercises can enhance the efficacy of psychomotor actions. This study's term "technical skills" pertains to expertise and analytical proficiencies in utilizing tools and methodologies within particular domains. Learners can understand and exhibit proficiency in performing designated activities, specifically those necessitating using methods, processes, procedures, or techniques. TVET are directly involved, such as technical skills like graphic communication through design activities, preparation of engineering drawings, technical drawings, or even geometric drawings [46]. As a result, technical capabilities and the exchange of visual ideas with others are critical components of the design process, particularly in the early phases.

Career adaptability pertains to the psychosocial traits that enable a student to take responsibility for comprehending their responsibilities and cope with unexpected changes and challenges in the context of learning and employment. The findings indicate that the participants agreed on integrating career adaptability skills within the context of CA. The statement highlights the significance of career adaptability skills in fostering the proficiency of technical and vocational learners. A significant correlation exists between generic abilities and career adaptability [47]. This finding highlights the crucial role of the curriculum in shaping students' future success in the workforce. Further, it empowers educators to incorporate these competencies into their pedagogy and evaluation methods, thereby aiding learners in comprehending the occupational trajectory, cultivating occupational expertise, and sustaining a constructive outlook throughout their vocational exploration. Therefore, assessment is crucial because it can help determine the success of student learning, enhance future learning, and evaluate the efficacy of the entire subject curriculum, including TVET.

6. CONCLUSION

The technical and vocational education training students increasingly incorporate technical skills, Industry 4.0 generic skills, and career adaptability skills into classroom assessments. The study reveals a need for secondary school leave and new labor market entrants to be equipped with these skills, particularly those demanded by their chosen sector. Teachers must have in-depth knowledge and skills in assessment to effectively implement the CA of TVET subjects, ensuring all aspects of skills are assessed as intended in the TVET curriculum. Future research should explore other ways to give students a competitive edge in the labor market. Teachers must be proficient in assessing students' higher-order cognitive skills, allowing them to employ a broader spectrum of pedagogical approaches. The research findings significantly impact Malaysia's TVET education system, whether it is students, teachers, schools, or the Malaysian Ministry of Education. The significance of this study lies in its relevance to TVET as it contributes towards producing a competent and proficient workforce. It informs students and stakeholders to foster a good atmosphere that improves student abilities and competencies.

Moreover, it could aid the Ministry of Education in creating a more effective educational curriculum that cultivates students' skills in alignment with the prevailing demands of the industry. Efforts should be made to conduct a comprehensive evaluation that prioritizes acquiring knowledge, developing intellectual capital, establishing a forward-thinking cultural mindset, and promoting ethical conduct and moral principles. It also emphasizes the need to perform assessments using appropriate assessment ideas and procedures. Assessment of information's accuracy allows teachers, students, parents, and institutions to take appropriate action. In addition, the role of teachers as implementers of this novel classroom assessment practice in TVET is recommended as a potential avenue for future research based on the outcomes of this study. This approach allows for a comprehensive evaluation of student learning and helps ensure that students are knowledgeable in their field of study, possess generic skills, and adapt to changing career demands. By including these competencies in the assessment process, educators can provide students with a well-rounded education that prepares them for success in the workforce.

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BIOGRAPHIES OF AUTHORS

Siti Raudhah M. Yusop is a Ph.D. Candidate, Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia. She is a secondary school teacher specializing in Design and Technology. Her research focuses on TVET education, assessment in education, and TVET for Secondary Schools. She can be contacted at P109257@siswa.ukm.edu.my.

Mohamad Sattar Rasul received a PhD & MSc. in Industrial Engineering and systems) from the Universiti Putra Malaysia. His experience as an Academician at the Universiti Kebangsaan Malaysia (UKM), currently holding the position of Professor at the STEM Enculturation Centre within the Faculty of Education at the Universiti Kebangsaan Malaysia. His research interests include TVET Policy and curriculum, quality assurance, qualification and skills certification system, career development, engineering, and STEM Education. His publication topics include TVET curriculum, TVET career development, STEM education, technology education, and vocational education. He can be contacted at email: drsattar@ukm.edu.my.

Ruhizan Mohamad Yasin received a PhD degree in education from the University of Minnesota, Twin Cities, USA, in 1998. She has over 30 years of experience as an Academician at the Universiti Kebangsaan Malaysia (UKM), where she is currently a Professor at the Faculty of Education, UKM. Her research interest includes students' learning and development at various levels and areas, especially in STEM education. Her publication topics include technology education, vocational education, sustainable development, workplace learning and lifelong learning. She can be contacted at email: ruhizan@ukm.edu.my.